THE

INDIAN AGRICULTURIST.

A MONTHLY

JOURNAL OF INDIAN AGRICULTURE, MINERALOGY, AND STATISTICS.

VOL. V.

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VOL. V.] CALCUTTA : THURSDAY, 1ST JANUARY 1880. [No. 1.

NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.

Calcutta, 1st Feb. 1876.

CONTENTS.

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

CORRESPONDENCE.

COFFEE LEAF DISEASE.

TO THE EDITOR.

SIR,—In the issue of the *Indian Agriculturist* for December, I was much struck with an article under "Coffee Leaf Disease" as being of a nature better calculated to lead to a clearer and more enlightened view of the matter than obtains in the meantime. The manner in which you have treated the subject too, should make those people, who are so confident of sulphur and lime being the only remedy for leaf disease, weigh the matter more fully before giving vent to assertions which very frequently assume a dogmatic character.

With your permission, I would offer a remark or two on what in my humble opinion is the true secret of the subject, and which you ably put into these few words. "In looking into the sources of this disorder, we must go back to first principles". . . . and that "we interfere with the natural order of things, we want more seed and fruit than the bushes would produce in the ordinary course of Nature, and hence we adopt measures to that end." Everybody will I think agree as to the truth of these statements, but I suspect that the same unanimity will not exist in regard to the remedies suggested. If I understand you, you appear to advocate a system of non-intervention when the tree would seem to me to require it least—after it has given a large crop; for without coming to its relief by a judicious application of manure and the pruning knife, the results must prove disastrous to the tree in the first place, and secondly, to the revenue of the planter.

I consider that the solution of the problem is to be sought and found in quite another direction. In the wild state coffee has never been found growing except *under* the *shade* of *forest trees*, hence would it not be the most natural conclusion to arrive at, that it is in following Nature as closely as possible, the greatest success may be expected. By adopting the system of cultivating the coffee tree under shade, there are a great many other advantages besides the main one of not having its energies exhausted year after year with crops greater than it can well bear, which might be taken into account. The need for manure is less, owing to a copious deposit from the large trees which materially adds to the fertilization of the soil; the need for pruning is also lessened since the tree does not "make" the same amount of wood as when grown in the open, while the saving in the expenditure as regards weeding, digging, &c., is enormous. I am strongly of opinion, that if in Ceylon and elsewhere planters cultivate shade with the same assiduity as they pay to matters of minor importance, in less than ten years there would be very little occasion for so much talking and writing on the vexed question of Hemeleia vastatrix."

J. L.

CINCHONA IN HAPUTALE—SPLENDID RESULTS IN OUTTURN OF DRY BARK PER TREE.

(*To the Editor of the Ceylon Observer.*)

Broughton Estate, Haputale, [illegible]th Nov. 1879.

DEAR SIR,—Seeing an inquiry made in your paper a few days ago as to the average outturn of dry bark from cinchona officinalis trees of matured growth, and also a statement of yours that you thought 2lb. about the average, I beg to state that I have despatched 338lb. *dry* bark from 45 trees, that is 7·51lb. per tree. These trees were planted along the boundary of this estate about 10 years ago, where the soil is far from good, and were coppiced in July last, and the bark thoroughly dried in store before despatch.

The succirubra trees, coppiced at the same time, averaged 10·62lb. per tree : 1,094lb. from 103 trees, which though not so good an outturn as was obtained from some 400 trees felled on Sherwood Estate two

years ago, namely, 14·75lb. is by no means a bad average when it is remembered that the Sherwood trees were planted on good soil whilst these were simply put round the roads and patena boundary.

Yours faithfully,
H. H. CAPPER.

RASPING TEA.

SIR,—In the *Indian Agriculturist* of 1st October, I have been reading Article No. II., on "Drawbacks to the success of Tea," and as I have had a varied experience of four years in a London Brokers' office, ten years in mercantile life in various parts of India, and am at present in tea in Assam, I think myself in a more unprejudicial position than most people for judging some questions connected with the planters' interests.

The first objection I have to make to your article, is your statement that the Assam qualities, *viz.*, strength and pungency are solely in favour of the home China market, and a style of manufacture calculated to produce them you characterise as "simply ruinous."

My personal belief may be of little weight, but I am confident the average price of Assam tea could not be realised if it was bought for drinking, not blending purposes, and if the day ever comes when Assam has beaten China out of the London market, farewell to the Assam prices of the past, unless indeed it is still in demand for giving body to the hill teas. But the point I wish to make is, that, consumers cannot afford to compete with dealers for a special article used by the latter to raise the quality of a large bulk.

Wine merchants know how a small quantity of full flavoured and full bodied wine will improve the quality of a large quantity of inferior liquor, but the growers of the former know their interest lies in making a wine suitable, for trade rather than consumption, as the public are quite unable to compete with the trade in such matters.

When Assam tea was at its highest, it was necessarily the most profitable for Assam planters. In those days a little Assam had to do a vast amount of work, and the competition for it, of course, was very brisk among dealers, but fancy consumers paying Rs. 5 per lb., and I remember one parcel fetching over Rs. 10.

As Assam deliveries increase, necessarily the value falls, and if eventually it supplants China, it will beat China prices, and then the question arises, can it be grown at those prices profitably? You look forward hopefully to that day as the millenium of the Indian tea planter, but personally I should bitterly regret it, but I have no fears of it ever coming to pass, as even at prices ruling in the early halves of 1878-79, many thousands of acres in Assam would go out of cultivation.

The second point I would controvert in your article, is the superiority of the London market for sellers over the Calcutta one.

You say you have closely studied the Calcutta prices as compared with the London ones, and find the latter higher. As in 1878-79, the market for the latter halves of those years has been a rising one, it would naturally be the case, but your conclusion that as people continue to ship tea, therefore it must pay, though it should be true, I regret that every one acquainted in the smallest degree with Indian trade, knows there is no "must" in the matter at all.

In my experience there is very rarely a margin of profit between Indian and home prices in all kinds of produce, and most shipments are made on the hope of the market rising between shipment and arrival, and so realising a profit. In proof of this you have the numerous recent failures on both sides of India, and if you know many, or say any merchants retiring with fortunes, though out here many years, you are more fortunate in your acquaintances than I am. Some firms have done well by systematic *bearing*, always selling forward at home, trusting to the market falling to enable them to cover here at a profit, but such firms are in a very small minority, and men with capital find the home markets more advantageous to work upon than the Indian as being lower in the long run.

In short I deprecate your advice to planters both as regards style of manufacture and market for sale, but I hope some day when Indian trade is in a sound condition with fair margins for the merchant to work upon, that it will be the interest of all of us planters to ship the bulk of our teas to London, but that day I am afraid is still far distant.

NONDESCRIPT.

BAMBOO FOR PAPER STOCK.

I.

SIR,—In his report on the Royal Botanical Garden, Calcutta, 1878-79, which appears in your journal for October, Dr. King remarks that his further experience gained during the year in the process of cropping clumps of bamboos has confirmed him in his opinion of the unsuitability of the plan proposed by Mr. Routledge.

I have shewn in previous letters and in a pamphlet I have published on the subject, that Dr. King from the very first, misapprehended what he is pleased to term "my plant," but having instituted experiments on this erroneous basis in the year 1875-76, has persistently carried them on year after year with the infructuous result he again records.

It is very much to be regretted that during this somewhat lengthy period while experimenting upon a system he declared would not answer, so able a botanist having all facilities at command, did not simultaneously carry on parallel trials or experiments on some other system, (either his own or one of those recommended by Dr. Brandis) which promised better prospects of success, this however does not appear to have occurred to Dr. King, and he now therefore leaves the question just as he found it.

Fortunately for progress I have been more ably assisted through other channels (*vide* my letter of 24th August in your October issue), by which Dr. King's *Question No.* 2 is his report is conclusively answered, shewing that immature shoots of wild bamboos "*can be collected from the native forests and conveyed to a Factory;*" as also that they can be floated long distances and delivered under a cost of five shillings per ton, both facts disputed by Dr. King.

I am glad to say that Dr. King's *Question No.* 1, is also in a fair train for settlement as Dr. Ribbentrop, the Conservator of Forests in British Burmah, has inaugurated plantations under irrigation, which will authoritatively test this important question, and has published his opinion that irrigation will he believes, materially promote the productive growth of bamboo, thus not only would be the cost of cutting and carrying so bulky an article as young bamboo shoots be materially reduced, but strict surveillance kept over their collection, a very important point in ensuring regularity of quality.

Although no doubt from the native forest, under proper supervision, the young season shoots can be cut and collected at a very low cost, the danger will always exist of some older growth being mixed with the young stems, which would be extremely prejudicial to the quality of the "stock" manufactured, selection or sorting after cutting being extremely difficult, indeed after the stems have been crushed and dried, it is almost impossible to detect and separate the old from the young; and I perhaps should explain that for economy of manufacture, and to ensure high quality of fibre, it is essential that the young shoots should be cut while the sap is flowing, and before they have attained full development or maturity, for this and foregoing reasons I give a most decided preference to plantations.

Dr. King's 3rd question remains to be considered, *viz*, "*A Floating Paper Stock Mill*;" I can only infer that Dr. King could never have seen a paper mill, or he never seriously would have made such a suggestion:—

Without entering into full details, the plant for a Paper Stock Factory would consist of 12 or more large iron vessels, each to contain 1 ton dry crushed bamboo, filled when working with say 1,200 gallons caustic alkali, to keep which boiling, steam generating boilers would of course be necessary as well as to drive the cutting, pressing, willowing, drying, and other machinery with balling presses. Obviously therefore heavy machinery of such a character is impracticable on any floating vessel, but were it otherwise as shewn in my last letter, bamboo will float, clearly therefore it would be far more simple and practical to float the bamboos to the factory, than the factory to the bamboos.

Should it be determined to collect the young season shoots from the native forest, a steam launch may be employed, the machinery arranged for driving crushing rolls and the stems thus collected and crushed towed into lighters to a central factory.

It must, however, be borne in mind that under no circumstances are young shoots produced during all the year; a certain portion therefore as collected and crushed whether from plantations, or the native forest must be dried and stored for the continuous supply of the Paper Stock Factory, which like a paper mill must be worked night and day during the year, and such a factory to ensure commercial success, must be upon a scale capable of converting at least 100 tons bamboos (calculated as dry) into paper stock weekly producing say, from 60 to 70 tons merchantable stock.

Dr. King intimates in his report, "*that even accepting Mr. Routledge's estimate of its value,*" bamboo as a material for "the manufacture of paper can only be tested by practical paper makers," the inference is obvious, but although it may appear egotistical to say so much, I venture to assert that my judgment on this point will be admitted by our English Paper Trade, and I unhesitatingly state that no fibrous material that has come under my notice is so well adapted to meet paper making requirements as bamboo; the whole question so far as paper stock and paper therefrom having been conclusively tested, it only remains to organise the supply of bamboo in connection with Paper Stock Factories; the sale of the manufactured product being assured to almost an unlimited extent.

During the past few weeks in unison with the general rise of all articles of produce, the price of Esparto grass (the raw material on which at present the paper trade mainly depends) has risen from 30 to 40 shillings per ton, and the market is absolutely bare of stocks, we paper makers therefore are in rather a critical position. (Tripoli grass the cheapest quality, selling at £7 per ton.) I shall therefore be much surprised if with the revival of commercial enterprise, bamboo does not soon come to the front, as it is a material infinitely superior in quality to Esparto, and the pater stock therefrom producible at less cost.

THOS. ROUTLEDGE.

Claxheugh, Sunderland, 5th Nov., 1879.

II.

DEAR SIR,—On inquiring in the Reading Room of the Royal Colonial Institute, of which I am a fellow, I find your journal absent, which is regrettable, not merely in the interests of the institute where the papers of nearly all our colonies are filed and regularly transmitted, but being read there, would I doubt not, induce many subscribers judging from the interesting matter *I always* find therein.

The practice of the institute appears to be, to exchange compliments with Editors and proprietors of Colonial and other journals, they sending their papers and an annual book recording the meetings and events of the year.

They would I doubt not, pay the postage on your journal, if you thought well to exchange, but if you do not care for this, I doubt not by placing your journal before the Committee with a suggestion to that effect they would subscribe for it.

In any case I wish to see your journal in our rooms so kindly intimate to me or to Mr. Frederic Young, the Hon. Secretary, 15, Strand, London, what you will do.

I am going to put a case of bamboo in all its stages up to paper in the Museum, and if you have the back numbers in which you have so kindly inserted my several letters on Bamboo, by you, say from last January, I should be glad if you will forward them to the institute and let me know the cost, which I will hand your London Agent, who I assume will be Street and Company of Cornhill.

Our Esparto grass still continues to rise in value. Rags also have advanced in price from 30*s*. to 40*s*. per ton, therefore with the general commercial revival which now appears to be established, I trust ere long to see bamboo make a move.

THOS. ROUTLEDGE.

London, 19th November 1879.

THE ASHES OF MANURE.

SIR,—I see from your issue of Tuesday last, an extract from the *Pioneer* respecting Mr. Caird. In England he is considered a great authority, and in the extract I sent you he does not give a mere *on dit*, but the result of a careful experiment by the European manager, Mr. Robertson, at the Government Experimental Farm at Sydapet, near Madras, and he says he "ventured to press on Mr. Robertson the propriety of repeating the experiment." He also adds :—" Very great advantage to India is likely to result from the *well-considered* experiments carried out here by Mr. Robertson." You will find this article in *XIX Century* for September last. I have always been under the impression that as regards *fertilising properties*, *i.e.*, plant-food of a substance, the ash contained the whole or *nearly the whole* of the substance in itself or what it could absorb from the atmosphere or internally chemically reproduce. I give my authority from memory as I have not a copy to hand, *viz*., Professor Johnstone's work on Agricultural Chemistry, the small edition. He either says the whole or nearly the whole ; or gives one or two exceptions. What I wish to point out is that Mr. Caird did not think the result improbable, but rather likely.

In a trip through South India many years ago, I was surprised to see how the land could give continual crops when the villagers burnt the whole of the dung of their cattle. Early in the morning numbers of women and children would be seen collecting the dung from the roads even, to be made into flat, round cakes stuck on the walls of their houses to dry, and afterwards to be used as fuel, but I did not known that it was carefully applied to their fields afterwards in the form of ashes.

[Our correspondent is quite right ; we had specially marked Mr. Caird's quotation from Mr. Robertson for notice ; the *Pioneer's*, paragraph did not refer to such statements of facts.—ED. *Ceylon Observer*.

IMMIGRATION INTO BRITISH GUIANA.

SIR,—In our memorial, dated 20th February 1879, we omitted to explain how it is that the infants and other children, in this colony, are shut out from the possibility of obtaining the free return passage to India, which it appears from Ord. 7, 1873, section 77, is within the reach of every such immigrant.

No infants above 5 years of age on arrival can by any means acquire a right to a free back passage, as they cannot under the existing law, as interpreted by the Immigration Agent-General obtain a Certificate of Exemption from labour. Ord. 7, 1873, section 77 provides that infants and minors may be indentured after their arrival, and while residing on a plantation, but this has never been carried out, and a resolution of the Court of Policy, dated Monday, 28th June 1875, has virtually abrogated section 77 by fixing the bounty on indenture on a plantation at a sum which no planter would pay, namely, $200. The bounty was raised in this manner avowedly to put a stop to indenture under-contracts under section 72, and it operates equally in preventing indenture under section 77.

If the Ord. 4, 1876, were carried out literally, no immigrant who had not been indentured on arrival, could get employment on a plantation. For Ord. 4, 1876, section 47 provides, that no person shall employ an Asiatic immigrant not under indenture until such immigrant shall have produced his Certificate of Exemption from labour, while the Immigration Agent-General holds, that no immigrant can be entitled to a Certificate of Exemption from labour, unless he shall have served five years under indenture, so that any immigrant born in the colony on arriving here under 10 years of age would not be eligible for employment. It is true the Immigration Agent gives them which he calls a Certificate of Freedom, but this is a document not provided for by law, and consequently null and of no legal value.

We beg to state that no reply or acknowledgment has yet been received from the Governor to our memorial.

ILAUDUM,

For self and others who signed the memorial.

British Guiana, 23rd October 1879.

MADRAS NOTES.

SIR,—It is a matter for regret that, owing to the financial crisis which the country has been brought to by amateur financiers, the efforts of the local Government are likely to be paralysed as far as regards efforts for agricultural improvement. That scheme so energetically propounded last year by Sir R. Temple in Bombay, also seems likely to collapse, if the reported refusal of the Secretary of State to appoint a trained officer to superintend the work to be carried out by the native instructors be true ; for without such an officer is it likely that the native teachers will be kept from gravitating back into the courses pursued by their ancestors, relations, and friends. Thus it seems that the abolition of the Etc. Department under the Government of India is to be accompanied by the extinction or nullification of all efforts for the improvement of native husbandry, notwithstanding the grandiloquent phrases made use of in the resolution abolishing the department named. Mr. Harman, who was, I believe, to have been appointed to superintend the work of agricultural education in Bombay, has recently returned from Australia, whither he was obliged to proceed on account of his health having broken down during his tours in Coorg, &c., when inquiring regarding the leaf disease. His health has, it is to be feared, been permanently injured in performing this duty, and his stay in India doubtful. His report regarding the disease is being looked for, but I suppose it is in the hands of the Mysore Government, and probably, as such documents usually fare, will not see the light until it is stale, and perhaps rendered useless by further discoveries.

It is confidently reported that some of the members, at least, of the Famine Commission have grasped the importance of the facts which show the agricultural condition of the country ; and Mr. Caird says that, what should be patent to all, we have an increasing population, but a stationary system of farming ; a state of things which of course cannot go on, for there must soon be found a limit to the increase of the arable area, which has heretofore met the increased demands for food to supply the wants of the growing population. There can be little doubt, I think, that our famines must be chiefly attributed, in their severe forms, to the backward state of our husbandry—an exhausting and impoverishing, instead of an improving and advancing one. And there are those who venture to assert that, had the country been under a higher system of cultivation in 1876, the Madras famine in all its horrors would never have occurred to devastate so many districts ; although of course they admit that with great failures of rain there must always be high prices.

* Mr. Caird I see endeavours to throw a doubt on the evil character of the practice of burning cattle dung; but he loses sight of two facts, which are of great importance in the question, and also certainly does not seem to have been aware of the results given in your October issue, detained at Bangalore. The facts I refer to are 1st, the loss of organic matter through burning, and thus of the consequent mechanical benefits to the soil, and, 2ndly, the fact that if wood were used as fuel, the ashes therefrom would go to swell the manure heap, *in addition to* the cattle dung. He also does not seem to remember the value of the urine of cattle, which is of course, when the solid excreta are used as fuel, totally wasted. The figures also on which he based his conclusions, show I think quite the reverse to what he states, if carefully examined. For, on looking them up, I find that it was only in the first cutting that the ashes gave the heavier return, whilst the second cutting of the fodder they had but little effect, bearing out the well-known fact that their action is very rapid. Mr. Caird would have done well to have weighed the results before him better, before jumping to a conclusion.

A correspondent of yours, I see, appears to try and deprecate the value of the education given in our local school of Agriculture at Saidapett; but surely he might have taken the trouble to understand what he was writing about before he ventured to give his opinion. He does not appear to be aware of the fact that model farming, as a means for improving agriculture has been given up in almost every country, and in Madras also, although the local Government did not long ago express themselves of the opinion that a model farm was a necessary adjunct to a good system of agricultural education, in this forgetting their previously express approval of the abolition of their own model farm, and also the experience gained in Germany, America, and England in connection with Agricultural Colleges. In this country in particular model farms are likely to be most particularly useless, as the native farmer is not at all prone to copy, nor is he one who is likely to perceive the advantages of improvements; add to this his ignorance, superstition, and conservatism, and the probable results from placing an example before him are not likely to be great, even if any at all are obtained at a cost at all commensurate with the improvement effected in his agricultural processes.

I quite believe that the founders of the institution referred to started with far too ambitious aims, and that the curriculum of study is much too scientific and not practical enough in its bearings. No more unfortunate place for teaching agriculture practically could have been chosen, for as regards its position, its soil, and surroundings, it is exceptional. There is no fair specimen of native agriculture near by; the district around being more than commonly in the hands of pauper cultivators. The students therefore have no chance of comparing, or of being shown the difference between the system recommended to them, and that pursued by the ryot according to time honored custom. But it must be admitted that agricultural education in any form, as long as it is sound, must be a benefit to the country, even though it may not be as effective and thorough as is desirable. That Hindu students will take to practical work, when they have sufficient inducements to do so, is shown by the fact that they will compete in ploughing matches such as the one held at Saidapet last year, and which is to be repeated very shortly. Last year the competition attracted a good deal of attention from the public, and the competitors were numerous.

AGRICOLA.

December 17, 1879.

KOTEGURH NOTES.

SIR,—The weather during the present month has been dry and bright. We have had only half-a-dozen days on which clouds appeared, and only one day which threatened rain, but nothing fell here all passed off to the snowy range, which soon had a new white covering.

The hill sides are now brown, and the deciduous trees have shed their leaves, and the country side is putting on its wintry appearance. The atmosphere continues generally clear, though at times it becomes slightly thick and hazy.

The following is a comparative table of the past five seasons:—

	1875.	1876.	1877.	1878.	1879.
Rainy days	....	1	....	....	....
Wet "	1	1	4	....	....
	Dry and bright.	Dry and bright.	Satisfactory.	Dry and bright.	Dry and bright.

Wind hardly any, when it comes it is from the N. or E. Frost commenced about the middle of the month, and during the last week water has frozen in the *gharrahs* in the bath-room.

The thermometer (Fahrenheit) hung in an open verandah (6,400 feet above sea level) W. aspect is about 45° in the morning, 54° in the afternoon, lowest 36°, highest 57°.

There is not much to record different from last month.

The birds are the same, though the vermin, rats especially, are in greater numbers than ever, and a good heavy frost, to thin their numbers will be duly appreciated.

The pink flowers of the wild sorrel (vern. *balora, malora*) came out about the 6th; the white waxy looking flowers of the wild oleander (nerium oleander) about a week later. Their advent is the sure sign of the beginning of winter. The leaf buds of the walnut and horse chestnut, and the fruit buds of the peach are forming.

The Rampur Fair was held on the 8th and 10th. Here congregate people from Tibet and from the plains of India for the purpose of exchange of commodities. In a late number of your journal you gave a short account of this fair, so I need not repeat. Rampore is the capital of the Native State of Bissahir, about 22 miles to the east of this place. The fair time is well attended and is looked forward to by the inhabitants, for many miles round, as a season of relaxation from the agricultural duties, and a means of laying in a stock of warm woollen cloths for the winter.

The villages are now busy threshing out the remainder of their autumn gathered crops, among which rice is the chief. They are also hard at work collecting firewood, pine-leaves for bedding for their cattle, grass, and leaves, and small twigs of trees for their goats and sheep. The men folk are now busy spinning wool, which they do in all spare moments, carrying a small basket (*kaondah*), containing cleaned wool (*ún*), on their left arm, and the spindle (*takkri*) with which they spin the wool, in their right hand; many twist the wool which they have spun as they walk along, and the operation is even carried on in the Naib Tahsildar's court when a case is in progress and by the different persons interested in it; women seldom spin, the labour being considered much too light for them. The women are told off to carry out and spread the manure in the fields, that being the proper kind of work for them, and they are now busy carrying out that operation, as the villagers consider it advisable to get the manure spread before the snow falls, so that its strengthening properties may be carried into the ground when the snow melts; at this season of the year there is but slight loss by evaporation consequent on the manure being now spread out over the fields. Chenopodium (*kala battú bitú*; similar to the English goosefoot and nearly allied to the quinoa cultivated in the Andes of South America, was harvested about the second week; it is not eaten alone but mixed with barley and the amaranth. Jowar ripens about the same time, it is cultivated in very small qualities, and by a few only of the better off zemindars. Hill potatos are being dug up and stored for winter use. The ploughing operations are nearly all over, only a very few fields—those lately under *kala battu* and hill potatos—remaining the barley was all sown by the first week, the first day of the Rampore, *viz.*, the 8th, being reckoned the last safe date. Some of the villagers now begin to press out apricot oil, the operation seldom takes place until the field work is nearly over and labour spared for the purpose. As I have already given full details in the Indian Agriculturist for July 1st, 1878, page 229, on the subject of the manufacture of apricot oil, I need say no more on the subject here. An oil mill, when the property of a *deota* (idol) is placed convenient for the use of the inhabitants of 3 or 4 villages; a small share of the outturn is given to the *pujaris* (priests) of the idol. Whoever arrives first at the mill and *lights a fire*, obtains the use of the mill for the day, and he can pass to and from his home or anywhere else, as often as he likes, and no one will interfere with the mill provided his fire continues to burn; if it goes out another person can at once make use of the mill.

In the garden we have zinia, mignonette, snap-dragon, narcissus, stock chrysanthemum, white china rose, red monthly rose, aster, scarlet geranium. In September phlox, partulacca, centaurea were sown, they came into flower, about the middle of the month, and still continue in blossom. Myrtle, fuschid, geranium, heliotrope, hydrangea, and other similar kinds of plants have been wrapped up in grass coverings since the middle of the month.

Peas sown in September are now ripe. There are still a few tomatoes, but they are almost tasteless. Also beet-root, carrots, cabbages, and jerusalem artichokes.

G. P. P.

Kotegurh, 30th November 1879.

The Indian Agriculturist.

CALCUTTA, JANUARY 1st, 1880.

THE GOVERNMENT AND THE RAYAT.

THE reforms so urgently wanted in the style of farming in this country, do not seem to be so emergent in their nature to the Government, as they do to private individuals, and there may be this excuse for that apparent blindness. The members of the Government look at most things from a purely fiscal point of view, while the outsider lives and moves among the rayats, knows all their little difficulties, and in many cases knows what would remedy them. The Government lives principally in the cerulean atmosphere of Simla, high out of the way of the cries of distress which float upwards from the villages. Their time is taken up with the mighty "affairs of State" while individual wrongs are unredressed because of this. The private resident of our Mofussil stations knows all the rayat's affairs, and is in a position to give the Government valuable information on all such subjects, but his position is frequently such, as not to entitle him to a hearing. We are not speaking now of the present Government, whose special manner of conducting affairs is a fair subject for politicians to discuss, but does not come within our province. Our remarks are general, and refer to the system of Government in this country. We have repeatedly drawn attention to this subject, and would once more point out the vast importance of the whole question of the rayat and his mode of farming. It is a truism that good Government means the "greatest good to the greatest number," and we must not forget that if we could confer any "good" on our agricultural population, we would thereby benefit the greatest number, as no less than 70 per cent. of our population depend directly on agriculture for their daily bread, and it may truly be said that the entire population depend on it indirectly. The very revenues of the country depend almost entirely on its success, and hence it comes, that a year of plentiful and seasonable rains means a year of sure revenue, while deficient or untimely rains mean a difficulty in realising the revenue of the district affected. It may thus be affirmed that there are few subjects of such absorbing importance to the Government of India as this, and it is a pity that they fail to see this, or seeing it, set about its consideration in so very perfunctory a manner.

We have lately been studying several departmental administration reports, and are astonished at the great diversity of produce in different districts, and these districts so closely situated sometimes, that it is hard to account for this difference on the grounds of diversity of soil or climatic influence. For instance, we find that in the district of Seoni in the Central Provinces, the produce of wheat per acre is only 120lb., while at Raipur, 150 miles distant, it is 454lb. Now it may be presumed that the soil and climate are not so very diversified as to account for this vast difference, and it may also be assumed that the cost to the rayats will be much the same in both cases, while the result to the two men is vastly different, to the one, it means an ability just to make both ends meet, while to the other, it means despair, financial ruin, and his getting deeper than ever into the toils of the bunia, and yet this does not seem at all an important subject to our Government. So very trifling indeed, is it considered, that when the recent scare in economy took possession of the gubernatorial mind, the Agricultural was the first department to go by the board. It is not exactly abolished, but is mixed up with a few other departments in such a way as to shew the value placed on it at head-quarters, and to speak ill for its consideration and the elaboration of details in its administration. Speaking of this produce per acre, reminds us that the average production of wheat per acre in the United Kingdom is about 1,600lb., while the average all over India is only 660lb., and how is this to be remedied, for it must be self-evident that a large annual outturn must be a vast benefit to the individual farmer, and ought to be equally so to the Government. One method for the improvement of farming, and one which has not been much noticed among the various schemes put forth by those who have the best interests of India at heart, is the system of raising the land revenue. As at present fixed, this charge is as unchangeable as a statute of the Medes and Persians of old, and "changeth not;" should the season be a good one, the farmer can meet it easily, as it is not a heavy charge *per se,* but a bad harvest places it beyond the rayat's power to pay it, hence a reference to the bunia, who advances the necessary amount, under an agreement whereby he receives the next crop at purely nominal prices. The general terms of the bargain being, that the rayat hands over his grain to the bunia in repayment of the advance with its concomitant interest, at so many seers per rupee beyond the rate ruling in the bazaar at the date of payment, the Tahsildar's *nirik* being the standard. This means a sacrifice of all his profit, which goes to the bunia, and compels the rayat to repeat the process in view of the succeeding crop. Now this would be obviated by the Government fixing a fluctuating percentage of the produce as the Government rent, instead of a fixed and unalterable sum in money. Say it was fixed at 12½ per cent., or two annas per rupee, not of the value of the crop, but of the actual crop itself, two great advantages would accrue. *First,* the rayat would not have to sell his grain in a falling market, or hand it over to the bunia to obtain the necessary cash to meet the putwaree's call, but would at all times be able to meet it in proportion as his crop turned out. If he had a good crop, he could afford to pay a heavy quantity of grain, and if his harvest were deficient, the Government demand would not complete his ruin, and *second,* the Government would on the average realize more profit from the soil by this method, and a more important end still would be attained. The amount of land revenue receivable being dependent on the amount of the crop harvested, would give the Government a direct interest in securing as many good harvests as possible, and the cause of improved agriculture could not fail to be benefited, by the interest which the revenue authorities would necessarily and naturally take in all that concerned the rayat and his affairs. Difficulties may be said to exist as to collection of revenue in this form, and as to its ultimate disposal, but these are details with which we are not concerned here, although we may note in passing, that we do not think them at all formidable with the existing staff of revenue officers, from the Chairman of the Board to the Tahsildar's chaprassie; we are convinced that ample material in the way of administration exists to enable the Government to cope successfully with all these objections. At all events these are for the consideration of our statesmen and lie without the province of an agricultural journal.

There are many other remedial measures which we might mention, but as we have already done so *ad nauseam,* we defer going over the same ground in the meantime. Some important alterations in the mode of assessment and distribution of canal water, will form the subject of future remarks. Meanwhile we take leave of the subject by drawing attention to its vast importance, both as concerns the rayat on the one hand, and the prosperity of our revenue on the other.

THE GENERAL TREATMENT OF FARM ANIMALS.

ONE of the great differences between plants and animals is, plants build up their tissues from inorganic compounds such as water, carbon dioxide, urea, and salines of various kinds, usually abundant in all fertile soils. Animals have not the power to do so, their food must be elaborated and prepared in the tissues of plants; and consists mainly of organic compounds. Plants absorb inorganic compounds directly from earth air, and water, and construct out of these, substances which may be generally classed so far as foods are concerned, into tissue formers or *proteids*, and heat producers or amyloids, starches, and fats. Animals eat plants, or other animals which feed on plants, and so make use of "these proteids and amyloids to build up their own structures. The tissues of animals in the various processes of life, and ultimately in death, are broken up into simpler substances which result in the production of carbon droxide, water, urea, and salines of the various sorts found in Nature.

The bodies of animals are in some respects like machines. No organ of the body can be in healthy action without producing force, and this force is produced at the expense of materials existing in the body, which undergo certain chemical changes that generally may be spoken of as combustion or oxidation. In a machine, the mechanical force is due to the heat force, generated by the burning fuel. There is this resemblance, but there is also a difference. The body of animals is self-repairing, a machine must be repaired by some agent outside of itself. During life the oxygen of the blood is sweeping everywhere over every particle of the body, and continually entering into combination with substances such as carbon and hydrogen. This union produces combustion, in the process of which heat and force are evolved. In the living body, oxygen is the servant, the scavenger, sweeping out all effete and hurtful matter. In the dead body oxygen is the lord and master, breaking up into innumerable compounds that very structure which in life it served to keep in health and action. Wherever the blood flows, it carries with it oxygen derived from the lungs, this implies oxidation of waste tissue and the production of waste matter. Every motion of the muscles, every throb of the heart, every breath drawn, every exercise of nerve force produces waste material, which must be removed from the body through the lungs, skins, kidneys, or other excretory organs if the animal is to be kept in health. The ultimate products of this waste have been already briefly noticed. They are taken up by the blood and carried to the excretory organs and expelled from the system.

In the selection, breading and rearing of farm animals, sufficient importance has not hitherto generally been attached to the physiological and hygienic principles which ought to govern and regulate operations so intricate and to the agriculturist so important. Certain peculiarities in the structure, constitution, and habit of these animals have been seized on, and these peculiarities further developed, until a point is attained, beyond which it may not be safe to go, lest degeneracy set in. The causes that originally produced the various breeds of sheep and cattle, found all over the world, up at least till the very recent period when the latest breeds took their rise under the conscious action and interference of man, are due mainly to "Natural selection and evolution," laws first brought into prominent notice and powerfully illustrated by Charles Darwin, the greatest naturalist that has appeared since the time of Couvier if not greater than he.

In the most famous breeds of sheep and cattle, famous that is for their coming to maturity in a very short time, noted for the speed in which they can be turned into beef and mutton, we venture to think that these excellencies have been attained at the cost of vital stamina. Instead of having to wander over a more or less extensive area in search of food, and to content themselves with but indifferent shelter from the rigors of climate, sheep and cattle of approved breeds have much, if not all of their food laid down to them, and but a fractional part they gather for themselves over a comparatively limited area. The less movement, the less waste of tissue, rest and quiet with abundance of proper food, and warm comfortable housing hasten the period of maturity and greatest weight. This tending of animals of approved breeds, thus concentrating all the functions and forces of their bodies in the direction of eating and resting, and eating again, must as a natural consequence tend to dwarf some organs of their bodies and render them liable to disease. It seems to us that the pleura-nemonia so very prevalent in Britain and elsewhere, has, as one main cause of its continual recurrence, the deteriorated con stitution, the deficiency of stamina, and the dwarfed and weak lungs of improved breeds. Of course wherever disease of this nature presents itself, it is communicable to other individuals on the same farm who may be subject to the same conditions which tend to produce deterioration in vital stamina. We remember a Veterinary Surgeon of some eminence in the North of England giving it as his experience, derived from the *post mortem* examination of numerous subjects, that there was scarcely an animal when brought to the knife of the butcher, that did not show a tendency to lung disease sometimes pretty well developed. This is a matter which we think could very safely have been predicted; and hence there is more than ever a pressing necessity that the sanitation and ventilation, especially the latter, of all buildings in use for cattle or sheep should receive a much greater share of attention and judicious contrivance to secure the health of the animals, than it has hitherto been the custom to bestow.

Just as in the case of the soil, agriculturist do away with the indigenous plants of Nature's own sowing, and in their stead plant and rear crops of their own, so with the animals breed on farms for their milk, butter, pork, beef,and mutton. Farmers interfere with their feeding and breeding, deprive them of much of their power to feed and breed at will, provide many things for them which in a state of Nature they sought and obtained in a greater or less degree for themselves, seized on those qualities and peculiarities which rendered them more valuable for farm purposes, and endeavoured to reproduce and further develope these, until a breed, distinguished for one or more points of excellence was attained. These improvements in all breeds of animals raised on the farm, even though effected in accordance with the laws of animal life, nevertheless have not been produced without a considerable loss of vital energy, a great falling off in the *hardiness* of the animals and a lower type of stamina, all of which imply a considerable loss in the power of all improved breeds to resist disease, once the conditions of disease have been developed, and a greater likelihood of their being more easily effected by everything that in any way tends to lower the normal type of health, and produce disease. We have said that in our opinion no insignificant cause of the prevalance of "*pleura*" is due to the causes above enumerated. The "*rot*" and "*staggers*" in sheep are really diseased livers produced by the stunting of that organ in the general treatment of improved breeds. The "*rinderpest* and. the *foot and mouth* disease that produce such widespread havoc, fifteen or more years ago in Britain and elsewhere in Europe, the measles and other diseases of swine were neither "scourges of God" nor "inscrutable dispensations of Providence" any more than the plague, the black death, cholera, typhoid, and typhus fevers were. All these diseases are simply the result of the brut

ignorance of man, of those very laws which, whether men know them or not, cannot be violated with impunity. The rinderpest, like most gigantic evils was not without its uses. It was probably the only thing that would have stirred up agriculturists as a class, to greater precautions in the avoiding of diseases and to more rational treatment of their cattle; and probably the result of *pleura* in the long run will be, that if men will stunt the lungs of cattle in order that they may consume less heat-producing food materials, and hence take on fat sooner, they will find it their interest to be as careful of those weak dwarfed abnormal lungs as they can; it will pay in the long run, hence as we have said the whole subject of sanitation, and the general physiological and hygienic principles, that stand in such intimate relation to the health and breeding of stock of all kinds, must engage the attention of agriculturists a great deal more than it has hitherto done.

AGRICULTURE IN BURMAH.

(*Communicated.*)

THE state of agriculture in Burmah, the condition of the cultivator, what can be done to advance and improve these, are subjects which we intend to review in this paper.

British Burmah may be divided into two agricultural zones. If, during the dry weather we ascend any one of the great water-courses within 60 or 80 miles from its mouth, the eye meets nothing on either banks, but an interminable expanse of alluvial plain, intersected here and there by mangrove or tidal jungle, and perhaps a patch of rising ground looking like an oasis in the desert. These plains form the first zone. They are devoted to paddy cultivation, and nothing else will thrive on them. During the S.-W. monsoon, their retentive clay keeps the water which feeds the paddy crop, and when the cold weather sets in, as the water evaporates, they settle into a hard brick-like subtance, which no amount of labour or high cultivation will cause to yield profitable crop. These lands, year after year, yield the cultivator 60 to 80 and 100 fold, and he is well contented to let them rest a while and wait until a bountiful Providence will send him a natural fertilizer in the shape of plentiful rain. The high prices his produce commands, induce time to cultivate his lands as his forefathers did, he is entirely dependent on the rainfall, and knows that nothing will improve his crop if water fails him; if this is abundant, he increases his area, and in the end he finds his profit with a little more labour. A notion has long existed abroad that the Burmese cultivator is careless and lazy; those who believe this, have never been across paddy fields between June and August, let them do so, and they will gather different ideas. Nature and circumstances are kind to him, and it is not to be expected that without a stimulus he will go out of the old groove.

These plains then fulfil their mission, they will always yield the staple produce and be the wealth of the country; their cultivation increases yearly, and nothing but communications are wanted to see this increase reach its climax.

Beyond these plains lies the second zone, here the country and vegetation assume a different aspect. The mangrove and tidal jungles merge into savannahs and tropical forests. The grey muddy river bank is changed into a sandy loam covered with gardens and banana plantations, villages are ensconsed amidst a luxuriant, evergreen vegetation; the landscape is intersected with hills, and in the valleys which spread at their foot, the stiff plastic clay is vainly sought for. Here the paddy cultivator finds but a scanty harvest, the rainfall is lighter, and the sandy soil quickly absorbs the heaviest showers. In the dry season too the cold is more intense and the dew more abundant. In this part of the country immense forest tracts in which the decaying vegetation of centuries has formed a crust of rich humus soil, await the enterprising agricultural pioneer, and nothing has as yet been done or tried to bring to light the wealth hidden in these almost deserted tracts. Burmah with its virgin lands of unequalled fertility is still nothing but a paddy-producing country, and is still dependent on its neighbours for its yearly supplies of wheat, tobacco, oil seeds, and pulses,—dry or cold weather cultivation on high land is unknown here, it is confined to river banks, and no attempt has as yet been made by the cultivator to extend it to the inland parts, for what reasons we shall see further.

As we divide the country into two agricultural zones, so do we find two classes of cultivators. The first is the well-to-do paddy cultivator of the plains, he whose produce is the staple of export, he generally owns several yokes of cattle, he works only during the paddy season, he has no urgent need of money, and holds his crop until the greedy boatman gives him almost any price he asks for; he then lays in a stock of fish, buys a little gold for his wife and daughters, adds a few improvements to his house, and spends the balance of his earnings in dances and good works in the shape of resting-houses or monasteries, and awaits the coming monsoon. This man wants nothing, no improved agriculture will add to his wealth or to the wealth of the country, and any one going through his fields about October, will find very little to criticise if rain has been timely and copious; he knows that paddy requires a clean soil, he cleans it, Nature does the rest.

The other class of cultivators is that which dwells within the inner zone; here we find great scope for improvements. The cultivator is not poor, for he is not in debt, but in that portion of the country which would strike a stranger as being the wealthiest, we see the cultivator struggling for existence and hardly able to make both ends meet—and how does he succeed?

During the rains he cultivates a paddy field, but the nature of he land and the uncertainty of the rainfall brings him but a poor crop, if he gets a 15 or 20 fold return, he thinks his labour well-repaid. He lays in his store for the year and exchanges his surplus (when he has any) for fish. Another resource is now opened to him; the river bank and chur with their rich loamy deposits offer the prospect of an abundant harvest, on these after cutting and burning the grass and lightly scraping the surface, he plants tobacco which none but himself will consume, and maize, cucumbers, and other vegetables which scarcely suffice to supply the demand in the neighbouring market.

Another means which is only resorted to by the poorest hillmen, Shans and Karens especially, is the loungyah cultivation.

During the hot weather a patch is cleared and burnt in the forest, when the rains set in, holes are dug about, and paddy, cucumber, pumpkin, sessamum, and sometimes cotton seeds are placed in holes, thus a miscellaneous crop is secured, the luxuriance of which shows at least the incomparable fertility of the soil.

The cultivator in these parts also generally owns a garden planted with mangoes, jacks, plantains, and other fruits, the produce of which adds a small contribution towards his welfare.

But he often gets tired of a life of unceasing toil, and the uncertainty of his returns makes him look with envy towards the plains below, then one day he migrates, and thus is the upper part of the country gradually becoming depopulated, until the plains have absorbed four-fifths of the agricultural population.

We have seen that the state of agriculture is all that can be desired for the present within what has been described as the first zone. At least the results are highly satisfactory, and whether the time for high cultivation, irrigation, and improved implements has arrived, may remain an open question; one thing is certain, as long as the cultivator will find eager speculators to give him prices which all expenses told, leave him over cent. per cent. profit, as long as his land-tax is only nominal, no effort will induce to him employ expensive implements or alter a system at once so simple and so profitable.

But setting aside paddy cultivation, we find every other branch of agriculture greatly backwards; we see a fertile part of the country in a stagnant condition, a population bearing the burdens of civilization without enjoying its advantages. It is a strange anomaly that one portion of the country with no natural disadvantages, should be returning to a primeval condition whilst the other is making rapid strides towards wealth; a paucity of population does not account for this fact. The best reason which can be given, is the neglect of agriculture, caused by the ignorance of the agricultural population.

They have not yet been made to realize that new wants have sprung around them, and that the supply of these wants would be a source of richness to them. They still live in the times when no more was required than to get enough paddy for food, and a little more to spare for the few requisites which could not be manufactured at home.

That Burmah can be self-supporting as far as food and oil grains are concerned, that it ought to export yearly enormous quantities of tobacco is well-demonstrated by the few unpersevering experiments which have been made, and that it is entirely dependent for these produce on the neighbouring countries, can also be easily ascertained by the imports of grains and tobacco. That a sheep is a curiosity, and that not a single bullock is bred in the country, are facts which any one who has travelled twenty miles from Rangoon, has had an opportunity to ascertain.

The measures adopted to improve this alarming state of things, have as yet been few. And it must be acknowledged that Government to whom it belongs to initiate the reform, has many difficulties to contend against. Agricultural Shows have been opened, but these have a very poor chance of effecting any good, so long as the people do not know what is required of them. In fact they only tend to mislead. A man grows 50 square yards of tobacco, he selects the finest leaves, brings them to the show, and gets a prize of say Rs. 30, of course he goes home with the belief that he has done very well. In the meanwhile the neighbouring market has to import thousands of maunds to meet the demand.

Before this man can be induced to grow wheat, tobacco, &c., on an extensive scale, he will have to be taught the high marketable value of these articles of produce and the large demand for them, it will also be necessary to show him how they are grown. In fact, before we have agricultural shows, we should have an *agriculture*, before we produce to exhibit, we should produce to supply our wants. In all countries exhibitions have followed, but not preceded the creation of industries, thus the way has been lead towards improvements and perfection.

An experimental farm was started about two-half years ago in the Arakan hill tracts; after many vicissitudes, working at great disadvantages of climate and labour, and having to struggle against the most untoward and unexpected difficulties, it is at last showing some signs of life and success. High land, at a distance from the river bank has been cleared, and promising crops are now growing; very favourable reports have been received on the tobacco cured at the farm, from which cigars second to Havanahs only, have been rolled. Sessamum has been raised during the rains, on land generally devoted to paddy. Thus a new agricultural era has been opened in Burmah, and so far, the experimental farm may be said to have been successful.

But the question has arisen whether in the face of many difficulties, especially the unhealthiness of the climate and the scarcity of labour, it is expedient to continue experimental farming at Myouktoung. The money expended and the difficulties overcome would be of little avail indeed, were the enterprise to be abandoned, it would again open speculations about the agricultural prospects of Burmah, such as have arisen after the several careless and unpersevering attempts which have been made. But the fact that difficulties have been overcome, mark the place as the most suitable for experimental farming. A successful crop at Myouktoung is the best criterion which can be desired, for that which is dissiminated all over the country in the way of drawbacks, is found concentrated here, whilst the advantages the place may possess are to be met with in any part of Burmah.

The system of working however requires alteration, and lessons taught by past failures should be put to profitable use. If the object was merely to show that high land can be cultivated during the cold season with several crops, then the farm has fulfilled its mission. But if it is desired to ascertain whether land can be placed through a regular course of uninterrupted and remunerative cultivation, whether the capitalist or cultivator will find farming a practicable and profitable calling in Burmah, then it is necessary to abandon the primitive mode of cultivation pursued on the farm, which is only suited to sand banks. A novelty is being introduced, it ought to come with as many of its improvements as is compatible with the country in which it appears.

But before launching into the expenses entailed by a higher standard of cultivation, it will perhaps be necessary to bear in mind that it is entirely beyond the reach of the natives until they shall find a landlord who will clear and prepare the land for them; the cultivation then, for the present, must be confined to the capitalist in whose behalf the State should lead the way.

Nine-tenths of the land in Burmah available for highland cultivation is forest land. before a plough can be set to work, clearing, draining, and levelling are indispensable. On high lands the same crops cannot with profit be grown year after year. A farm for instance, which shall be nothing but a tobacco farm will not survive long—there must be a rotation. A certain crop requires or exhausts a particular plant food, this must be supplied or replaced. We must beware of imitating the wasteful system pursued in India, which instead of bettering, empoverishes the ryot. Cattle which are to work comparatively heavy soils, must be fed on something better than the rank grass generally found at working times. Irrigation will often become a necessity. These elements of agriculture being admitted, the course to be pursued is obvious.

Let an experimental farm be started and conducted on rational and accepted principles, let it be supplied with implements of husbandry most likely to ensure cheapness and economy of labour, and it will begin a work which cannot but tend to be greatly beneficial in a country where enterprise is generally guided by example. Native agriculture too cannot but be greatly benefited, for if portions of the land thus brought under cultivation be let to cultivators, they will very soon with our crops adopt our system of tillage.

The Burmese are better off than their Indian neighbours, nor are they imbued with their prejudices; they are an imitative race, and they only require to be shown the way. These circumstances make improved agriculture simply a question of time in Burmah, if the proper impulse be given.

E. M.

EDITORIAL NOTES.

WE beg to draw attention to the fact that the present number commences a new volume.

WE have the pleasure in drawing attention to an interesting article on Himalaya *Lepidoptera* to be found in another column. Mr. de Nicéville has kindly promised us a few more articles of a similar nature, having reference to other portions of India, we are sure a large portion of our readers will take an interest in this enticing subject. We are deeply indebted to our correspondent for the trouble he has taken in placing these notes at our disposal.

IN our August number we reproduced and made an editorial note on some queries of Mr. W. B. Smith, which he put in the *Journal of Agriculture* Franklin Co., Mo. In that note we left Mr. W. B. Smith to be dealt with by his own countrymen, many of whom we said were something more than *practical* farmers. Professor G. C. Swallow has replied to Mr. Smith's queries in a manner which we think highly satisfactory. The worthy Professor says "he has little sympathy with our comments." Well, probably had he seen as much of *practical* farmers as some men have, he would have been as severe as we were. However, the Professor's answers have justified our expectation, and we may add that if we have mistaken the spirit of Mr G. C. Smith's questions, it arose from no desire on our part to "burke" inquiry or withhold information.

We are pleased to observe that our old friend at Kotegurh is continuing his interesting notes this year, we are much indebted to him for this popular series of papers.

A PRACTICAL paper in "Agriculture in Burmah" has been forwarded to us by an esteemed correspondent, from whom we shall be glad to hear further. He is in a position to know thoroughly what he writes about, and his paper gives evidence of his not writing as an official who draws his knowledge from a study of blue-books, but as one who understands from practice what he treats of.

THE number of *The Indian Tea Gazette* for 5th December, commences, volume VI., and we have much pleasure in noticing the continued progress this useful publication is making. It is more and more becoming a medium of communication among tea planters, and if these gentlemen would second the efforts of the editor by taking a more lively interest in its success, it would become still more serviceable to them than ever.

It will interest our readers to know that the highest price ever obtained for indigo so far, was at Messrs. William Moran & Co.'s sale yesterday, when 23 chests of the well-known mark G H G—S realised an average of Rs. 350, and 12 chests of G H G—B an average of Rs. 374 per factory maund, the indigo being the outturn of the Sugrampore Concern in Bhagulpore. The first 10 chests of the G H G—B mark fetched no less than Rs. 377-8 per factory maund!

Tea and Coffee, &c., in France.—In 1876 the import of tea was 2,498,077 kilogrammes, of the value of 7,494,231 francs. The coffee imported was 87 million kilos. The consumption reached 53,471,000 kilos. The rest was exported. There are in France 248 factories of chicory; the total production is 18,546,595 kilos. There were made in France in 1876,20 million kilos. of chocolate of the average price of 2s. 10d. per kilo., or a total value of 64 million francs. About 10 million kilos. of cocoa were imported.

Railway Sleepers.—According to the various official reports of the most recent date, the gross number of sleepers required for the railways of the world is set down at 250,000,000. Taking the life of a sleeper at an average of some eight years, and allowing for the large increase of mileage every year, it would appear that above 45,000,000 of sleepers must be the annual requirement—or, making a deduction of about 5,000,000, on account of many railroads being laid with cast and wrought iron sleepers, the yearly destruction now going on may, it is thought, be fairly calculated at 40,000,000. These contain, on an average, about two and one-half cubic feet of timber in each sleeper, or about 100,000,000 of cubic feet, and, even at the most moderate estimate of their value, an enormous sum is thus annually expended, and a vast industry represented, in this single item.

In a communication from the Secretary to the Government of Victoria, Australia, to the Government of Madras, dated 29th March 1879, the subject of the importance of wattle-bark is discussed, and if the subject of tanning material is of sufficient importance to engage the attention of the Australian authorities, it is of much greater importance to us, who import leather goods so extensively, while we have all the raw material for our own supply within ourselves. The wattle, of which there are several sorts, principally belonging to the *Acaciæ* and *Eucalyptus* families, grows freely on swampy land, and on the borders of creek and water courses, and surely one could manage to cultivate it here, where there are many marshy localities. During the eight months ending 30 June 1878, the Colony of Victoria exported 11,378 tons of wattle-bark valued at £85,903, being at the rate of £7-11-0 per ton, or say Rs. 2-13-0 per bazaar maund. A communication on the subject, attached to this report, from the pen of Colonel Beddome tells us, that several species of the tree grow freely on the Nilgiris and Palneys, as also the fact that the bark of these trees if carefully cured here, is worth £5 to £6 per ton in England. We trust this subject will receive careful attention.

The order of the Government of Madras, on the working of the Saidapet Farms or the year 1878-79 is published, in which the results of the many experiments tried are spoken of, generally with approval. In tobacco, the old result followed; very superior leaf was grown, but the curing was a failure, when will it strike the Government that they must import exports, if they are ever to succeed in this. When the tea industry commenced in India, planters brought round from China as many professional tea-makers as were necessary to instruct the natives. Had they not done so, but tried experiments in their own way, they would not now occupy the proud position they do as the makers of the best tea in the world. Speaking of the ploughs tried which were the Swedish and American sorts, as also two of Collins's, the report says that the latter "did not work satisfactorily, but they are capable of improvement." It seems to us the mistake regarding these ploughs is, that they are in general too heavy for the cattle of this country. Have the managers of this farm tried the Jones plough. Mr. Jones of the Muir Mills, Cawnpore, has made one which we noticed in our last volume, page 260. We have seen it, and think it the very thing that India wants. Instead of introducing a plough new and strange to the conservative India rayat, Mr. Jones took the common country implement, and by making a few simple alteration and improvements, he succeeded in making a plough, which the rayat can carry on his shoulder, and which will be very effective in the field we are convinced.

Mr. A. O. Hume has reprinted here and in England his "Hints on Agricultural Reform in India," which was reprinted during the past summer for private circulation in England, and was actually in type, when, as the author says, the Government emphasized many of the remarks that it contains by abolishing altogether the Department of Agriculture. In an introductory note Mr. Hume says of the disestablished department that it has never "been able to effect much where agriculture was concerned, but it was working in a right direction; it knew what was required, and from time to time, when allowed a chance, did a little good on its own motion, or supported and assisted the efforts of others in this direction. So long as it existed, there was always some one at the head-quarters of the Government of India who possessed a knowledge of these subjects, and was at hand to support and advocate the sanction of all reasonable and practicable projects for improving in any way, however humble, the agriculture of the country. So long as it existed, there was always a hope, that amid the vicissitudes to which public affairs are subject, some lucky turn of the wheel might bring more enlightened ideas on these subjects into vogue, and thus render possible its conversion in a real working Agricultural Bureau. All this has passed away, and the only hope for India now lies in the chance that the real bearings and vital importance of the questions herein discussed may be better understood and appreciated in England than they have ever been, since Lord Mayo's death, by those in power in India." If report is to be believed, Lord Lytton has merely accorded a cold assent to the abolition of the department.

In reviewing the annual report on Labour Immigration into Assam during 1878, the Government of India has the following remarks on the increase in the number of desertions. Of Act VII. coolies, 3,954, or 5·29 per cent. on the actual strength absconded; and the desertions amongst coolies not under the Act were 3,561. The total for the province was thus 7,515 of all classes, as against 4,724 in 1877:—

The Government of India have hitherto considered that no special measures should be taken to check this evil, and have looked to the improvement of communications and the fuller supply of labour thereby afforded, as promising in due time its diminution. In consequence of the state of the finances, it has been necessary to forego, for the present, the Chief Commissioner's scheme for continuing the Northern Bengal Railway from the Teesta to Dhubri, and for establishing a service of Government steamers on the Brahmapootra from Dhubri to Dibroogurh. He has been asked, under these circumstances, to take up the question of improving the present route, and to endeavour to induce the Steamer Companies to run their vessels, during the immigration season, with greater punctuality and speed. Notwithstanding the excessive number of desertions now reported, and the unavoidable postponement of the more effective schemes for facilitating immigration, the Chief Commissioner does not ask for any reconsideration of the decision already arrived at. He observes that, although a mutual determination amongst the planters to inquire into the antecedents of new arrivals, and cordial co-operation in arresting offenders, would go far to suppress desertion, the great losses of the year under review have not induced the planters to take united action. Such combination has been prevented by conflicting interests, and the planters who from position and superior intelligence would lead the movement, suffer least, as the better management of their gardens reduces the number of desertions. This view of Sir Steuart Bayley is accepted by the Governor-General in Council. A high desertion-rate follows a high death-rate; and the year, was very unhealthy. Absconders were most frequent amongst the North-West coolies,—a class whose mortality was lamentably severe. It is shown that the more remote the district, the lower the desertion-rate, that in the nearer and more populous localities desertion is easier and discovery more difficult, and that thus, as a general rule, desertion decreases as the Brahmapootra Valley is ascended. But eliminating these special causes, it is found that within each district desertions are greatest amongst the classes which exhibit the heaviest mortality. The loss to the planting body, though it can easily be stated at a high figure on the assumption that deserters leave the province, is probably not really great, as deserters from one garden or district re-engage elsewhere. There is no reason, the Government of India think, to interfere on

behalf of the cooly. The panic which drives him from a garden where his comrades sicken and die may often be no more than the normal result of the instinct of self-preservation. The planters may be presumed to understand their own interests, and until they represent that action is required, it seems unnecessary for Government to move in the matter.

HIMALAYAN LEPIDOPTERA.

(By Lionel de Nicéville.)

NOTES on the Diurnal Lepidoptera taken at Kotgarh, N.-W. Himalayas, from 28th September to 6th October 1878, and from July 31st to August 13th, 1879.

The following insects were principally taken in the bed of a stream which crosses the road between Kotgarh and Komársen, about 1,000 feet below the station of Kotgarh, which itself is but a poor collecting ground, it being situated about midway between the valley of the Sutlej and the top of the range of hills on which it stands. Those insects that were taken in any other place are so noted.

NYMPHALIDÆ.

Danais, *Latr.*

D. Limniace, *Cram.* Very common on both occasions. It has, like the rest of the genus, a somewhat weak, flapping motion, but when disturbed, can make good use of its wings. Expanse from 3·8 in. to 4·2 in.

D. Plexippus, *Linn.* Also common. This is a very widely distributed insect, met with everywhere in the plains, and extends some distance into the interior of the Himalayas. Expanse from 2·8 in. to 3·6 in.

D. Chrysippus, *Linn.* Even commoner than the two preceding, and met with throughout India, and extends even into Europe. Expanse from 2·5 in. to 3·3 in.

Euplœa, *Fabr.*

E. Core, *Cram.* An exceedingly plentiful insect in Calcutta during the cold months, and occasionally met with in the hills in the autumn. It has a slow, weak flight, and continually settles. Expanse from 2·7 in. to 3·8 in.

SATYRINÆ.

Zophoessa, *Westw.*

Z.——— *n. sp.* I first came across this butterfly on the Jalauri Pass leading from the Kulu to the Simla district. I next saw it in the thick forest between Kotgarh and Narkunda. Colonel A. M. Lang, R.E., to whom I have submitted my specimens, tells me that it is an unnamed species. All my specimens I took at rest on the red flowers of a Persicaria. Expanse from 2·1 in. to 2·2 in.

Lethe, *Hübn.*

L. Neelgherriensis, *Guér.* This genus seems particularly partial to the shade, and this species is no exception to the rule. Very common amongst trees and bushes, very seldom venturing into the broad sunlight. Expanse from 2·1 in. to 2·5 in.

Rhaphicera, *Butl.*

R. Moorei, *Butl.* I took one specimen of this insect near Narkunda, on August 13th, 1879. I have also one specimen from Murree. Expanse 2 in.

Maniola, *Schrank.*

M. Scanda, *Koll.* Common amongst long grass during the summer and early autumn months. It has a weak, pitching flight. Expanse from 2 in. to 2·1 in.

M. Annada, *Moore.* W. F. Kirby in his "Synonymic Catalogue of Diurnal Lepidoptera," gives this insect as a synonym of M. Scanda, but I am inclined to agree with Mr. F. Moore that it is a distinct species. It has the same habits and appears at the same time as M. Scanda. Expanse from 2 in. to 2·7 in.

Satyrus, *Latr.*

S. Schakra, *Koll.* This insect is to be met with at all seasons and everywhere in the N.-W. Himalayas, flitting along rocky roads and paths, and continually settling on stones, &c. I have taken it in Kashmir and far up into Ladakh. Expanse from 2 in. to 2·3 in.

Hipparchia, *Fabr.*

H. Parisatis, *Koll.* I took a few very worn specimens in October, 1878. Common this year in Chumba on grassy hill sides end of May, met with along the banks of the Chandra Bhaga River near Kushtooah, Kashmir, in June, and late in July near Bajoara, Kulu. It has a very strong, soaring flight, and is by no means an easy insect to capture with a precipice on one side, and the hill on the other rising at an angle of about 45°. Expanse from 2·6 in. to 2·8 in.

H. Brahminus, *Blanch.* Very plentiful during the rains, and met with almost everywhere. Like the rest of the genus it always settles on the ground with its wings closed, and then shuts the upper wings into the lower ones, so that only the lower wings and the extreme tips of the upper are visible. Expanse from 2·4 in. to 2·7 in.

H. Saraswati, *Koll.* This insect was exceedingly plentiful along the roads and pathways about Kotgarh this August. Its habits are exactly those of Brahminus. Expanse from 2·7 in. to 2·8 in.

H. Padma, *Koll.* This is the first insect of these last three to come out in the Spring, and is also the largest of the three. It has also a stronger and more soaring flight. Worn specimens are to be met with late on in the rains. Expanse from 2·9 in. to 3·6 in.

Ypthima, *Hübn.*

Y. Sakra, *Moore.* Common throughout the rains in grassy meadows and on hill sides. All this genus have a very weak flight and are given to continually settling. Expanse from 1·7 in. to 1·9 in.

Y. Philomela, *Joh.* The above remarks apply equally to this insect. Expanse from 1·4 in. to 1·5 in.

Atella, *Doubl.*

A. Phalanta, *Dru.* Very common in the plains during the winter months, and fairly so in the hills during the autumn, where it is generally to be met with near water. Expanse from 1·7 in. to 2·7 in.

Argynnis, *Fabr.*

A. Childreni, *Gray.* This is the most handsome and has the strongest flight of all the Himalayan Fritillaries. It first appears about June, and worn specimens may still linger on till late in September. Like the rest of the genus, it is very partial to thistles, and can be easily taken when busily engaged in sucking up the honey of these flowers. It also occurs in the Chumba State, Kashmir and Kulu. Expanse from 2·9 in. to 3·3 in.

A. Kamala, *Moore.* Fairly common throughout the North-West Himalayas and also in Kashmir. I have seen dozens of males (the females of all butterflies I believe, and as far as my experience goes do not similarly indulge) sucking up moisture in damp spots on the borders of streams in Kashmir in June. They are also very fond of compositæ. Expanse from 2 in. to 2·7 in.

A. Niphe, *Linn.* This insect is apparently double brooded, as I took small but quite perfect specimens at Jutogh near Simla on April 11th, 1879. It has a second brood, which is by far the most plentiful, about June. I have met with it only on the tops of bare hills, flying backwards and forwards and occasionally settling, and then baffling with the wind that is generally rampant in such places. The females are very much scarcer than the males, probably they fly but little. Expanse from 2·1 in. to 3·3 in.

A. Issæa, *Moore.* Kirby gives this insect as a synonym of the European A. Lathonia. There is hardly a month in the year when this hardy and apparently multi-brooded insect is not to be met with. It seems to have an antipathy to water: grassy hill tops and sides, particularly where the "wild thyme grows" seem its favorite grounds. Expanse from 1·9 in. to 2·1 in.

Symbrenthia, *Hübn.*

S. Hyppoclus, *Cram.* Fairly common in the beds of streams during the summer and autumn. Expanse from 1·6 in. to 2·1 in.

S. Hypselis, Godt. Not nearly so common as the above. It has a habit of flying backwards and forwards in a narrow gorge between rocks in one of the mountain streams so common in the Himalayas, and occasionally settling on the over-hanging foliage. Expanse from 1·5 in. to 2 in.

Vanessa, *Fabr.*

V. Charonia, *Dru.* This beautiful insect is generally to be met with in the beds of streams, though I have taken it on the very tops of hills, very far from any water. It frequently settles on the trunks of fir trees if there are

any near, where, with closed wings it is almost invisible, the dark shaded markings of its under-wings exactly assimilating with the bark of the trees. It also very frequently takes up a "beat" in the bed of a mountain stream, up and down which it continually flies, but always returning to one stone on which it settles, however often it may be disturbed. Expanse from 2·2 in. to 2·9 in.

V. KASHMIRENSIS, *Koll.* Kirby gives this also as a synonym of the European V. Urticœ. This insect may also be met with on fine days from January to December, it has several broods, and like its European cousin, feeds on the common stinging nettle. It is certainly a much darker colored insect than the home one, and I think deserves to be called a different species. Expanse from 1·9 in. to 2·3 in.

V. XANTHOMELAS, *Wien.* By no means a common insect, I have taken a few at Simla, again at Kujeah, near Dalhousie, in May, and at Ulwas, near Pangi, a little later on. In Kulu it feeds on a bush called by the natives "Kukkurree." Expanse from 2·5 in. to 2·8 in.

Pyrameis, *Hübn.*

P. INDICA. *Herbst.* This insect is generally known in India by Miller's name, P. Callirhoë. It is very common in the late summer and autumn months throughout the N.-W. Himalayas, and hybernated specimens are met with in the spring. Like its English cousin the "Red Admiral" it feeds on nettle. Expanse from 2·1 in. to 2·7 in.

P. CARDUI, *Linn.* This is one of the first insects you will meet with in the Spring, and the last you will see in the Autumn. It is an early riser, and one of the last to go to bed. I have actually watched them follow the setting sun as its beams gradually ascended the hill side, caused by the sun setting behind an opposite range of hills. I have taken specimens in the plains as far east as Dinapore, but I have never seen any in Calcutta. It also occurs commonly in Kashmir, and I have taken it high up in Ladakh. Expanse 2 1 in. to 2·6 in.

Junonia, *Hübn.*

J. LEMONIAS, *Linn.* Equally common in the plains and in the hills, in the latter it is most frequently met with in the beds of streams. Expanse from 1·7 in. to 2·2 in.

J. ŒNONE, *Linn.* This insect affects paths, rocky, bare hill sides, the beds of streams where they widen out into stony expanses of sand and boulders, and similar places devoid of vegetation. They are hard to catch, flying off on one's approach and settling on a stone or rock a few yards ahead, and on again coming near, the same performance is repeated. It was common at Kalka in October 1877, and I took it in the Botanical Garden sand nowhere else in Calcutta, in December 1878. Expanse from 1·8 in. to 2·3 in.

J. ORITHYA, *Linn.* Generally seen in company with the preceding; it also closely resembles it in habits and time of appearance. Both are to be met with on the wing in the hills from March to November. Expanse from 1·4 in. to 1·9 in.

J. ASTERIE, *Linn.* In Calcutta I have taken this insect all through the winter in gardens, on the borders of tanks, &c. In the hills it is far more scarce, I have only taken it occasionally just after the rains in the beds of streams. Expanse from 1·9 in. to 2·3 in.

J. ALMANA, *Linn.* A commoner insect than Asterie, and met with in similar places and seasons. Expanse from 2 in. to 2·4 in.

Precis, *Hübn.*

P. IDA, *Cram.* This insect is more generally known as P. Iphita, which Kirby gives as a synonym of Ida. Common all the summer and autumn in the beds of streams, and occasionally met with on hill tops far away from any water. Expanse from 2·3 in. to 2·7 in.

P. VEDA, *Koll.* Generally known in India by Moore's name of P. Hara. It is much rarer than Iphita, and I have only seen it near water. Each insect seems to frequent a limited space, and flies backwards and forwards within this space, occasionally settling on overhanging bushes, &c., but starting off in pursuit, and doing battle with any intruder, especially one of its own species, that dares to invade its domain. It soon becomes shattered, and no wonder considering its pugnacious temperament, so it is not easy to secure a perfect series. Expanse 2·1 in. to 2·4 in.

Cyrestis, *Boisd.*

C. THYODAMAS, *Boisd.* This beautiful insect, very appropriately called, "the map" by school boys, is frequently to be seen soaring backwards and forwards in some mountain stream with richly wooded sides. It frequently settles, often with widespread wings on a quartz rock, where, by reason of its coloration and markings, it is almost impossible to see. It has also a habit of suddenly settling on the *underside* of some broad leaf overhanging the water, with wings wide outspread, a feat of gymnastics I have never seen any other butterfly accomplish. It is on the wing from early summer, and I have taken perfect specimens as late as the middle of November at Simla. Expanse from 2·2 in. to 2 4 in.

Stibochiona, *Butl.*

S. NICEA, *Gray.* I took two very dilapidated specimens last year, and two—one only just out—this year. It has a somewhat bold flight, but settles with wings wide open on trees and bushes, and is then easy to capture. It does not seem to occur at Simla, but I have Darjeeling specimens. Expanse from 2·5 in. to 2·8 in.

Hypolimnas, *Hübn.*

H. BOLINA, *Linn.* I first saw a specimen of this insect at Kotgarh last year in the remorseless clutches of a large green Praying Mantis, subsequently I took several specimens. For so large an insect, it has not a very powerful flight, and is easy to capture. It is common in gardens, &c., in Calcutta during the cold weather. My specimens do not differ in size very much, I have seen some from Central India however quite half the size of my largest specimen. Expanse from 3 in. to 4 in.

Neptis, *Fabr.*

N. AMBA, *Moore.* Rather uncommon, and always met with in the beds of streams. It seems double brooded; I have taken specimens early in the summer and again after the rains. Expanse from 2·2 in. to 2·8 in.

N. NANDINA, *Moore.* This insect seems to affect a wider range of country. I have taken it most frequently near water, but also on hill tops. Occurs late in the autumn, but probably there is an earlier brood in the summer. Expanse from 2·2 in. to 2·5 in.

N. ACERIS, *Lep.* To be met with everywhere where there are trees, and at all seasons of the year. Like the rest of the genus it has a very beautiful, floating flight, it is a particularly pretty sight to observe two of these insects courting, they fly round and round each other making endless circles in the air, and with so little apparent exertion, hardly moving their wings at all, they always seem to be spread wide open. Expanse from 1·5 in. to 2 4 in.

Athyma, *Westw.*

A. OPALINA, *Koll.* I have taken perfect specimens of this insect from March to November, so it must be poli-brooded. It has a very swift flight, but often settles. It is met with everywhere from the bottoms of the valleys to the tops of the hills. Expanse from 2·2 in. to 2·7 in.

A. ASURA, *Moore.* I took 3 specimens of this insect at Kotgarh in October 1878, and have never come across it elsewhere, so I consider it a rare insect in this part of the N.-W, Himalayas. Expanse from 2·5 in. to 2·9 in.

Nymphalis, *Latr.*

N. ATHAMAS, *Dru.* I took one specimen in October 1878, at Kotgarh, imbibing moisture on a damp spot near the Komársen stream. Of all the butterflies I am acquainted with this insect is the swiftest on the wing. I have taken a few small and apparently hybernated specimens on hill tops near Simla in April, and have *seen* the ordinary sized ones in various places near Simla in the autumn. My Darjeeling specimens are decidedly darker than those taken at this end of the Himalayas. Expanse from 2·2 in. to 2·9 in.

(To be continued.)

OFFICIAL PAPERS.

ARTESIAN WELLS.

From

W. King, Esq.,

Deputy Superintendent, Geological Survey of India.

To

J. H. Garstin, Esq., C.S.I.,

Acting Secretary to Government,

Revenue Department,

Dated Yercaud, 7th October 1879.

In reply to the Order of Government (13th September 1879, No. 1,878), I have the honor to inform you that no suitable sites for artesian wells, properly so called, are known in this presidency to the Geological Survey of India.

2. The present inquiry having however risen out of the discovery of the gushing wells at Pondicherry, I venture to make some remarks on these for the information of Government.

3. I use the term "gushing wells" in this connexion because the Pondicherry wells are not yet shown to be artesian, it being quite possible that the gush of water may be caused by the pressure of the superincumbent strata (in one case 79·52 metres in thickness) on a confined stratum of water instead o f, as in a true artesian well, by the basonal water-stratum having a higher level at more distant area than that at the well vent. I myself do not recollect any higher environ of Pondicherry whence such a stratum of water could extend under the vent at the Jardin d' Acclimatation ; hence I am led to speculate on the possibility of superincumbent pressure.

4. So far there is no direct evidence as to why these gushing wells should occur at Pondicherry. The first well, that of M. Charles Poulain, was struck, as it were, by chance, and the next under the Colonial Engineer was taken at random. The chances are that such wells may be struck on the Madras alluvial plot, or indeed anywhere else along the Coromandel alluvial border ; the desideratum in any case being, according to my view, that they should be bored to a sufficient depth to ensure a good pressure of overlying strata.

5. The fact remains, however, that wells having a gush over surface level have been struck at Pondicherry ; hence it may be assumed that there is a possibility of striking the same kind of water sources on any alluvial stretch similar and similarly placed to that of the French possession. In some respects the Madras alluvial plot agrees with that of Pondicherry ; as, for instance, below the Red Hills, though the Cuddalore, Nellore, and Cocanada plots are much more similarly placed in regard to adjacent high-ground.

6. My own recollection of the Pondicherry plot only allows me to carry the comparison so far, but it is possible that were I to revisit that ground, I might be able to run the argument closer. Should the Government approve of my visiting Pondicherry for this purpose, my services are of course at their disposal on my being placed in communication with the French Government at that station.

7. Experiments might certainly prove successful at the Government Farm at Saidapet or at the Horticultural Gardens, but as long as the search is one of mere guess-work, it is a question whether the development of this source of water-supply might not be left to private enterprise which in this way has been successful so far at Pondicherry.

REANA LUXURIANS.

From

The Director, Department of Agriculture and Commerce,

N.-W. Provinces and Oudh,

To

The Secretary to the Government of the

N.-W. Provinces and Oudh,

Dated Cawnpore, 26th November 1879.

Sir,

In continuation of my No. 253, dated May 21st, 1878, I have the honor to submit a report on the cultivation of Reana (ruchluana) luxurians in these provinces during the year 1878-79.

2. The introduction of this fodder plant into these provinces dates from the commencement of 1877, when I obtained a small packet of seed from the Agri-Horticultural Society of Calcutta. Although it could only be tried in that year on a very small scale, yet the results appeared to prove that the plant would flourish well in the plains, and would give an abundant fodder crop which was more liked by cattle and (from its sweetness) more nourishing than the usual crops grown for fodder in this country.

3. In March 1878, some more seeds were received from the Government of India which had been received from Dr. Shewsenfourth, the Afr ican Explorer. The quantity was small but supplemented by the seed which resulted from the cultivation of the preceding y ear, enabled experiments to be conducted on a larger scale.

4. Seed was distributed to the Saharunpur Botanical Gardens, the Cawnpore Experimental Farm, the Lucknow Horticultural Gardens, and the Forest Nursery, Ranikhet, for careful sowing and cultivation. Some was also sent to canal officers for cultivation on the banks of distributaries, to the Ordnance Timber Agent, Fatehgarh, and to various European officials and native landholders who showed an interest in agricultural matters. Reports from some of these latter have not been received, nor is it considered advisable to insist in all cases on the submission of detailed information as to the result of this, or similar agricultural experiments. The trouble of keeping and submitting an accurate Register of results might debar this department from the co-operation and assistance of private persons for whose benefit the experiments themselves are intended.

5. The reports which have been received may be taken to prove that the Reana Luxurians is a most successful fodder crop in the plains and on irrigated land. In the hills (judging from the report of the Superintendent, Forest Nursery, Ranikhet) it will not succeed, and it is only when plentifully watered that it grows with the luxuriance which makes it one of the most prolific of fodder crops. Under favorable conditions the plants grow to a height of over 15 feet, with as many as 30 stalks from a single root. It will give three cuttings between August and November. The quantities of seed which can be distributed were very small, in most cases not more than 1 oz., since there is a large demand for seed it was considered advisable to grow the plant for seed, and not as a fodder crop, and there are no definite statistics of the amount fodder produced *per acre*, since the plants were in no case systematically cut down. The return in seed was very large, the plants at Lucknow yielding 1 maund from 1 oz., or 1,280 fold. The green stalks and leaves are greedily eaten by cattle and elephants.

6. During the past year, sufficient seed has been raised for the cultivation of Reana during the pr esent year on a large scale to give definite results as to its outturn in fodder, compared with the native fodder crops.

SALARU EXPERIMENTAL FARM.

No. 3834 of 1879.

Revenue Department.

From

Colonel L. Dunsterville,

Collector and Magistrate of Hyderabad,

To

The Commissioner in Sind,

Hyderabad Collector's Office,

Dated, 22nd October 1879.

Sir,

I have the honor to forward herewith the report of the farm at Salaru, for the half-year ending 1st October, with a statement of income and expenditure from 1st April to 30th September inclusive.

2. Mr. Strachan's letter is dated 28th September (it should have been dated 1st October). It reached me on the 4th instant, but was returned for amendment as the report of the Economic Garden (which will shortly be separately submitted) was mixed up with it.

3. It will be observed that, as was the case throughout the province, the season was later than usual this year, the rising of the river being greatly delayed by the want of rain in Upper India, whilst the mildness of the winter deprived us of the early "freshes" which come down as soon as the snow begins to melt,

the mass deposited below the line of perpetual snow being insignificant compared with that of ordinary years.

4. Another cause for the lateness of the season in all the Northern talukas of this districts is, the visitation of locusts which devoured seedling cotton and cereals (in some instances, more than once) as soon as these appeared above ground and the Salaru Farm formed no exception to the rule.

5. The inundation, showing, in its earlier stages, every sign of being an unusually low one, the cultivators in the neighbourhood of Salaru and elsewhere ventured to cultivate the low-lying lands left by the river, and which are usually cultivated with spring crops (rabi) after the river has receded. Later on, the river rose rapidly and attained the height of 19 feet 7 inches on the gauge at Kotree (½ an inch higher than last year's maximum) and the result was that the whole of this cultivation was submerged and destroyed.

6. The result of the experiments detailed in paras. 5 and 11 of Mr. Strachan's letter will form the subject of the next half-yearly report.

7. I shall be glad to receive and submit the report and proposals of Mr. Strachan for utilizing the wind as a motive power for raising water. I had some conversation on the subject with the Hon'ble Col. Anderson on his visit to Sind in the spring, and he promised to get me some information, but I have not since heard from him. Probably, he has not been able to meet with machinery cheap enough and simple enough, for our requirements.

No. 90 of 1879.

FROM

The Superintendent of Cotton Experiments,

To

COLONEL L. DUNSTERVILLE,

Collector of Hyderabad, Sind,

Superintendent of Cotton Experiment's Office Camp,

Salaru, 28th September 1879.

SIR,

I HAVE the honor to forward the following half-yearly Report, in compliance with Government Resolution No. 2188, dated 24th April 1879, and your endorsement No. 1455 of 3rd May 1879.

2. What is past of the current season has been chiefly characterized by severe hail-storms in the beginning of May. Late flooding of the river, and an almost total want of rain in July and August. The first and last remarks I believe apply only locally. Our total fall of rain since May is only 89 cents. which fell on 30th June, July 2nd, and August 18th. During July and August there was a good deal of cloudy weather which was very beneficial to the young plants, and prevented the rapid evaporation which goes on during clear weather. Locusts were very plentiful and did a good deal of damage on several of their visits.

Water came into the Mahmood Ghora on the 8th or 9th of June, but fell almost immediately after, so low, that it could not be got into the wheel channels, till the 23rd of the month, on this account cotton has been less sown on this canal this year than is usually the case, and grain more extensively. Since the 22nd of the current month the water is again very low, and we are now obliged to work a double lift to get it on to the farm.

3. Crops in general in the vicinity of Salaru are good, the cotton is in some cases rather later than it should be, but the plants are good, the grain crop will be very good if locusts do but keep away till it can be harvested. On the kurrias or small canals the grain crop is more backward, being late in being sown, it will not be possible to give it sufficient water to bring it to be a good crop. In many cases the cultivators are themselves to blame for being late, for the water was up to their wheels some time before they began to work them, and as they sow little but *bajri*, three months' water should have enabled them to, at least ensure a fair crop. All the crops in the *katcha* (low land along the banks of the river) were destroyed by the high flood we have had this year. The crops anywise largely grown in this neighbourhood during the inundation season, are cotton and grain; chiefly *bajri*, any other crop grown, occupies but a very limited area compared to these two.

4. We were unable to begin watering till the 23rd of June, by which time the cotton seed should have been nearly all in the ground—on this account my cropping arrangements were considerably upset and some of my experimental too. The different crops and the areas sown with them are as under :—

	Acres.	Goontas.
Sind Cotton	8	14
Sorghum Sacharatum	1	0
Red seeded Jowari	1	27
Bajri Penicillaria Spicata	20	1
Guar (1)	0	14
Tobacco	0	22
Nanguli	0	9½
San	0	20
Oord ka Dhal	0	10
Tir	0	10
Total area sown ...	33	7½

5. The experiments undertaken this year are as follows :—

I. Sind cotton on limed and on unlimed land, the object being to ascertain whether an application of lime would be beneficial to land in this neighbourhood.

II. Guar (a kind of pulse) used as a vegetable in the green state, but grown chiefly for camel feed on limed and unlimed land, object the same as the preceding.

III. *Bajri* sown and transplanted to ascertain which process will give the most profitable return.

IV. *Bajri* manured with farmyard manure and with brick-kiln rubbish, to shew whether the latter be valuable as a manure, the substance being at present pretty plentiful in this neighbourhood and entirely unused. The foregoing four experiments are in duplicate, the remainder are single.

V. San (Panicum frumentaceum), Nanguli (Eleusine Coracana), a continuation of last year's experiment with these crops on khullur land.

VI. An acre of each of the five varieties of *bajri* referred to in previous reports, was sown between the 15th and 20th July, to ascertain which of them would be best for cropping here. At present they are all good crops and seem very equal. Each plot has been treated the same as to manure, ploughing, and watering the crop will be ready for harvesting in about ten days hence.

VII. *Oord ka dhal* to try how the plant would thrive here. The seed was obtained in the Hyderabad bazaar and sown on the 17th August, the plants are doing fairly well; the plot was limed last year, and manured with farmyard manure this season previous to the seed being sown, the young plants were once needed. Of these two experiments VI. and VII. I shall not say more at present. On the others I offer the following remarks.

6. The experiments on limed and unlimed land is a continuation of an experiment commenced last year, and one which would require to be continued over a series of years before definite results be obtained. The original area was two acres, but on account of the end of the field adjoining the Mahmood Ghora having been last year pitted and partially washed away, the area sown with cotton is 1-10 goontas, and that with guar 14 goontas. During the cold weather the land was lightly ploughed with the English plough to get quit of the grass weeds, which last damp season caused to over-run it while under a *bajri* crop. The whole was manured with farmyard manure, and cross-ploughed with the Sindi plough at the time of sowing. At the present date I cannot say which (the limed or unlimed) is the best crop, both are good, the plants being over 5 feet high and well branched. The guar is an unusually luxuriant crop, and is to all appearance equally good on the unlimed as on the limed land. Both fields have been irrigated five times and the cotton twice weeded. If the cold weather do not set in too early, the latter will be a very heavy crop.

7. *Bajri* sown and transplanted, half an acre was sown on the 6th August and the same area filled up by transplanting on the 27th August. The land in other respects has treated the same

[illegible] been plots. It was manured with farmyard manure and once ploughed at the time seed was sown. The sown portion is at the present time the best crop. The transplanted area has filled up well, and the plants are good but too late to give a full yield—some portions are only beginning to show the ear, some of the spikes are of good size, but not what I expected they would be, judging from what I have seen of them where early transplanted to make up blanks in ordinary fields—in such cases I have found both the spike and the grains larger than on the sown portions, and in the present instance, I account for the apparent failure by the operation of transplanting having been done too late in the season.

8. *Bajri* on land manured with farmyard manure and brick-kiln rubbish, ½ an acre of each. The kiln rubbish contains a considerable quantity of wood-ashes, and a little ash of cow-dung, the remainder is lightly burnt clay in a powdery state. The one-half acre got 160 ass-loads of this compound, and the other 178 ass-loads of farmyard manure, culture in other respects has been the same for both plots, both were sown on the 7th of August, at the present time it is not possible to detect anything more favourable in the one than in the other, both are very equal fair crops, the plants on the rubbish manured land has a slightly darker colour than those on the farmyard manure plot, but even in this the difference is little at any rate,—so far as this experiment has gone, it shews that such rubbish may be made useful as manure instead of being left about in unsightly heaps often in the midst of cultivation, and where other manure is difficult to obtain. I have seen none of it used by the natives here. The ashes probably hold the chief active elements it contains, but the soft burnt powdery clay is also likely to be beneficial mechanically, if not chemically. It may be burnt too much to be easily soluble, consequently it may be almost inert in furnishing plant food.

9. San (Panicum frumentaceum), and nanguli (Eleusine Coracana), on salt or khuller land is a continuation of an experiment commenced last year, and the result is as yet much in favour of the nanguli, which is about equal to last year's crop in appearance, while the sand is inferior to what it was last year. The nanguli is the only crop I know of worth growing on such ground, and it would no doubt exhaust the soluble saline matter sufficiently in course of time to fit the ground for producing other crops of more value. It could however only exhaust what is within reach of its roots, and this would soon be replaced from deeper laying strata. The only really effective remedy would be drainage, and that would be rather expensive at the outset, and often from the low situation of the land inapplicable.

10. Sorghu and red seeded *jowari* were again sown this year, with the view of further testing last year's experiment with them, but they have been so damaged by pigs that I have given up the idea of considering them reliable for that purpose. On account of the jungle land along the river being flooded, the wild pigs took shelter in the cultivated fields, from which it is almost impossible to get quit of them, if hunted out during the day, they find their way back at night again. The *jowari* was sown on the 26th June, watered 4 times, manured with farmyard manure and once ploughed at the time of sowing. We are now nearly finished harvesting it, it is an excellent crop, but as already mentioned, very much damaged by swine. The sorghu was sown on the 27th June, treated in every manner the same as the *jowari*, it will not be fit to harvest for some 15 days yet. It is a good crop, but also damaged from the same cause as *jowari* suffered. There also appears to be a considerable number of hybrid plants in the field, there was none such in last year's crop. This is the first time I have observed any mark of hybridisation in the sorghu, but I believe it is, under circumstances favourable to that operation, prone to it. Last year being more than ordinary damp, and the sorgho and *jowari* growing and seeding side by side, I have no doubt but the mixture had taken place then through the agency of insects and the wind. Some of the hybrid panicles have seed more than twice the size of the original sorghu, and have less of the black shell which envelopes it, while in colour they are different from the sorghu or any *jowari* which was growing near it, being almost white.

11. Tobacco is a good crop this year all round Salaru. It is almost always grown by bunyas, and not very extensively by them, in this district few fields of it are over an acre and-a-half to two acres in extent. It is grown year after year on the same ground which is always heavily manured with goat droppings before the crop be transplanted. Transplanting is done here in August and beginning of September, it is taken in hand as soon as the *bajri* and cotton has been sown, and from that time till it be fit for harvesting in December or the beginning of January it requires constant looking after, in weeding, watering, and stopping, leading, or lateral shoots; 2,300lb. per acre of leaf (weighed after sweating when it is packed into bales (*pindees*), each weighing 2¼ maunds) is a common yield; our last year's crop of 22 goontas (a little over half an acre) weighed as above 1,267lb. and was sold for Rs. 116-10-8 on the farm; the actual cost of producing it was Rs. 77-5-10. This year's crop on the same piece of ground seems as yet to be fully heavier than last year's. Were we to plant a new plot of land we would get but very little for, if in fact we managed to sell the produce of the first year or two's cropping. New land produces too mild an article for local sale.

12. Irrigation.—The quantity of water artificially applied to crops here is probably greater than in any other part of India. I give the following as an example. It shews the approximate depth of water our tobacco field had last year both naturally and by artificial means, each watering ordinarily is of a depth of fully 3 inches—the field got 8 waterings, equal to 2 feet, and during the growing season we had a rainfall of 18 inches 86 cents. which makes the total irrigation and rain water equal to a depth of 3ft. 6·86 inches supplied to the field between 6th July and 25th October. During the growing season, June, July, and August if the weather be dry and clear, cotton requires about three waterings each month to prevent it receiving any check in growth. It is but seldom people are able to water all the land they sow at the time the crop most wants it, and this makes the crop later in coming to maturity and the yield much less than would be the case were water applied when required. Especially is this the case with fields worked by Mahomedans; they sow a larger area than their means will admit of their working properly in any respect, and, as in this district where cotton is pretty extensively grown, the Mussulman mostly has a partner in raising this crop, or he lets the land to a bunya, he (the land owner) supplying bullocks for ploughing, and promising three waterings a month to the crop while it is growing, the bunya does all other work at his own cost, finds manure if the field get any, otherwise it gets a top dressing when convenience offers of Khuller from the site of some ruinous village, or swept from under a babul tree. The amount paid for the land is made to depend on the stipulated number of waterings being supplied, and for cotton ranges from Rs. 30 to Rs. 50 per acre for the season, provided it get three waterings monthly. It very often happens that the area so let takes the greater part of the water the cultivator can lift, and his grain crop suffers in consequence. During this season I have been devoting considerable attention to wind as a motive power for irrigating. It could not be depended on alone for raising water for any crop, but it would be of great assistance to the present means of irrigating. The main obstacle is the great expense of the necessary machinery. I believe that as the wind here blows almost constantly during the inundation season from a southerly direction, and during the cold weather from the north, less complicated and much cheaper machinery than any generally in use, could be made to answer the purpose, wherever the wind blows with any regularity from two opposite directions, as is the case here. In the course of this season I will submit a further report on this subject, along with a model of the sort of machine I propose to try.

13. Cultivators are now commencing to clear land in the *kutcha* for winter crops, owing to so much land having been flooded, the *rabi* cropping has every prospect of being very extensive. Mutter and jumba are the crops first sown. Wheat will not be sown for some time yet.

14. During the season of 1878-79 we distributed very little seed for field sowing. During the current season we have disposed of the following quantities of seed:—

Cotton seed	...	...	... 126lb.
Bajri ...	...	...	... 231 „
Other seeds	...	...	... 11 „

Statement shows the expenditure and income on account of the farm for the past six months from 1st April to 30th September, both days inclusive.

EXPENDITURE. Description.	Amount. Rs.	A.	P.
On account of Farm Establishment	198	6	2
Do. Labourers' wages	342	4	0
Do. Cooly hire	14	13	10
Do. Manure and Carriage of same	258	6	4
Do. Kirby	224	4	0
Do. Oilcake	65	15	5
Do. Cotton Seed	116	6	5
Do. Seeds for sowing	80	13	0
Do. Clearing cotton fields	8	0	0
Do. Clearing tobacco field	1	0	0
Do. Digging water courses to Naras ...	5	5	8
Do. Dead stock such as 2 uessurs and 8 plough shares	6	12	0
Do. Medicine for cattle	0	12	9
Do. Clearing field for bajri—samples ...	2	0	0
Do. Clearing field for general crop of bajri ...	7	11	0
Do. do. of san crop	1	12	0
Do. Weeding bajri samples...	2	6	0
Do. do. general crop of bajri	2	6	0
Do. do. cotton	50	1	0
Do. do. tobacco	2	8	0
Do. do. nanguli	0	10	0
Do. do. mak dhab	1	0	0
Do. Transplanting tobacco	1	0	0
Do. Live stock, 2 bullocks and 1 camel ...	142	0	0
Do. Service postage stamps	5	0	0
Do. Repairing tools	0	13	6
Do. Collecting bones, &c.	4	15	8
Do. Brokerage on selling farm produce ...	4	11	2
Do. Clearing *medans* for grain, &c.	2	0	0
Do. Petty contingencies	24	4	3
Total Expenditure ...	1,523	6	2

RECEIPTS. Description.	Amount. Rs.	A.	P.
On account of sale 4 maunds of tobacco 1878-79, at Rs. 7 per 84lb.	28	0	0
Do. Rent of Govt. farm land 1878-79 ...	219	4	0
Do. 18 maunds 38lb. cotton seed (1877-78) at Rs. 2-4 per 84lb.	41	8	3
Do. 1488 bundles of bajri kirby 1878-79, at Rs. 16 per 100 bundles	230	0	0
Do. 430 bundles of sorghu kirby at Rs. 10 per 100 bundles	43	0	0
Do. 42lb. Nankin cotton seed at Rs. 2-4 per 84lb.	1	2	0
Do. 13 maunds of bajri grain 1878-79 ...	50	7	3
Do. One piece of babul wood	3	0	0
Total Income Rs. ...	616	5	6

W. STRACHAN,
Superintendent of Cotton Experiments.

No. 4262 of 1879.

Revenue Department.

COMMISSIONER'S OFFICE,

Kurrachee, 29th October 1879.

SUBMITTED to Government—the date of sending in the Report, has been altered as required by Government Resolution No. 2188, dated 24th April last.

Letter No. 8834, dated 22nd October 1879, from Collector, Hyderabad, with report on Salaru Farm.

2. A very fair quantity of work appears to have been done on the farm at Salaru during the half-year ending 1st October 1879, despite the many difficulties encountered, such as the late rising of the river, the scanty rainfall, the visitation from locusts, and the submersion of crop from the rapid and high inundation later on.

3. The results of the experiments made in the use of lime as a manure are still, as they were at the time of the last report, uncertain, nor can it be said that the recorded results of any of the experiments teach much, though doubtless they are all valuable in their way. Mr. Strachan, like many before him, seems eager to to try wind as a motive power for irrigation purposes. This has been often tried, and has always failed, and Mr. Strachan would do well to devote his energies to matters less mechanical and more directly connected with agriculture.

H. N. B. ERSKINE,
Commissioner in Sind.

SELECTIONS.

OPIUM CULTURE IN AMERICA.

THE interest expressed by a high official of the Opium Department in the cultivation of the poppy in America, induced the Editor of the *Indian Herald* journal to apply to the Government of the United States for information on the subject. The following reply was received by the mail delivered this morning, together with statistical abstract, which we purpose examining in a more lengthy article.

Department of Agriculture, U. S.
Washington, D. C., *7th November*.

THE EDITOR OF THE INDIAN HERALD, ALLAHABAD,
N.-W. PROVINCES, INDIA.

SIR,—In response to your expressed wish for information concerning the poppy and the manufacture of opium in this country, it may be stated in general that the poppy has never been cultivated here for commercial purposes to any extent, and that the production of opium is comparatively trifling, while experience in several of our States has demonstrated that opium of good quality can easily be produced here.

Samples of opium produced in Tennessee, North Carolina, and New York, and even as far north as the State of Vermont, have upon analyses been pronounced fully equal to the average of the best imported.

In California the culture of the poppy has been somewhat largely introduced, and is being extended. The middle and southern portion of that State are thought by those who are familiar with opium culture, to be, in respect to both soil and climate, peculiarly adapted to the production.

The common garden poppy (*Papaver somniferum*) is the species cultivated here—the white seed variety being used for making opium, and the black seed for oil.

You will thus perceive that the cultivation of the poppy for medicinal purposes has not received in this country the attention which it deserves. Our supply of opium chiefly obtained from Smyrna, exceeds 450,000 pounds, and the total value of our imports is at least 2,000,000 dollars.—Respectfully, C. A. CARMAN, *Acting Commissioner*.

AN EXPERIMENT WITH PEARL MILLET.

MR. P. HENDERSON, a well-known New York gardener and seedsman, sends the following communication to one of our American exchanges:—

Pearl millet has been cultivated for some years as a forage plant in some of the Southern States as 'African cane,' 'Egyptian millet,' 'Japan millet,' and in some places as 'horse millet,' but little was known of it a the North before last year, and then only in such small quantities as to hardly allow of a fair trial. From what we saw of it in 1877, we determined to give it a thorough trial this season. A piece of good strong loamy ground was prepared as if for a beet or turnip crop, by manuring wit stable manure at the rate of 10 tons to the acre, ploughing 10 inches deep and thoroughly harrowing. The millet was then sown in drills 18 inches apart, at the rate of 8 quarts to the acre. We sowed on the 15th May, about the date we plant corn; in 12 days the plants were up so that a cultivator could be run between the rows, after which no further culture was necessary, for the growth became so rapid and luxuriant as to crowd down every weed that attempted to get a foothold. The first cutting was made July 1, 45 days after sowing; it was then 7 feet high, covering the whole ground; and the crop, cut 8 inches above the ground, weighed (green) at the rate of 30 tons per acre. This, when dried, gave 6½ tons per acre as hay. After cutting, a second growth started, and cut August 15, 45 days from the time of first cutting. Its height was 9 feet; it weighed this time at the rate of 55 tons to the acre (green), and 8 tons dried. The third crop started as rapidly as the second, but the cool September nights lessened its tropical luxuriance, so that this crop, which was cut on October 1, only weighed 10 tons (green) and 1½ ton dried. The growth was simply enormous, thus:—First crop in 45 days gave 30 tons green, or 6½ tons dry; second crop in 45 days gave 55 tons green, or 8 tons dry; third crop in 45 days gave 10 tons green, or 1½ tons dry; the aggregate weight being 95 tons of green fodder in 135 days from date of sowing, and 16 tons when dried to hay. This exceeds the clover meadows of Mid-Lothian, which, when irrigated by the sewage from the City of Edinburgh, and cut every four weeks, give an aggregate of 75 tons of green clover per acre. There is little doubt that pearl millet is equally as nutritious as corn fodder, which it resembles even more than it does any of the other millets. We found that all our horses and cattle ate it greedily, whether green or dry. If sowing in drills is not practicable, it may be sown broadcast, using double the quantity of seed—say sixteen quarts per acre. The ground should be smoothed by the harrow, and again lightly harrowed after sowing; if rolled after harrowing all the better. I know of no farm crop that will better repay high manuring; but so great is its luxuriance that it will produce a better crop without manure than any other plant I know of. In those parts of the Southern States where hay cannot be raised, this is a substitute of the easiest culture; and being of tropical origin, it will luxuriate in their long hot summers. Even though our northern seasons may be too short to mature the seeds, our experiments in New Jersey this summer show what abundant crops may be expected if similar conditions are secured. Pearl millet, as a fodder plant, presents a new feature in our agriculture, and I feel sure that within ten years we shall

wonder how we ever got along without it. Besides our own testimony given above, we have received the most satisfactory letters from experienced men in different parts of the country to whom we sent seeds of pearl millet for trial, and all are unanimous as to its enormous productiveness and great value. From all we have seen and can learn, we are fully convinced that pearl millet is to be one of the great fodder plants of the future.

TEA AND COFFEE IN THE UNITED STATES.

THE quantity of tea imported during the five years from 1854 to 1858, inclusive, amounted to 126,003,504 pounds, and during the five years from 1874 to 1878, inclusive, to 307,269,473 pounds, showing an increase of 181,265,969 pounds, but considering the increase of popula tion since 1858 this is not an excessive quantity.

The quantity of tea imported from each country, irrespective of the country of production, during the year ended June 30, 1878, was as follows:—

Countries.	Quantities.
	lb.
China, including Hong-Kong	33,325,184
Japan	23,938,734
The United Kingdom (England, Scotland, and Ireland)	3,097,624
British East Indies	18,518
Netherlands	14,793
Provinces of Nova Scotia, New Brunswick, and Prince Edward Island	14,547
Provinces of Quebec, Ontario, Manitoba, and the North-West Territory	13,027
Dutch East Indies	4,630
Hawaiian Islands	4,428
Newfoundland and Labrador	1,550
Belgium	1,889
Argentine Republic	1,114
Germany	846
British West Indies and British Honduras ...	325
France	100
Total	65,366,704

The United Kingdom, it is well-known, imports more tea than any other country, as the United States imports more coffee than any other country. From official statistics, it appears, that the co nsum ption of tea in the United Kingdom amounted to 4·56 pound *per capita*, during the calendar year 1877, and in the United States to 1·36 pounds *per capita*, during the fiscal year ended June 30, 1878; while, on the other hand, the consumption of coffee in the United Kingdom amounted to 0·98 pound *per capita* during the calendar year 1877, and in the United States to 6·55 pound *per capita* during the fiscal year ended June 30, 1878. The following table gives quantities of imported tea and coffee retained in the United States for consumption, and the estimated consumption *per capita* of population, during the years 1830, 1840, and from 1850 to 1878, inclusive:—

Year ended—	Tea.		Coffee.	
	Retained for Consumption.	Consumption per head.	Retained for Consumption.	Consumption per head.
	lb.	lb.	lb.	lb.
1830	6,872,091	0·53	38,363,687	3·0
1840	16,882,999	0·99	86,297,761	5·05
1850	28,199,591	1·22	129,791,466	5·55
1851	18,604,774	0·57	148,992,595	6·2
1852	25,887,668	1·03	180,712,687	7·3
1853	19,291,884	0·75	185,999,243	7·8
1854	19,236,113	0·73	150,246,403	5·7
1855	19,768,593	0·72	175,160,441	6·4
1856	18,181,470	0·64	228,696,479	7·9
1857	16,500,285	0·57	216,655,977	7·5
1858	26,766,577	0·97	174,497,161	5·9
1859	28,119,289	0·76	240,820,918	8·1
1860	26,828,928	0·84	182,049,527	5·8
1861	21,916,667	0·66	177,910,452	5·5
1862	29,208,889	0·71	113,013,678	3·4
1863	27,021,040	0·80	74,808,758	2·2
1864	35,851,922	1·04	127,848,958	8·7
1865	16,849,789	0·49	84,316,045	2·4
1866	42,511,444	1·17	175,794,883	5·0
1867	34,136,216	0·94	172,741,788	4·8
1868	37,655,656	1·02	212,879,267	5·8
1869	39,14[illegible]55	1·04	280,814,877	6·1
1870	40,812,199	1·06	258,571,665	6·6
1871	48,972,788	1·19	294,930,949	7·5
1872	34,224,494	0·84	289,785,880	5·9
1873	104,423,570	2·55	401,975,241	9·8
1874	54,410,055	1·27	285,669,219	6·7
1875	64,7[illegible]089	1·47	317,017,310	7·2
1876	62,744,429	1·38	338,548,996	7·5
1877	58,941,173	1·26	332,005,687	7·1
1878	65,366,449	1·36	309,956,498	6·5

The consumption of tea and coffee in the United States for each year, from 1850 to 1856, inclusive, is estimated by subtracting the amount exported from the amount imported. For the years 1857 to 1878, inclusive, the amounts of the respective articles entered for consumption at the Custom-houses is taken as the consumption. The population is estimated for years other than the census years 1830, 1840, 1850, 1860, and 1870. The first two years named end September 30, all the others June 30.—*Journal of Applied Science.*

A GOOD HORSE.

WIND, says an old horseman, is the grand secret of a good horse. Good lungs will cover a multitude of faults, while, on the other hand, perfection of shape and form are useless when the wind is out. The chest, therefore, in all cases, should be large and capacious. It may vary somewhat in shape, according to the service to which the horse is to be put. If he is apt to be kept for slow work and heavy drawing, the chest may be nearly circular in form, because this shape is one for strength and bulk to receive and bear up against the pressure of the collar, while at the same time sufficient room is secured for that expansion of the lungs caused by slow, regular work. But if the chest is circular, let it be at the same time deep, or else the lungs may be cramped. A horse with a shallow chest is worthless for any purpose. The rule, then, is : for a draught horse, a circular but deep chest ; but as you pass through the different degrees of speed up to the racer and trotter, the chest will increase in depth, compared to its roundness, until for the highest rate of speed you must take a chest as deep as a greyhound, and at the same time not lacking in strength.

HEALTH OF HORSES.

THE health and comfort of horses have of late years been greatly improved by the better construction of stables. They are made more roomy and lofty, and provided with means of thorough ventilation. In many new stables lofts are done away with, or the floor of the lofts is kept well above the horses' heads, and ample shafts are introduced to convey away foul air. By perforated bricks and gratings under the mangers and elsewhere round the walls, and also by windows and ventilators, abundance of pure air is secured for the horses ; while being introduced in moderate amount and from various directions, it comes without draught. Too much draught is almost an unknown luxury. To secure a constant supply of pure air, horses require more space than they generally enjoy. Even when animals are stabled only at night, a minimum of 1,200 cubic feet should be allowed. In England the newer cavalry barracks give a minimum of 1,509 feet, with a ground area of fully 90 square feet per horse, and the best hunting and carriage horse stables have more room.—*Journal of Chemistry.*

CULTIVATION OF THE AUSTRALIAN BLUE GUM.

WE fear our correspondent "Eucalyptus" gives us credit for more personal knowledge of the subject he refers to than we possess. Our experience has certainly not been much more favourable, if so much so as that of many of our neighbours. Occasionally every one, nearly, of a set of plants put out will grow, but frequently a very small percentage will leave, especially if the plants are allowed to grow big. When they do grow, the trees stand wind better in stiff soil than they do in the loose soil near walks,—that is when exposed to wind. In such positions, there seems nothing for it, but to put *two* large, long stakes slanting inwards to each tree from south-west and north-east. The tree seems naturally to have little tap root, but we have seen one from which the earth had been cut away buttress itself by a tap-root rivalling the trunk in size. The seed seems to grow readily, spread over an unsheltered bed and watered when the weather is dry. Transplanting is the difficult matter, and we should recommend balls of earth and temporary shading. Better go to this expense than lose set after set of plants. But we once published an account of Colonel Beddome's process. It was to cut the bamboo of which estate baskets are made, and which is not more than an inch or two in circumference, into bits about three inches long. Place these pieces endways close together, in thousands ; cover over with forest mould or fine soil and sow your seed. In this way there will be from one to three or four seedlings in each bit of bamboo. When carried out in the bits of bamboo the best plant can be left, the others being removed and utilised immediately or at a subsequent period. Perhaps planters with more experience will give our readers the benefit of their information. A new interest attaches to the cultivation of the Eucalypti as breakwinds or separately, from the fact that the fine straight timber makes excellent sleepers for railway lines, where hard wood is desiderated. The trees, many of them, are well grown at eight to ten years old.—*Ceylon Observer.*

STUDIES ON GUANO.

M. CLOUET has been engaged anew in an investigation of the composition of Peruvian guano and some of the mineralogical products found in conjunction with it. Different kinds of guanos vary greatly, as is well-known in their efficacy as manures, the Peruvian variety being especially valuable. The quantity of this latter may be estimated at 738,000,000 metric centners, and it is divided into three different sorts, which were undoubtedly deposited under very different climatic conditions. The first kind is that from the Chincha Islands, now almost exhausted; the second comes from Chanavaya, in the south of the Republic; and the third variety is obtained from the Guanape Islands, towards the north of the country. The average composition of the three sorts is as follows:—

	Chincha Islands. Per cent.	Chanavaya. Per cent.	Guanape Islands. Per cent.
Uric acid	12·000	15·500	0·900
Oxalic acid	4·464	3·609	3·810
Phosphoric acid	12·100	19·030	12·560
Carbonic acid	0·690	—	3·700
Sulphuric acid	2·050	1,960	2·100
Chlorine	2·966	1·240	1·500
Lime	18·950	16·020	14·640
Magnesia	0·520	1·100	0·400
Potash	2·100	2·250	2·200
Soda	0·000	1·200	1·100
Ammonia	11·100	8·500	9·100
Silicic acid	1·900	2·000	1·180
Hygroscopic water	10·500	5·200	20·000
Undetermined organic substances	24·840	22·400	26·990
Total nitrogen	14·47	12·18	10·29

Hence it appears that the guano from the driest regions is richest in uric acid, which in the Guanape variety is washed out by the rains, while, on the other hand, the proportion of carbonate of ammonia in it is largely increased.—*Country Gentleman's Magazine.*

SELF-DEFENCE AMONG PLANTS.

ONE of the means of self-defence among plants, says Dr. Francis Darwin, in a recent lecture, is the presence of poisonous alkaloids. Thus ruminants will not eat such plants as nightshade (belladonna) monks hood (aconite), hellebore, thorn apple (stramonium), peony, veratrum, and hemlock (conium). Many plants are protected by their poisonous milky juices, as the spurges (euphorbia) poppy, celandine, and others. In the strychnos nux vomica, the poisonous alkaloid strychnia is contained in the seeds, its whole object being to prevent them and the young plants contained in them from being injured, the fleshy parts of the fruit being quite harmless and eaten by the natives. This eatable part surrounding the seeds entices birds to swallow them, that they may be distributed after, and by passing through the animals' bodies. Bitter almonds are comparatively safe from the attacks of mice, whereas sweet almonds are much injured by them. In addition to an almost endless series of poisonous plants, there are those which contain essential oils having a pungent aromatic odour or taste. Thus the fennel, aniseed caraway, and others have otherwise unprotected seeds, which are safe from the attack of birds on this account. In Brazil the lime alone of all the orange tribe is distasteful to the leaf-cutting ants probably owing to an oil similar to that which gives the strong taste and odour to orange peel; and this fact has decided the fate of the tree, for it is the only species of the tribe which has been able to establish itself beyond the limit of cultivation, the orange, citron, &c., growing only where protected by man. Turpentine in fir leaves serves as a protection against cattle. The aromatic flavour of mint is a defence against browsing animals, and as it is frequented by a large number of insects, it affords an analogy to the nettles and thorns, which are resorted to by butterflies and birds to rear their young. Flowers are usually more acrid than the plants which bear them, and are thus protected from destruction by browsing animals and other foes, by being uneatable. Caterpillars will die of hunger rather than eat the flowers of the plants whose leaves form their natural food.—*Australasian.*

THE IVORY NUT PALM.

A WRITER, in a recent number of *Science Gossip* states that in 1843, Mr. William Pardie was despatched to New Granada to collect plants for the Royal-gardens, Kew. He was specially instructed to find a few special plants, one of which was the ivory nut palm. In his account of this Mr. Purdie says:—"In a journey of 600 miles from Santa Martha to Ocana, in new Granada at the village of Somaha, seventeen leagues from hence, and near the great river Magdalena, I entered the mountains, and saw for the first time the ivory nut palm (Phytelephas macrocarpa), called *Tagua* by the natives. The habit of this palm is to have little or no stem, what there is is decumbent; it is not a robust tree. Old plants have from 15 to 20 primate leaves, which when fully grown measure nearly 20ft. in length, of a delicate green colour, very graceful, and similar to those of the date palm. The male and female flowers are borne on separate plants. The male flower are produced generally in six clusters from the bases of the leaves and on short footstocks. The clusters are compact and form a nearly globose head, which, on account of the style-like projections resembling the rigid hair of a negro, is not inaptly called *Cabeza del negro* (negro's head). These heads lie close to the ground, each cluster containing four or five seeds. The seed contains, at first a clear insipid liquid, which afterwards becomes milky and sweet, and ultimately hardens and becomes the 'vegetable ivory, of commerce. Each of these nuts is about the size of a green walnut, and is covered with a yellow, sweet, oily pulp, which is collected and sold under the name of *Pepo del Tagua.* A spoonful of the latter with a little sugar and water makes the celebrated *Chiche de Tagua*, said to be the most delicious beverage of the country."

KEEPING UP FLESH.

THE bare pastures (says an American contemporary) will suggest the absolute necessity of feeding to keep stock growing. Young stock suffer more than mature stock from falling off in flesh in the fall, and for the reason that, besides the actual loss of flesh from insufficient food, young stock receive a check which they do not subsequently recover. In this connection the question of shelter comes in as an important integer. No animal should be left exposed to chilling storms in late autumn or winter. It is simply a question of the conservation of force. If an animal, whether a horse, a steer, a hog, or sheep, or young animal loses flesh, it loses force. To regain this, not only must the feed be supplied to keep up the natural waste, but the flesh lost must also again be put on. Thus all the animal waste formerly supplied in originally gaining the same amount of flesh is a dead loss, but the time lost in losing and again gaining this flesh must again be taken into account. Thus the wise farmer not only feeds early and well, but he also shelters early and well, knowing that the loss of heat means loss of flesh, and that loss of flesh means loss of profits. In all this the stock raiser, of course, is guided somewhat by the relative cost of shelter and the cheapness of food; nevertheless we always find that those who give the best shelter have the best stock, and for the simple reason that warmth conserves the natural heat in animals as well as man.

COVERED YARDS FOR YOUNG STOCK.

THE question of covered yards for young stock is one that has been much debated. Those who are in favour of them have at least two cogent arguments to support their views—the additional shelter afforded to the cattle, saving thereby a given quantity of food; and the economy of litter, much of which is always trodden to waste, or next to waste, in open yards. On the other hand, some writers contend that open yards are conducive to the health and hardiness of the animals; fresh air, and even exposure to the elements, being necessary to give them the desired vigour of constitution. It is true enough that young animals may easily be injured by being kept under cover too much, but we fail to see any advantage in exposing them to the storms and blasts of winter. Fresh air is necessary to them, and so is exercise, but it is a simple matter enough to arrange that they shall have plenty of both in connection with covered yards. The mistake made by those who on these grounds condemn covered yards lies in assuming that when once put in the yards the cattle are not allowed out of them during the winter. In this matter we may admit the teaching of instinct in the animals. If young stock have a building, a shed, or a covered yard into which they can retire when they choose, we find they always do retire into it in bad weather, and that they require little or no teaching to do so. So with covered yards it is a simple matter, which suggests itself to any one, to allow the animals to go out in fine weather and to come in in foul; they will do both these things of their own accord, if they are allowed.—*From 'Dairy Farming,' by Professor Sheldon.*

THE WAY TO HANDLE SHEEP.

THERE is a right way and a wrong way, a hard way and an easy way, an awkward way and a skilled way, to catch and handle sheep. A great many men will catch the sheep by the wool on the back with both hands, and lift the animal clear from the ground by the wool only. Barbarous! Let some great giant grasp you by the hair of your head, and lift you from the ground by the hair only! Would you not struggle and squirm worse than the mute sheep does when lifted by the wool? And would there not be a complaint of a sore head for a week or two? If

you do not believe it, try the experiment. We have slaughtered a great many sheep in years past, and when removing the pelts of such sheep as had been handled by the wool, we never failed to observe that beneath the skin, wherever the animal had been caught by the wool, blood had settled. In many instances, the skin had been separated from the body so that inflamation had become apparent. We have known proprietors of sheep to be so strict in regard to handling them, that they would order a helper from the premises if he were to catch a sheep by the wool on any part of the body. Some owners of sheep direct their helpers thus :—'When about to catch a sheep, move carefully toward the one to be taken, until you are sufficiently near to spring quickly and seize the beast by the neck with both hands ; then pass one hand around the body, grasp the brisket, and lift the sheep clear from the ground. The wool must not be pulled. If the sheep is a heavy one, let one hand and wrist be put around the neck and the arm pressed against the leg.' We have always handled sheep in the way alluded to. We never grasp the wool. Others seize the sheep by a hind leg, then throw one arm around the body and take hold of the brisket with one hand. But ewes with lambs should never be caught by the hind legs, unless they are handled with extreme care. When sheep are handled roughly, especially if their wool is pulled, the small bruises and injuries will render them more wild and more difficult to handle.—*Drover's Price Current.*

CAN LEAVES ABSORB WATER?

SOME short time since we had occasion to allude to the experiments of the Rev. George Henslow, from which it appeared, contrary to the opinions expressed by Duchartre and others, that leaves do absorb water. We have now before us, in the *Bulletin* of the Botanical Society of France, the record of some further experiments on this subject by M. Mer, and which confirm Mr. Henslow's experiments. M. Mer's conclusions are as follow :—

1. Leaves can absorb water either when they are entirely submerged after having lost their turgidity, or when liquid is in contact with a portion of their surface only, the remaining portion being subject to transpiration.

2. Absorption is more active on the lower surface than on the upper face, more active also in leaves with thin cuticle than with those with a thicker epidermis. In the former case absorption occurs to such an extent as to prevent the drying up of the internodes and leaves not immersed in the water, when these organs receive water from no other source ; it is nevertheless sufficient to preserve the turgidity of the roots. In the second case this absorption is not strong enough to restore the weight the plants had before being withered.

3. The absorption is not local merely, as it induces turgidity in neighbouring parts. Moreover all the tissues of a plant are more or less continuous (*solidaires*) with reference to water.

4. The leaves do not absorb water when (*a*) they are still turgid, unless there are adjacent organs transpiring rapidly ; nor (*b*) when they have at their disposition tissues rich in water, and from which by preference they derive their supplies of water when slightly withered.—*Gardener's Chronicle.*

AGRICULTURE IN THE UNITED KINGDOM.

AT a time when agriculture is in so depressed a condition, it is of interest to inquire what has been the tendency observable amongst the farmers of the United Kingdom of late years. Has the area under cultivation increased, diminished, or remained stationary? And how have the cultivators directed their efforts in order to meet the trials that have come upon them? In the Agricultural Returns which have just been issued by the Statistical Department of the Board of Trade, we are furnished with the means of answering these very important questions. It is due to Mr. Giffen to say that since he became head of the department these returns have been much improved. They are collected earlier than they used to be, a summary of them is promptly delivered to the press, and the complete tables, with accompanying comments, are given to the world as soon as the harvest itself is got in—at present, indeed, before it. The information contained in them is thus made available while it is really useful. Moreover, the amount of information has been largely increased, and it is of a kind which enables us to institute instructive comparisons without having to consult other publications. The agricultural statistics for the colonies and foreign countries, it is true, have been omitted, as we think with advantage ; but in their place we get an expansion of the home tables giving the results of the previous nine years, and, in addition, we have most valuable information respecting prices, imports, and other matters bearing on the subject in hand. By the aid of these we can frame answers to the questions propounded above. It may be well, however, before we proceed further, to make somewhat more distinct the nature of the problem with which we propose to deal.

In 1859 the population of the United Kingdom was, in round numbers about 29¼ millions ; last year it was about 33¾ millions ; the increase, therefore, was 4½ millions, or 15½ per cent. But the value of the imports of food of all kinds rose in the same interval from 21,359,000*l.* to 86,996,000*l.* —that is to say, was almost quadrupled. The imports of food thus increased out of all proportion more rapidly than the mouths that consumed it. This will appear still more clearly when we say that these imports in 1859 amounted to no more than 17*s.* for each man, woman, and child in the kingdom, and that last year they were as much as £2 16*s.* 10*d.* for each. In other words, when we have made full allowance for the growth of the population, the imports of food have nearly trebled in value in twenty years. It may perhaps be said that a large part of them consisted of articles not produced in this country, such as tea, coffee, sugar, rice, wine, brandy, fruits, and so on. Let us, then, take the headings separately as given in the volume before us, and we find that the value of the live cattle, sheep, and pigs imported has risen from 1,684,000*l.* to 7,458,000*l.* ; of the meat, butter, cheese, eggs, and potatos, from 4,680,000*l.* to 29,478,000*l.* ; and of the corn, grain, flour, from 18,044,000*l.* to 59,864,000*l.* We omit in every instance the odd hundreds ; but the omission does not materially affect the result, which manifestly is that the land of this country has not produced enough for the wants of its population. If now, with these facts before us—that the land of the country has not produced enough to satisfy the wants of the population, and consequently that in twenty years our food imports have been almost trebled—we inquire what has been the course of prices, we get a very strange reply. In 1859 the *Gazette* average price of wheat was 43*s.* 9*d.* ; last year it was 46*s.* 5*d.* The year of the Italian war, 1859, was perhaps the finest within the memory of the present generation, and therefore was highly favourable to the growth of wheat. Last year was very unfavourable, and the harvest was bad. Yet, in spite of this, and in spite of the further fact that last year there were five and a quarter million additional mouths to fill, the rise of price was no more than 2*s.* 8*d.*, a trifle so small as not to be worthy of notice. Indeed, between 1859 and 1876 there was a difference of 9*s.* 6*d.* The rise in barley in the twenty years has been from 33*s.* 8*d.* to 40*s.* 2*d.*, but in 1876 the price was as low as 35*s.* 2*d.* ; in oats the rise has been from 23*s.* 2*d.* to 24*s.* 4*d.* Practically, then, there has been no advance in the price of corn. In wool there has been a very great fall. In 1865 English fleeces fetched as much as 2*s.* per lb. ; last year they were as low as 1*s.* 3½*d.* This is a decline of over one-third. In pigs, again, the price has been stationery. And even as regards butchers' meat the rise in no case amounts to 50 per cent., and often is not above 20 per cent. And, if the prices of the present moment were taken instead of those of last year, the advance would be found to be still less. It is not to be forgotten, however, that in 1859 the effect of the gold discoveries, and of the great outburst of trade activity that followed the repeal of the Corn-laws and the application of steam to locomotion, had already begun to tell upon prices. But this does not affect the point to which we wish to direct attention—namely, the vast augmentation of our food imports simultaneously with ; small advance, or no advance at all in prices, and the effect of this combination of circumstances upon agriculture in the United Kingdom. What, then, has been this effect?

In one respect it has been different from what might have been expected from the foregoing facts. One would be inclined to infer that foreign competition is overbearing home agriculture, and to look in consequence for a diminution of the area of land under cultivation. But, on the contrary, there is a steady increase. In 1870, the earliest year for which in the publication we are treating of the statistics on this subject are given, the total area in cultivation in England, Wales, and Scotland was 30,407,579 acres ; last year it had risen to 31,975,784, an addition of 1,568,205 acres, or about 5 per cent. Some of this increase, no doubt, is merely apparent. Greater accuracy in the returns swells the total acreage. But there is also a real extension of cultivation by the reclamation of bog and moorland and waste mountain sides. This reclamation is going on even in the present year, when we hear so much of agricultural distress, showing that the wealth of the country is growing even in the worst times of depression, and that a fair return is made for the cares of the skilful husbandman. But while the total area under cultivation is thus receiving annual increments, the acreage under tillage is constantly diminishing. Thus the area under corn has fallen from 9,545,000 acres, omitting the odd hundreds, to 8,935,000 acres, under grass crops from 3,586,000 acres to 3,554,000 acres ; under clover from 4,504,000 acres to 4,478,000 acres. It will be seen that the falling of is mainly in the breadth of land under corn ; and in this category it is principally in the wheat area, which has decreased from 3,500,000 acres to 2,890,000 or over 600,000 acres. In oats again there is a diminution of 107,000 acres, in potatos of 46,000 acres ; and in turnips of nearly 200,000 acres. In the area under barley, on the contrary, there is an increase of 296,000 acres. It is in the acreage laid down in permanent pasture that the whole augmentation is found ; but the increase in cattle is by no means proportionate with this augmentation. There is, in fact, a decrease in the number of both sheep and pigs. And in cattle the increase does not exceed 423,000 head. The change that is being effected in our system of farming can hardly, therefore, be considered satisfactory. The seasons since 1870 have been very unpropitious, and perhaps, therefore, it was inevitable that the growing of wheat should be more and more restricted. The cheapness and the highly nutritive quality of maize, too, make it a formidable competitor of oats. But that tillage generally should fall into disfavour is not so easy to understand. With more of the country laid down in permanent pasture we have fewer sheep and not very many more cattle, while foreign meat is underselling home-fed in our own markets. It seems to follow that the course pursued by our farmers is a mistaken one, and that the

would do better if they were to till more. It is certain at any rate, that our agriculturists have not kept pace with the times. It would appear that the present depression is rousing them to exertion, and that in many instances they are discovering ways of making money which had previously been neglected. In the current year, for example, there is a considerable increase in the acreage under orchards, and there is also an extension of market-gardening. The very high price of fruit proves that there is room for enterprise at home in supplying an increasing want, while the growth of our urban population provides a perennial and increasing demand for fresh vegetables. There is no reason but routine why farmers in the neighbourhood of large towns should not devote a part of their holdings to the growing of these. In farming, as in every other business the pinch of hard times seems to be needed to make men put forth all their energies and give attention to small gains and minute economies. If the present depression compels our farmers to do this, they will find means of meeting the foreign competition which is now too much for them.

Hitherto, however, it must be confessed that the improvement in the condition of the people of England, the rise in the standard of living amongst them, and the consequent great demand that has arisen for food products of all kinds, have stimulated only agriculture abroad, not at home. For example, it appears that the area under wheat in Australia has doubled within the last eight years, and that it now exceeds 2½ million acres. In the United States this year the breadth of land under wheat exceeds the enormous total of 32⅔ million acres, or more than ten times the breadth under wheat in the United Kingdom. The yield per acre, however, is very small, and the whole crop, therefore, will be very much less than those figures would lead one at first sight to expect. Yet these figures, after every allowance is made, afford eloquent proof of what we have said, that it is distant countries, not our own, which have been stimulated to supply the growing demand in these islands for the necessaries of life. Vast, however, as is the area under wheat, that under maize is still vaster, it is over 58 million acres. These figures bring out very clearly how different the tendency is at home from what it is in those newer countries. Here there is a diminution of tillage continued year after year; there we see a rapid extension. The seasons since 1870 have been exceptionally bad at home, and have accelerated the movement; but it had set in long before, and the disposition undoubtedly is to regard it as one that must go on. Probably it is impossible to compete with these new countries in the cultivation of wheat, but we clearly have an advantage in the cultivation of barley, and, we venture to think, in other things beside. If the same skill, enterprise, and capital were applied to the soil which are applied to trade, we believe it would be found that agriculture in the United Kingdom may still be a profitable business. But our object now is not so much to insist upon this point as to bring out the effect produced on British agriculture by the influences acting upon it.—*Saturday Review.*

THE BIGGEST WHEAT FARM IN AMERICA.

THE United States, although famous for great business undertakings, have not many large wheat-growing farms. Throughout the Eastern, Middle, and even the North-Western States the ordinary grain farmer seldom possesses more than 200 acres. But here at Casselton, in Dakota Territory, in the valley of the Red River, is a striking exception—a farm of 75,000 acres held by Mr. Oliver Dalrymple. Four years ago this enormous farm was a portion of the far-reaching prairie wilderness. No evidences of human life were visible. Prairie fowls, snipe, jack rabbits, the prairie squirrel or gopher were the inhabitants; while wild ducks and geese congregated in creeks or marshy spots. A few years previously buffaloes and badgers were common, and on the untilled prairie their whitened bones lie thickly strewed. Some of the directors of the Northern Pacific Railway had acquired these lands and wisely appointed Mr. Oliver Dalrymple their manager, with a half-share in the concern. Mr. Dalrymple brought to his serious task a goodly experience, acquired in successfully farming 6,000 acres at Lake Elmo, near St. Paul, Minnesota.

On Friday, the 26th of September, the members of the Royal Commission; Messrs. Read and Pell, your Commissioner, and a party under the guidance of Mr. James H. Drake, Assistant Manager of the St. Paul and Sioux City Railway Company, were most hospitably received by Mr. Dalrymple; were driven for miles over this vast prairie farm; examined its dark, friable, alluvial soil, perfectly free from stones, varying from 12in. to 20in. deep, resting upon an argillaceous clay rich in vegetable remains; gathered information as to the cost of wheat production, and speculated on the permanence of continuous wheat-growing. The arrangements of this great farm are well considered and systematically and effectually carried out. Minor details receive more attention than on most farms of 100 acres; time and labour are everywhere economised. On one of the sub-divisions of the property telephonic communication, at a cost of only $300, is established between the superintendent's office and that of his foreman; and this rapid and direct system of control is being extended throughout the whole estate. Substantial and economical wooden buildings have been erected at suitable points, consisting of houses for superintendents, sleeping and dining rooms for the men, stables, granaries, and sheds for the storing of the numerous and valuable machinery and implements, with blacksmiths' and carpenters' shops. Handy to the several buildings, wells varying from 50ft. to 80ft., have been dug into the sand and gravel bed which underlies the clay; On one farm avenues of trees are planted out. Amid such modern equipments and good cultivation it is difficult to realise that this busy profitable settlement was five years ago lonely, barren prairie.

This Dalrymple property cost from 40*s.* to $5 per acre. There are no federal taxes; rates, mostly for school purposes, amount to 10*c.* per acre. The estate is partitioned into divisions of 5,000 acres, each under the management of a divisional superintendent, who has under him two foremen, one of whom, on horseback, accompanies his 15 or 20 teams to work, sees to the ploughing or drilling, observes and reports as to the behaviour of the men, the condition of the animals, and the efficiency of the machinery. Each division has two or more sets of buildings, and in connexion with the principal homestead of each farm are the quarters for the men—large wooden barrack rooms, sometimes over the stables, comfortably warmed with stoves, where 50 men sleep in busy times two in a bed. Hard by are the kitchens, each with the capacity to provide for the wants of 100 men, presided over by the cook and his mate, who, on requisition through the foreman, draw supplies from the stores—flour for bread, puddings, and cakes, beef which costs fresh fully 8*d.* per pound, pork, bacon, cheese, and butter, and coffee, and other good things. But the stores, liberally provided with necessaries and luxuries, including some of the best butter and coffee we ever tasted, wisely dispense neither beer nor spirits. Three hot meals a day are provided, before 6, at noon, and at 7; meat, bread, puddings, cakes, tea and coffee are supplied without stint. All payments are made by the book-keeper on vouchers signed by the foreman. Men can draw their money as they please. Some take it weekly; a few spend it at the beer saloons at Casselton; others, more provident, allow it to run on for weeks, or even for half a year. The rate of wages varies with the season. With board during the spring $18 a month (18*s.* a week) is given; during harvest wages advance to $2·25c. a day; during the thrashing season the rate is reduced to $2; during the autumn months the pay is $2·5. No piecework is adopted, but so thorough is the superintendence that full work is obtained from both man and beast. During harvest and thrashing, which is done out of the field, as many as 600 men are frequently employed. Even with this great accession of labourers, work proceeds systematically and harmoniously. No rows occur; brawling and fighting are extremely rare, but when they do occur it unfortunately is usually on Sunday. Dismissal for insubordination is scarcely known. Men injured or sick from causes beyond their own control are nursed and have medical attendance gratuitously. Extra men in harvest and during thrashing only receive pay for the hours they labour. So soon as frost prevents ploughing, the whole of the men on the farms are dismissed, with the exception of the divisional manager and about ten men, who each look after about 40 mules or horses, feed and water them, and turn them into a yard for a quarter of an hour's exercise night and morning. Hard as such wholesale dismissal would be in Great Britain, it is no hardship here, for these men readily find lumberwork in the forests. It is obviously an enormous boon thus to get rid of men whom the farmer cannot profitably employ during the five winter months. Many an English wheat grower would gladly practise this retrenchment and send most of his staff to other vocations during the short days and bad weather of mid-winter. Twenty thousand acres are already under cultivation; 5,000 acres are broken up annually. The uncultivated portions are chiefly used in growing prairie hay and grazing the milch cows. Four hundred mules or horses are at present daily engaged ploughing the stubbles, or back-setting or cross-cutting the land broken up from prairies during the early summer months. The sod of ages is already disintegrated, the prairie grass, previously, cut short by the mowing machine, is rotted. The stubbles are left of about the same length as they are in England; but since the straw is burnt it would save expense, both in reaping and thrashing, to leave a longer stubble and burn this and any weeds among it before the ploughs went to work. In one field we come upon nine double-sulkey ploughs; the ground being hard owing to a month's dry weather, four mules are allotted to each. The driver mounts comfortably, as on a reaping machine, guiding his four-in-hand with reins. Instead of a coulter, these ploughs made by John Deer, Illinois, and costing $60, have a cutting wheel. The working parts are of steel; the shares are sharpened every third or fourth day. Each of the two ploughs turns a furrow 15in. wide by 5in. deep. In another field a dozen mule teams are similarly employed. Two and-a-half acres are at present turned over by each team daily; but when the ground is softer fully three acres are overtaken. The teams walk 17 to 20 miles daily, turn out at 6, are in the stable and fed for an hour at noon, and have four to five hours' work in the afternoon. The fields are conveniently laid out in squares of 100 acres. Some are fenced with oak posts and two strands of barbed steel wire, which keeps back cattle and horses, but not sheep and pigs, and has the disadvantage of lacerating any animal coming forcibly into contact with it. To prevent idly walking several miles to work, the teams going and returning, invariably plough along the intervening fields, the twelve teams each time they go out or return contributing a broad strip of nearly 30ft. of ploughing.

The breaking up of the level prairie is neither tedious nor costly. No stones or tree roots cause breakage or delay. With the single hand ploughs and a pair of horses, or three abreast if the ground is very hard, a stout furrow, usually measuring 12in. by 4in., is turned. An acre and-a-half is easily overtaken in the May or June day or ten hours. Mr. Dalrymple estimates that the breaking up, allowing for wear and tear of plough and sharpening of the steel shares, which should last two seasons, costs him fully two and-a-half dollars. The stubble and cross-ploughing are computed to cost $1·75c. Even in this newly-settled country, small farmers and others can be hired to do the ploughing, furnishing a man and pair of good horses

at the cost of 12s. daily, and doing regularly their 1½ acre in a workmanlike manner.

Mr. Dalrymple and Mr. Dutton, one of his intelligent and able divisional superintendents, both prefer mules to horses on account of their hardiness endurance, equable temperament, and freedom from disease. With about an equal proportion of mules and horses they have in four years used up 16 horses, but the whole of the mules are still serviceable, excepting one, which was accidentally injured. The mules are bought chiefly at St. Louis at five or six years old; they are 16½ to 17 hands, weigh 1,100lb. to 1,200lb; are well broken, steady workers, good-tempered, and quiet, and cost on an average $140 (£28), while the transit of 1,000 miles from St. Louis home puts about $10 (40s.) more on their price. Mules and horses do not differ much in value, and are managed and fed alike. They are housed in good lofty stables, accommodating about 50, standing in pairs in 9ft. stalls. Racks and mangers are used as at home. They are tied by halters or head-stalls. The light harness, used indifferently for plough and wagon, costs $28 for each animal, and is expected to last ten years. The feeding, carefully attended to by the stable "boss," consists of 12 quarts daily of mixed home-grown oats and barley, and 15lb. to 20lb. of prairie hay. During winter, the amount of corn is of course reduced, and this five months' rest and some days' lighter labour between seasons accounts for the good looks and condition of the teams and their standing satisfactorily at busy times, 11 hours work daily.

Towards the end of March the working staff are again got together. The lumbering is finished up, and men are ready for farm work. A few of the hands of former seasons return. The gang foremen, selected for intelligence and promptitude, are appointed. The whole of the land intended for crop has been ploughed in autumn; the newly broken, as indicated, has had a second furrow, which keeps down weeds and insures more certainty of result. So soon as the frost has left the first six inches of soil, which is generally by April 1, the seeding of the wheat commences. Scotch Fife, a good, hard, thinned-skinned red variety, is used. The seed is selected from the newly broken-up land; if any cockle or other weeds are observable, they are carefully winnowed out. No dressing or picking is adopted. During autumn or winter, in 1½ bushel lots, the seed for each acre is bagged up. Whenever the weather permits seeding commences. The seed is distributed by broadcast machines, 100 being at work daily for three weeks. Two hundred sets of harrows complete the operation, two or three turns being required, and Mr. Dalrymple jocosely states that he orders it "to be well done, and then give one turn more." Four harrows, united by chains, work in a set, cover 20ft., and are drawn by four mules. In each harrow are 72 round teeth; the set costs 14 to 15 dollars. Immediately after the wheat seeding, the oats and barley grown for horse provender are put in.

No horse or hand hoeing, no weeding, or any further expenses are incurred until harvest. Seasonable showers usually occur during June and July; heavy dews restore part of the moisture removed during the warm noontide. For four years the seasons have been propitious. The drought during last July occasioned, however, considerable apprehension. Prayers for rain were offered in the churches, while English farmers were imploring fine weather. Another week of scorching drought would have shrivelled up the soft, milky ears; but the much longed-for rain came seasonably. Drought is probably the chief cause of uncertainty in the American wheat yield. Hailstorms and tornados, abounding further south, are unknown here. No wire-worm, weevil, or fly interferes with Mr. Dalrymple's crops; mice and rats have not yet made their home in Dakota; sparrows, larks, and rooks are equally rare. Grasshoppers did some injury in 1876, probably diminishing the yield by three bushels an acre; but Mr. Dalrymple considers that he is too far north to suffer much from the hoppers, and believes that they cannot do much damage on cultivated land, although why such marauders should spare the cultivated crops is not very evident.

Harvest begins about August 1, usually amid fine, settled Californian weather. About 800 extra men are engaged. One hundred and fifteen automatic self-bindings harvesters are busily at work; 100 of these are Walter Wood's, the remainder M'Cormick's. Both are reported to do their work admirably; no objection is found to the wire binding. The grain is shocked, and cutting is overtaken in 12 days No time or outlay is expended in stacking. The 21 steam-thrashing machines made by the Buffalo Company, and costing $600, with thrasher, winnower and straw-elevator in one, are placed at convenient points throughout the fields. Ten wagons, each with a pair of horses or mules, bring up the shocks and carry off the thrashed corn in three-bushel bags an average distance of two miles to the railway cars. A gang of 25 men keep wagons and thrashing machines steadily going, and deliver at the station 1,000 bushels of wheat daily. Each day the thrasher and engine which is partially self-propelling and costs $800, is moved, so as to shorten haulage of the sheaves. Every busy day, 50 railway cars, each containing, 400 bushels, are loaded, and stand ready for despatch, usually to Duluth 264 miles distant, on the western corner of Lake Superior.

The crop of the present year Mr. Dalrymple states to be much the same as that of former seasons. It averages 20 bushels an acre of 60lb. to the bushel. The natural weight is 59lb. to the bushel. As usual the produce of the newly broken up land is best. The quality is fully as good as that of 1878. When run once through the winnower at Duluth, it will be graded No. 1 hard. Mr. Dalrymple usually sells as fast as he can deliver, but this year, holding for the rise, he has still the chief portion of his crop warehoused at Duluth. The oats are reported to yield 50 bushels to the acre and 36lb. to the bushel; last year 60 bushels were produced. The barley has not done particularly well this year; but generally runs 40 bushels. On each farm a few potatoes, cabbages, swedes, and other vegetables are grown for home use and for the cows which are kept to supply dairy produce; but wheat-growing is the great business of this great farm.

Now comes the important question of the cost of production. Mr. Dalrymple furnishes the following figures:—Land valued at $12 per acre, interest thereon at 6 per cent., 72c.; taxes and rates, 10c.; buildings, machinery, and teams, valued at $10, interest at 10 per cent., 10c.; ploughing, $3, seed, $1 50c.; harvesting and thrashing, $3; total, $8 42c.

Mr. Dalrymple thus produces an acre of wheat for less than $8½ (34s.) per acre; indeed, he asserts that hitherto the actual cost has not reached $8, excepting in the case of the first year's crop which the extra expenses of breaking up and two ploughings advanced to $11. For four years his acreable yield has averaged 20 bushels, each of which on the basis of the above calculation, would cost 42c., or 1s. 9d. On his own and other suitable wheat-growing farms in favourable seasons, Mr. Dalrymple declares that the crop does not cost more than 35c. per bushel. Sold, as it readily can be at the railway station at Casselton, at 75c. to 80, a very handsome profit is obtainable. It approaches the Dutchman's 1 per cent., which on investigation proved to be a cent. per cent. return.

But now important alike to prounducer and consumer, comes the question. Will these crops and profits be permanent? No symptoms of deterioration are yet apparent. The land is clean; neither twitch, thistles, nor docks appear. The chief weeds are wild cotton, barn grass, a sorrel with a yellow flower, and the Michaelmas daisies. The manure made from the stables lies about in heaps which it is not yet thought worthwhile to apply. Excepting the small quantity of straw used for littering the animals, the whole produce of the 20,000 acres is burnt The spots on which these heaps burn show no obvious difference from the rest of the field, indicating that the unassisted soil still contains phosphates and potash sufficient to grow full crops. How long the continuous corn-growing can be profitably continued, is somewhat difficult to foretell. On similarly good land in various parts of the country fields are pointed out from which, without any restorative treatment, 20 consecutive crops of wheat have been reaped, and neither quantity nor quality as yet undergoes obvious diminution. Mr. Dalrymple is, however, too prudent a farmer to draw too long or deeply on the resources of his land. By ploughing year by year an inch deeper, he brings up fresh plant foot; by growing, at intervals probably of four years, as he purposes doing, a crop of clover, rolling it down and ploughing it in, he intends cheaply to maintain fertility. By these means and by selection and change of seed, as well as by an occasional crop of oats or barley, Mr. Dalrymple's superior management will doubtless secure a continuance of good crops for many years.—*Mail.*

THE APPLICATION OF NITRATE OF SODA TO CEREAL CROPS.

MR. HORATIO CHANCELLOR, Chessington, Surrey, writing the other day to *Bell's Weekly Messenger*, says:—

I have just thrashed my experimental plots for this year. As some few of your readers may like to know what nitrate of soda has to say for itself this remarkable season, I send you the results. I have always found this valuable stimulant make the best return in a moderately dry summer. The following statements will show, however, that it possesses to no small degree the power of rescuing vegetation from drowning. This is especially to be noticed in the barley series.

The proportion of grain to straw is small throughout—a prevailing feature of this year's harvest. I may say that locally the yield of grain was very considerably diminished by the terrific hailstorm which we experienced here in full force in the beginning of August. The wheat ears in some fields were fairly cut asunder, and generally so severely bruised and damaged as to suffer more than ordinarily from the continuous rains which followed upon the hail. The barley was also literally beheaded to a large extent especially in the heavily nitrated plots.

The series of trials given below have been carried out with a twofold object.

1st. As in previous trials, to find out to what extent nitrate of soda can be applied with safety and profit by dressing up to as near 'danger point' as possible.

2nd. As a new feature, to find out the advantage (if any) of applying the same quantities in small doses at intervals of two or three weeks.

The produce grown on plots upon which the nitrate has been applied in two or three distinct doses has not been thrashed, only the gross weight of sheaves being given. The monetary return is calculated on the assumption that the relative proportions of grain and straw are the same. The yield of grain per acre is given in bushels of natural weight (head and tail corn together, and valued at a low figure accordingly. The yield of straw is given in market trusses of 36lbs., valued at present prices. The deficit from gross weight of sheaves is made up by short straw, chaff, &c.,

averaging six to eight per cent. of the whole produce. No estimate is made of this, however, in the returns below :—

WHEAT (Rough Chaff White).

1879. Per Acre.	Gross Weight of Sheaves. lbs.	Straw. Ts.	Grain. Bs.	Value of Produce. £	s.	d.	Cost of Dressing. £	s.	d.	Grain per Acre. £	s.	d.
No dressing ...	7860	142	31½	15	15	8	—			—		
1 cwt. nit. soda, 1 ,, salt ...	8580	162	37	18	5	6	0	17	0	1	18	8
Do. in 2 dressings ...	8850	—	—	18	17	0	0	18	0	2	3	9
Do. in 3 ,, ...	8890	—	—	18	18	8	0	19	0	2	4	5
2 cwt. nit. soda, 2 ,, salt ...	9030	170	40½	19	11	4	1	13	0	2	8	1
Do. in 2 dressings ...	9080	—	—	19	11	4	1	14	0	2	2	1
Do. in 3 ,, ...	9270	—	—	20	1	8	1	15	0	2	11	5
3 cwt. nit. soda, 3 ,, salt ...	9600	180	48½	20	19	3	2	9	0	2	16	0
Do. in 2 dressings ...	9600	—	—	20	19	3	2	10	0	2	14	0
Do. in 3 ,, ...	9640	—	—	21	1	0	2	11	0	2	14	9
BARLEY.												
No dressing ...	1860	23	6	2	2	4	—			—		
1 cwt. nit. soda, 1 ,, salt ...	3200	60	18	5	8	3	0	17	0	2	8	11
Do. in 2 dressings ...	3460	—	—	5	17	0	0	18	0	2	16	8
Do. in 3 ,, ...	3380	—	—	5	14	4	0	19	0	2	13	0
2 cwt. nit. soda, 2 ,, salt ...	3860	73	14	6	5	8	1	13	0	2	10	4
Do. in 2 dressings ...	3960	—	—	6	9	0	1	14	0	2	12	8
Do. in 3 ,, ...	3860	—	—	6	5	8	1	15	0	2	8	4
3 cwt. nit. soda, 3 ,, salt ...	4880	96	18	8	8	0	2	9	0	3	11	8
Do. in 2 dressings ...	5560	—	—	9	5	0	2	10	0	4	12	8
Do. in 3 ,, ...	5530	—	—	9	4	0	2	11	0	4	10	8
OATS (Black Tartarian).												
No dressing ...	4400	78	40	8	14	9	—			—		
1 cwt. nit. soda, 1 ,, salt ...	5150	87	45½	10	1	9	0	17	0	0	10	0
Do. in 2 dressings ...	5280	—	—	10	4	10	0	18	0	0	12	1
Do. in 3 ,, ...	5690	—	—	11	2	10	0	19	0	1	9	1
2 cwt. nit. soda, 2 ,, salt ...	6000	105	50	11	8	9	1	13	0	1	1	0
Do. in 2 dressings ...	6230	—	—	11	17	6	1	14	0	1	8	9
Do. in 3 ,, ...	6420	—	—	12	4	9	1	15	0	1	15	0
3 cwt. nit. soda, 3 ,, salt ...	7280	125	68½	14	4	3	2	9	0	3	0	6
Do. in 2 dressings ...	7350	—	—	14	6	11	2	10	0	3	2	2
Do. in 3 ,, ...	7850	—	—	14	6	11	2	11	0	3	1	2

WHEAT.—The enormous weight of straw grown per acre is the chief feature of the wheat plots—an amount so great as to lead me at first to doubt the accuracy of the returns. Testing, however, other portions of the same field, I found that they fairly agreed. I have known the same apparent bulk of straw produce little over half the weight. The fact of cutting the crop in a partially green state and the sunless character of the season have both helped, no doubt, to lead to this. On the other hand, the natural weight of grain is the lowest I have ever known, being only 57lbs. per bushel. The weight varies but little on the different plots—perhaps ½ lb. in favour of the undressed. The light weight of grain is owing jointly to a want of condition and large percentage of tail corn. By reducing the bulk one fourth a fair sample of 61lb. is obtained. The returns given above as resulting from the use of nitrate of soda are fairly satisfactory for this season. Had the wheat experimented upon been of a stiffer-strawed variety, such as the square-head, the proportion of grain would have been much larger. Plots of these two varieties tested side by side in the same field proved this, the squarehead being quite erect at harvest, while the rough chaff was very much laid. The fact of the undressed plot making such a fair return this unfavourable season, proves that the land was in a sufficiently high condition to produce a good crop without any top-dressing whatever. Indeed my fear before thrashing was that I should find for once that the heavily nitrated plots revealed a loss. The above statement proves, however, such not to have been the case.

BARLEY.—The miserable yield of barley is but another melancholy characteristic of this harvest. On the heavy lands very generally the crop has proved a failure, both in quantity and quality. There was a very fine and vigorous plant growing on the field from which these experimental plots were taken up till the end of May ; but, under the influence of incessant rains and cold nights, it utterly succumbed early in June. The nitrate was applied during June, and an almost magical effect was produced in a few days. The land being in a fair condition, a quick-acting stimulant was only wanted to restore a healthy appetite to the plant. The low temperature of the soil and want of sun rendering the crop hopelessly prostrate, nitrate of soda was here invaluable. The poor return of grain, after all on the most highly-dressed plots is largely owing to the severe hailstorm previously mentioned, the increase of straw being very great, the returns varying from 1360 to 5500lb. per acre. The natural weight per bushel also varies considerably from 50lb. on the undressed to 53½lb. on the highly-nitrated plots. The difference in value was estimated by an experienced maltster at 10s. per quarter. In the above statements values are placed at 36s, 42s, 44s. The weight could be easily made up to 55 or 56 lb. per bushel by screening, &c.

OATS.—Only a moderate yield, but of superior quality. The natural weight per bushel differs but little ; 37 to 37½lb. in favour of the undressed plot could be made up to 40lb. The heavily-dressed plots were somewhat broken down by the hail and rains. The proportion of grain to straw would have been higher if the crop had been upstanding.

GENERAL.—Taking a general survey of these experimental plots, it is certainly no easy task to arrive at any very definite conclusions. It will be seen that throughout the whole series the plots receiving the superabundant dose of 3cwt. nitrate mixed with 3cwt. common salt give the largest return, and with but few exceptions increased grain has resulted from applying the nitrate in small doses repeated ; the oat plots especially reveal this, and in the case of the heavily dosed barley plots the grain reaches 21s. The negative results of the three dressings in the barley series, as compared with the same quantities applied in only two dressings, may be owing to the very late period (June 28th) at which the third dose was applied. On the whole, the above trials tend to confirm an opinion I have held for some years of the advantages in favour of applying minimum doses of the nitrate from time to time as the growing crop seems to need help. I should rarely think of exceeding 1cwt. at a time, preferring even half to three-quarters if the land be in fair condition, supplementing if necessary. There is also less fear of waste, in case of immediate heavy rain washing this soluble salt away before the crop has had time to make use of most of it. Then a late spring frost will often undo much of the benefit where luxuriance is brought about too rapidly by the heavy dose 'once and for all.' A more gradual building up of the stamina of the plant is desirable, and small doses of nitrate tend this way. It often happens, too, that in the same field a portion only of the crop requires a second or third 'touching up,' and the sower is thus enabled to favour any sickening spots at discretion, so rendering the whole crop more even and level at harvest. On large holdings, especially in such a spring and summer as our last, it has been difficult enough to get through the ordinary routine of farm work without attempting any fanciful operations ; but I am satisfied extra care and attention in applying manures of all kinds will well repay us. There is often too much of the 'penny wise and pound foolish' policy in the slovenly way in which even ordinary farmyard manure is spread ; and one sees occasionally nitrate of soda being sown direct from the bags as imported, lumps sufficient if crushed to fertilize a rod of ground being allowed to satiate just a few plants only. I always have the nitrate passed through a fine sieve just before using it. I have tried some of the special manure distributors for sowing ; but, as the salt is so susceptible of moisture, unless the weather be very dry, it will not work freely. A double cast by hand is more to be relied upon. Equal proportions of nitrate of soda and common salt have been applied in the above series of experiments. This is a matter decidedly for local judgment.

One important fact remains to be treated, viz., that the gains resulting from a top-dressing of the nitrate are almost entirely owing to the great increase of straw. This year, of course, is exceptional ; but, still, in all trials I have ever made straw has helped to swell the return materially ; in fact, at present prices for grain there would be little inducement to farm highly if our surplus straw did not command a ready sale ; but it is here that a very important question arises. At the present time of so-called 'agricultural depression,' landlords are in many cases only too willing to make any reasonable concessions to their tenants, and the granting almost universal freedom as to the growth and sale of produce is even talked about. But there is certainly no small danger of permanent mischief to the land arising from an indiscriminate use of nitrate of soda, or, in short, any of our forcing artificials, if straw is sold off the farm, and no equivalent in the shape of ordinary manure is brought on in return. Years ago, the straw grown near our largest centres mostly sufficed. Now this article is forwarded from comparatively remote parts of the country, often quite beyond the limits of a possible return of manure. Scientists have told us only recently that the direct manurial effects of straw are mostly over-rated, but apart from a chemical or simply mechanical benefit to our heavy soils, it is certainly all-important as a medium for returning the more general fertilizing constituents to the soil. In the neighbourhood of large towns straw may be sold with impunity, the same being returned in the shape of ordinary dung. We endeavour here to bring on one to two tons of dung for every load of straw sold off the farm. In the struggling endeavour to make 'both ends meet' nearly the whole of the straw has been sold off very many farms and comparatively little or no dung bought. This fact alone supplies the reason of much land getting 'below par' in condition. How far, then, a landowner is justified in granting absolute liberty to his tenant, to make free use of such forcing manures as nitrate of soda, and sell the straw, is a question of serious import. Many highly practical men are loud in their protestations against the somewhat modern practice of trusting so much to artificial manures—especially such a forcing stimulant as nitrate of soda, as peculiarly exhausting to the soil, and likely to lead to comparative

barrenness in the future. Mr. Crompton, in his valuable paper on 'Mineral Constituents,' which appeared in your last *Messenger*, also gives us a caution against indulging too freely in the use of forcing artificials, and neglecting to supply the soil with potash, &c.; and there are undoubtedly good grounds for such warnings where the old-fashioned dung-cart is in any way ignored or set aside. I have ever viewed nitrate of soda as the 'alcohol' of vegetation, and I fancy nearly every argument that can be brought forward both for and against the use of this stimulant, holds good in a sense with respect to its much-abused namesake in action. Used in extreme moderation, and from a medicinal point of view, the favourite stimulant often proves the greatest boon to ourselves, and whether animal or vegetable life be concerned, a recourse occasionally to the most severe remedial measures, stimulating or otherwise, is both necessary and beneficial. This is fully exemplified in the case of the heavily-nitrated barley plots. Certainly—believing that with a proper regard to the rotation of crops—treating my beans, pease, and root crops to a fairly liberal allowance of ordinary farmyard manure, and an occasional lime-dusting on my clover leys, I need not discard our friend 'nitrate of soda.' At any rate, it is no more my present intention to become a 'total abstainer' of the one than it is to 'sign the pledge' with regard to the other.

THE NUTRITION OF PLANTS.

IN the *Monatschrift* of the Academy of Sciences, Berlin, for July 1879, is a remarkable paper, which we have the authority of Professor Huxley for saying indicates the need of a great change in the views hitherto entertained respecting the nutrition and general physiology of plants. The subject is the action of concentrated sunlight on chlorophyll, the green colouring matter in plants, and on the plant-cell generally.

The mode of observation pursued by the writer, Herr Pringsheim, is to place the plant under examination upon the stage of an oridinary microscope, and then to concentrate the sun's rays upon it with the aid of a heliostat and 2½ inch lens. By this means an intense light can be brought to bear upon a very limited area—upon a single plant-cell or even on part of a cell, and the effects watched continuously and easily. The first effect of the intense light observed in the cell is the complete destruction of the green colouring matter. This takes place in a few minutes, and by proper arrangement can be made so local as to affect a single chlorophyll-grain or a single path in the diffused chlorophyll of an alga, all the rest of the plant remaining as green as before. This change is followed by the gradual destruction of the remaining constituents of the affected cell; cyclosis ceases; protoplasmic filaments are broken up; the arrangement of the cell contents is destroyed and their properties altered; the final result being the death and destruction of the cell, with the exception of its formed constituents—the cell-walls, the starch granules, &c.

That these results are in no way due to the *heat* of the sun's rays was shown by interposing in the path of the beam various coloured media, when it was found that a blue medium, which shut off nearly the whole of the heat rays, had no effect in stopping the destructive action, while with a red one, allowing 80 per cent. of the heat rays to pass, the cell and its chlorophyll remained quite unaltered.

Besides these experiments on the influence of coloured rays, Pringsheim tried the effect of surrounding the plants with atmospheres of various composition. The result arrived at was of great interest. *It was proved that the destructive effect of strong sunlight on the plant-cell only takes place when the plant is surrounded by an atmosphere containing oxygen; no effect is produced either in hydrogen or in a mixture of hydrogen and carbonic acid*; indeed the presence of the latter gas appears to be of no importance, as he process goes on with equal rapidity in an atmosphere from which all the carbonic acid has been removed. From these experiments the conclusion is arrived at that the destruction of chlorophyll by intense sunlight is a true process of combustion, and has no relation whatever to the decomposition of the carbonic acid in the plant. And, from the circumstance that the green colouring matter once discharged from the chlorophyll-grain, cannot be replaced, it is inferred that the process is not a normal, but a pathological one. The disintegration of the cell-contents is evidently of the same nature: that it is independent of the destruction of the chlorophyll is evident, as it takes place equally in colourless cells, such as nettle-hairs. But as long as the chlorophyll in the cell remains unaltered the protoplasm remains unaffected; so that the chlorophyll may be said to act as a protection to the protoplasm against the hurtful action of light, or in other words to diminish the intensity of the respiratory process. The absorptive power of chlorophyll, especially on *chemical rays*, confers upon it therefore the power of regulating the respiration of the plant.

In connection with the disintegration of the cell-contents, the interesting observation was made that the colourless granules which are found in the protoplasm diminished in number and disappeared during the earlier stages of the action of the light, so that probably these bodies, the exact nature of which is unknown, are the most combustible part of the cell contents, and as such are used up in ordinary respiration.

But the constituent of the cell which shows the greatest sensitiveness to light is a substance discovered by Pringsheim in the course of this inquiry, and called by him *hypochlorin* or *hypochromyl*. It is an oleaginous substance occurring in the chlorophyll-grains, and may be extracted by placing portions of plants in weak hydrochloric acid for the space of 12 to 24 hours. It is then found in the shape of semi-fluid drops, which gradually assume the form of indistinct crystaline scales, and finally of reddish-brown needles. These crystals are in all probability formed by oxidation of the hypochlorin in the chlorophyll-grains. Pringsheim considers that this remarkable substance is the "true primary assimilation-product of green plants," and that from it are formed the starch and oil in the chlorophyll-grains.—*Nineteenth Century.*

CROSS-FERTILISATION OF PLANTS.

IN Col. Wilder's presidental address to the American Pomological Society, the President, after alluding to the wonderful progress of fruit culture in the United States, proceeded as follows:—"What wonders have been achieved in the vegetable kingdom by cross-fertilisation in our own time. But still greater wonders are to be realised by this art as time advances producing new and improved varieties of still greater excellence. Instances are so numerous of wonderful improvement by the application of this art in the production of magnificent fruits, flowers, and vegetables, as to need no reference in detail. I have so often, during the forty years of my own experience, alluded to the importance of this art as a true means of rapid progress, that I refrain from extended remark and desire only to repeat my former advice—to plant the most perfect and mature seed of our very best fruits, and as the means of more rapid progress to cross-fertilise our finest fruits for still greater excellence. Thus I have discoursed to you for many years—thus I have promised to do while I live. This is our work, to direct and help Nature on in the course of improvement. Who that has witnessed the amazing improvement by the application of this art in the Rose, Camellia, Dahlia, Azalea, and other plants in our own time—who that has seen the hybrid Grapes of Rickets, Rogers, Ellwanger, and Barry, Moor, Campbell, and other practitioners, can doubt the potent influence of the cross-impregnation of plants? Who that reflects on the astonishing advance made by hybidisation of the Camellia in France and Italy, the Camellia and Azalea in Belgium, England, and France, and the improvement in the vegetable kingdom generally, can hesitate to say that this art is the great secret and source of the wonderful advance which has been achieved during the last half of the present century? Who that has seen the magnificent plants in our own conservatories, or the grand plant collections of England produced by this art, but would exclaim, 'Truly, here, at last, have we found the philosopher's stone!'"

AGRICULTURAL CHEMISTRY.

BY PROF. G. C. SWALLOW.

IN an article in your paper of September 18th, I notice some questions propounded by Mr. W. B. Smith, which had escaped my observation. Having but little sympathy with the comments of the *Indian Agriculturist*, I think science has a satisfactory answer, which I will try to formulate.

This answer lies in the well-known properties of the soil and the atmosphere, and the habits of our corn plants and their mutual relations.

A—Chemical science teaches us that the articles of plant food exist in the soil in two states, one soluble in water and the other insoluble in water. In our white-oak soils about 90 pounds in every 100 is silica, but of these 90 pounds of silica only one-fiftieth of a pound, or about ¼ of an ounce, is soluble in water, and available for plant food.

B—Chemistry also teaches us that the insoluble silica is rendered soluble by the chemical actions constantly going on in the soil; and that this chemical action is greatly hastened by the free access of water, heat, and air to the soil.

C—Botanical science teaches us that corn feeds largely on the silica of the soil. Every 1,000 pounds of dry corn-stalks contain 13 pounds of silica, and almost all the silica comes from the soil.

D—Botanical science teaches us that corn cannot take a particle of food from the soil until it is dissolved in water.

From these facts it is evident, 1st, that the soluble silica only is available for plant food.

2nd. That the 13 pounds of soluble silica taken from the soil for every 1,000 pounds of dry corn-stalks, would rapidly exhaust the ¼ of an ounce of soluble silica in every 100 pounds of the soil.

3rd. That the reductions of soluble silica would gradually lessen the power of the soil to produce corn.

4th. But a year of rest, or of culture in a crop that demanded little or no silica, or a crop that is fed upon the soil or ploughed under, as Mr. Smith's clover, would increase the power of the soil to grow corn; for while the soil rested and lost no soluble silica, the constant chemical action (B) in the soil, would increase the amount of soluble silica for plant use.

The same statements would be true of other elements of plant food in the soil, as soda and potash and phosphorus; but one is sufficient to illustrate the principle.

But these principles of science "show us how it is that a crop of red clover will in three years make a soil more productive."

The exhausted soil had lost its soluble elements of plant food, and in the three years of clover, the chemical action in the soil had rendered some of the insoluble elements soluble and available for plant food. This is one reason.

Two other reasons are given by the science of botany:—

1st. Botany teaches that plants (clover among them) feed largely on the elements found in the air.

2nd. The most abundant item of plant food is carbon. Dry corn and clover contain about fifty per cent. of carbon, some of which is taken from

the air; but so much is taken from the soil that constant cropping soon exhausts what is in the soil in a soluble state.

Hence the three years of clover (ploughed in) has increased the amount of carbon in the soil by all that the clover had taken from the air, and finally deposited in the soil on decay.

And besides, clover sends its long tap roots deep into the subsoil to bring up plant food which is deposited nearer the surface when the clover decays.

Thus science gives three good reasons why the three years of red clover will increase the fertility of soils exhausted by corn:—

1st. The increase of soluble plant food by the chemical changes in the soil.

2nd. The increase of plant food by what the clover takes from the air while growing, and leaves in the soil while decaying.

3rd. The deep ploughing of the clover roots, which root up the soil to the depth of twelve or sixteen inches, bringing up the plant food, and letting in the air and heat and water, to hasten the chemical action by which the plant food is rendered soluble and available for use by the plant.

It appears to me these scientific principles answer Mr. Smith's question—"Will scientific farmers show us how it is that a crop of red clover will in three years make the land more productive?" (I leave out of the question the last four words—"than it ever was," for that so changes the question that it may or may not imply a truth, and science can never answer what is not true, or what never does occur in nature.)

There is no question that clover does improve exhausted land; and it is equally true that fallowing improves it, but not so much as clovering.—*Journal of Agriculture*, October 23.

EUPHORBIACIÆ.

THE *Times*, in a little paragraph, draws attention to a preparation which is proof against the depraved ingenuity of white-ants. Some years ago, whilst the Colonial Government of Natal was carrying on survey operations, one of the officers engaged in the work found that certain plants of the *Euphorbiaciæ* genus exuded a gum which, if smeared over knives and other steel implements, would preserve the metal from rust. Further experiments were then made. Iron plates, coated with the gum, were sunk in the notoriously foul waters of South Africa, and kept their clean surface for any length of time. Sir Andrew Clarke, then in England, had a sheet of iron coated with the gum and sunk in the waters of the Chatham Dockyard. At the end of two years the iron was taken out and found quite free from fouling or corrosion. Moreover, the gum, says the *Times*, has been tried in South Africa, and it successfully resisted the attacks of white-ants, the taste being intensely bitter and disagreeable to those insects. The Euphorbia gum is now being introduced into England. "We have examined," says the *Times*, "several applications of this composition, which gives a coating alike impervious to air or moisture; while, according to results, its own peculiar protective property remains unimpaired." Now there are over thirty kinds of *Euphorbia*,—Spurgewort, in India; surely one of these would yield the antiwhite-ant gum. The Government of India in the Agricultural Department might look up the subject.—*Pioneer*.

AGRI-HORTICULTURAL SOCIETY OF INDIA.

THE usual Monthly General Meeting was held on Thursday the 20th of November 1879.

RAJAH SUTTYANUND GHOSAL BAHADOOR,
Vice-President, in the Chair.

The proceedings of the last meeting were read and confirmed.

The following gentlemen were elected members:—

Baboo Grees Chunder Mookerjee; the Chief of Kagul, Major G. A. Way; Manager, Darjeeling Tea and Cinchona Association; Rev. H. P. Boerresen; Messrs. J. Gannon, E. P. Wood, and R. Webster.

The names of the following gentlemen were submitted for membership:—

H. F. L. Dodsworth, Esq., Oorjee Factory, Azimgurh,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Baboo Suraj Deb Narain Sing of Bulgarh, Tirhoot—proposed by Mr. T. M. Francis, seconded by the Secretary.

P. Dickens, Esq., C.S., Nuddea,—proposed by the Hon'ble L. Tottenham, seconded by Mr. Robinson.

J. M. Gordon, Esq., Hissar,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

Geo. Udney Yule, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by Mr. W. Stalkartt.

Geo. Kennett Lyon, Esq., C.S., Rungpore,—proposed by Dr. R. D. Ghose, seconded by Mr. Cogswell.

A. H. Pirie, Esq., Professor, Canning College, Lucknow,—proposed by the Secretary, seconded by Mr. Cogswell.

Koomar Meharajah of Visianagram,—proposed by Rajah Suttyanund Ghosal, seconded by Baboo P. C. Mittra.

Rejoined,—J. C. Murray, Esq.

CONTRIBUTIONS.

1. A descriptive atlas of the eucalypti of Australia, first and second decades, by Sir Ferdinand Baron von Mueller,—from the author.

2. Report on Indian wheat, by Dr. Forbes Watson,—from the Government of India.

3. Annual Report on the Government Experimental Farms, Cawnpore and Allahabad, for 1877-78,—from the Government North-Western Provinces.

4. Report of the Commissioner of Agriculture, of the United States, for 1877,—from the Commissioner.

5. The *Indian Forester*, Vol. VI,—from the editor.

6. Proceedings of the Asiatic Society of Bengal for August 1879,—from the Society.

7. A plant of *Kigelia pinnata*,—from Mr. R. M. Daly.

8. An assortment of ferns from Ootacamund,—from Mr. F. A. Lazarus.

9. Ferns from Darjeeling,—from Mr. John Lynam.

10. Shoots of the Martaban plantain,—from Mr. C. Addy of Moulmein

11. Seed of *Panax elegans* from Queensland,—from Mr. L. A. Bernays.

12. A tree fern, Darjeeling,—from Mr. H. Kean, C.S.

13. Plants of *Bolbophyllum beccarii*, from Borneo,—from Mr. H. J. Murton, Superintendent Botanic Garden, Singapore.

14. Collections of seeds and plants from the Nicobars,—from Mr. E. H. Man.

GARDEN.

The Head Gardener's monthly report was read, of which the following are extracts:—

"The weather during the past two months has been dry, and the opportunity thus offered of cleaning up garden after the rains has been accepted as far as possible. Various rough-growing plants of little interest in any light have been cleared away with the object of supplanting them by species of greater popularity. Several common kinds of Crotons have been placed in tubs for the purpose of displaying the variegation of the leaves in the full grown plants; a few leaves of *C. Younghii* sent for inspection. [These are about two feet in length and beautifully marked.] We have a fine collection of palms and fruit trees on hand for distribution. The flower garden is being prepared, and I hope to have it ready as soon as possible. The Liberian Coffee seedlings are progressing favourably and promise to make healthy plants in a short time. A site for a new rose garden is urgently required, the most suitable place for that purpose being the central grass plot in the garden. Concerning contributions, we have received amongst others as below:—*Kigelia pinnata*—from Mr. R. M. Daly; "*Cyrtoderia fulgida*"—from Mr. J. Scott; two strong plants of 'Golden Ferns'—from Mr. W. F. Westfield.

"Of seeds, the palm seeds from Mauritius have germinated very fairly; the seeds seem to have been selected with care. The germination of vegetable and flower seeds, as far as ascertained, are herewith sent."

From the tabular statement referred to in the above report, it appears that of the English vegetable seeds five have not germinated, whilst the others (smaller seeds) have given a general average of 38 per cent. Of the American vegetable seeds, some 7 or 8 kinds have not germinated; whilst the others have given 24 per cent. Of English flower seeds, two have failed, and some of the others have yielded but a small percentage; remainder have given a fair return. The result of the acclimated (Lucknow) flower seeds has not proved satisfactory.

Letters were read from Lieut.-General Sir Arthur Phayre and Sir Ferdinand Baron von Mueller in acknowledgment of their election as Honorary Members. The Baron writes:—"I appreciate this mode of distinction all the more as I have comparatively done so little to advance the special interests of your important union; but I can assure you that I have watched with pleasure and with advantage to myself the strides made by your Society in enhancing the cultural resources of India and in diffusing a taste for refined horticultural pursuits also in the great Indian Empire."

TEA FROM YUNAN.

Mr. Locke, Secretary of the Economic Museum, forwarded for the inspection of Members a sample of "Puerh" tea, grown in the south of Yunan. The tea is stated by her Majesty's Consul at Shanghai to be "highly valued at the Court of Pekin, and by the Chinese generally, for its invigorating properties." It is also said to be "much appreciated in Thibet and to command a large market in that country." The sample in question, weighing about ten ounces, is prepared in a peculiar quoit-like form. Mr. Locke mentions that it has been submitted to a well-known Firm of Tea Brokers in Calcutta, who report on its description to the following effect—"Compressed leaf; thin, extra common, and old liquor; out of condition. This tea, in its present condition, would be unsaleable in the market. The sample must have been kept in a damp place, or come in contact with water, as it smells quite musty, like *damaged* tea."

A SUGGESTED REMEDY FOR COFFEE BLIGHTS,—PROBABLE APPLICABILITY FOR TEA BLIGHTS.

The Secretary recalled attention to the letter from Messrs. Macneill & Co., on the above subject, which was submitted at the last meeting. His application to Mr. D. Morris, the Assistant Director of the Royal Botanic Garden at Peradeniya, Ceylon, having been returned, in consequence of the departure of that gentleman for England, he had addressed Dr. Thwaytes, the Director, on the subject, who had obligingly sent him a printed copy of his remarks on the coffee leaf disease. The following extracts, which he would now read, would tend to show that the external application of sulphur is not likely to be so effective as

supposed in mitigating the ravages of coffee leaf disease. Whether it would be more efficacious in respect to tea blights remains to be seen:—

"The want of success which has attended the recent attempts to check the progress of the leaf disease by the application of sulphur and lime, seems to render it desirable that I should make some observations on the subject.

"It may be remembered that towards the end of the year 1869, the presence of some kind of disease, which proved to be the *hemileia vastarix*, was announced as present upon a few coffee plants on an estate at Madulsima. During the following year this fungus was detected at Peradeniya—a distance of about a hundred miles—and neighbouring places, still only in small quantity, but during the next year the *hemileia* occurred over considerable are as in the Central Provinces.

"The spread of the disease over such large areas in so short a time must no doubt have been due to the presence of inconceivably minute germs floating in the atmosphere and carried by the wind.

"The subsequent development of the *hemileia* filaments can have borne but a small part at first in the propagation of the pest. After a time, however, these filaments were doubtless an important element in the rapid spreading, or rather aggravation, of the disease in certain areas.

"It was to destroy these filaments with their supposed spore-producing capabilities that the treatment by sulphur and lime was adopted. This treatment though efficient in performing the work proposed, has however so far proved quite a failure in checking materially the propagation of the disease itself. Notwithstanding that the *himileia* filaments upon the plants were destroyed as expected, it soon became evident that the disease itself was not checked; for the succeeding young foliage immediately showed signs of incipient disease and this not resulting from the action of *hemileia* filaments, for those had been destroyed and none could be detected, but from some source which can only be attributed to latent infection in the coffee plants, or to the operation of the same minute germs supposed to be injuriously active during the first spread of the *hemileia* in the island.

"I am disposed to believe that *hemileia* filaments themselves do not remain in an active living state for more than one season, but that, as there is no doubt that the spores continue in a living condition for a much longer time, it is very desirable that the fallen coffee leaves, with the spores upon them, as well as the ground underneath the trees, be well treated with hot lime in order not only to benefit the trees themselves, but to kill the spores before new active development takes place to do mischief in the next season of growth.

I therefore feel it my duty to give it as my opinion that, judging from the serious effects produced, the external application of sulphur is hardly likely to be effective in curing, or in even mitigating to any very satisfactory extent the ravages of the leaf disease; and that it will have to be ascertained by very careful conscientiously conducted experiments, if any temporary benefit in the way of production of crop would be likely to result from the application of certain manures to the roots of the coffee trees."

THE ARGAN TREE OF MOROCCO.

The Secretary also recalled to the notice of members a communication on the above subject from the Director of Agriculture, N.-W. Provinces, as read at the last meeting. He had recently received a reply from the Assistant Director, Royal Gardens, Kew, to whom he had referred. Mr. Dyer writes—"The notice of the Argan tree in the *Gardener's Chronicle* is an old story taken out of the appendix to Sir Joseph Hooker's Book on Morocco. The distribution of seeds referred to took place many years ago, and we have none now to give away. If you wish to procure a supply, your best plan would be to apply to R. Drummond Hay, Esq, Vice-Consul at Mogador.

FODDER GRASSES AND OTHER ECONOMIC PLANTS.

Read a letter from J. H. Bridgman, Esq., respecting fodder grasses, of which the following are extracts. The Secretary remarked that he had already addressed Dr. Schomburgh on the subject:—

"You will remember that in April last I wrote to you quoting a passage from the *Pioneer* of the previous October, in praise of a timber tree called the *Catalpa bignonioides*. Three weeks ago the *Pioneer* had another article on the subject, from which it appears that it is extensively grown in the 'Western States' (of America)? and is 'to be' largely cultivated in Australia. Apparently Dr. Schomburgh is the authority from whom this information is derived, and for the interesting description given of the plant which represents it as one of the most valuable trees in existence. I have cut out from the paper the passage in which the information is afforded. The article refers also to other plants which I conceive will deserve your attention, particularly the fodder plants, of one of these, that which is the most praised, *viz.*, the *Panicum spectabile* you sent me some seeds some years ago, which I sowed, but the produce by no means deserved the encomiums bestowed upon it. The plant had a hard woody stalk and a harsh leaf which the cattle would hardly touch, and I gave up its cultivation in consequence. I have thought it possible that some mistake may have been made in the seed sent to me, for I think that no one could possibly describe the plant which grew in my ground as a valuable fodder plant. Dr. Schomburgh speaks so highly of it, that if there can be any doubt upon the subject, it would be quite worth trying it again."

INTRODUCTION OF INDIAN SEED POTATOS INTO GREAT BRITAIN.

Mr. Allen Stokes, a Member of the Society, submits the following extract of a gentleman of some local standing in Cork regarding seed potatos raised in India, for trial in Ireland:—

"I think we should import from some place where there is no disease, and I think you have none in India. Is this the case? and if so, will you let me know if I could manage 300 or 400 tons, the cost, the kind you would recommend, and if you can learn, would they keep for so long a voyage?"

And Mr. Stokes adds—"I shall be much obliged to you, or any of your correspondents, for any information on this point, which to the inquirer may prove of great value."

The Secretary added that he had received a communication from another member (Mr. Hindmarsh), now absent, on behalf of a friend in England, for potatos, though to a much smaller extent. Mr. Hindmarsh observes—"There has been great deficiency in all crops this year, the corn fully 30 per cent. under the average. Root crops 30 per cent., and potatos are so much diseased that in many places they are not worth lifting; in fact the absence of sunshine, a low temperature, and an excess of rain, have prevented healthy development both in farm crops and in fruit; altogether it has been a most disastrous season."

Resolved.—That these extracts be introduced in this day's proceedings with the view of eliciting information thereon.

REPORT ON JUTE RAISED IN THE VICINITY OF CALCUTTA.

Mr. Sterndale, Vice-Chairman of the Suburban Municipality, submits some fibre raised on municipal land by a native cultivator, and requests an opinion on quality and value. Mr. W. H. Cogswell, a member of the Fibre Committee, has kindly responded to this in the following words:—

"The sample of 'bun pat' jute you have sent me is well known to the natives of Bengal, being a self-sown, wild, jungly plant. It might have been much better prepared; the staple is short, irregular, very harsh, towy, but of fair strength. On such a sample it is difficult to put a correct valuation, but it is probably worth about Rs. 3 to Rs. 3-2 per bazaar maund."

Letters were read—

1. From the Director, Department of Agriculture, N.-W. Provinces, forwarding a copy of correspondence on the subject of mulberry tree cultivation, and requesting any further procurable information on the subject.

2. From the Manager, Muir Mills Company, Cawnpore, requesting information in respect to silk-worms' eggs for Australia. Mr. Smith adds—"As this is a subject that is not altogether of a personal nature, but one that may lead to beneficial results to a whole colony, I trust you will excuse my troubling you on the subject."

The Secretary intimated he had been able to meet both the above enquiries through the kind assistance of Mr. C. E. Blechynden, who had much practical knowledge on the subject.

3. From Officiating Under Secretary to the Government of India, Home and Agricultural Department, sending some further particulars regarding the cultivation of the Manilla Hemp in the Andamans.

4. From J. F. Duthie, Esq., Saharunpore, enclosing a translation from the Italian of a paper on the Carob tree (*Coratonia siliqua*). The above two papers were transferred for the journal.

5. From the Acting Superintendent Government Farms, Madras Presidency, applying for copies of the Society's publications. To be complied with.

6. From the Director, Royal Botanic Garden, Mauritius, returning thanks for certain publications of the Society.

THE usual monthly General Meeting was held on Thursday the 18th of December 1879. The Hon'ble Louis Jackson, C.I.E, President in the Chair.

The proceedings of the last Meeting were read and confirmed. The following gentlemen were elected members:—

Messrs. H. F. L. Dodsworth; P. Dickens, C.S.; J. M. Gordon; G. U. Yule; G. K. Lyon, C. S.; A. H. Pirie; Baboo Serraj Deb Narrain Sing, and Koomar Maharajah of Vizianagram.

The names of the following gentlemen were submitted for Membership:—

James F. Smart, Esq., Manager, Balajan Factory, Noacherra Tea Co. Assam,—proposed by Dr. C. J. Simons, seconded by the Secretary.

Sheik Atta Hosen, Small Cause Court, Chowdanga,—proposed by the Secretary, seconded by Mr. W. Waterfield.

Dr. W. H. Gregg, Civil Surgeon of Hooghly,—proposed by Mr. T. E. Ravenshaw, seconded by the Secretary.

Geo. Elphinstone Keith, Esq., Merchant, Calcutta,—proposed by Mr. H. J Leitch, seconded by Mr. W. H. Cogswell.

Rejoined,—H. C. Mahony, Esq., Tea Planter, Toklai Tea Factory Jorehat, Assam.

CONTRIBUTIONS.

A further collection of seeds and plants from the Nicobars. From, E. H. Man, Esq.

A quart of the seed of *Sorghum saccharatum* From W. F. Grahame Esq, C.S.

Mr. Grahame mentions that this quantity is one-third of the product of 100 seeds sown in the beginning of the hot weather last year. One seed yielded nearly 2,400 seeds.

A case of plants from Brisbane, from L. A. Bernays, Esq., V. P., Queensland Acclimatisation Society.

Plants of Begonia, *Richardia Œthiopica*, Violets and Iris. From T. M. Francis, Esq.

It was agreed, on the recommendation of the Council, that orders, similar to last season be given for vegetable and flower seeds from England and America for 1880.

Further, that an exhibition of vegetables and fruits and flowers be held early part of next year, the former in January and the latter in February.

GARDEN.

The Head Gardener's monthly report was submitted as follows:—

"The weather in regard to temperature has been seasonable, but the rainfall has been insufficient for successful garden operations. The principal labour in the garden has been taking off Rose layers, and

layers of various other ornamental plants and potting off young plants which have been propagated. We commenced repairing the principal paths throughout the garden sometime ago, the huge brickbats, which prevented the paths being travelled over with any comfort have been removed from the centre of the path, and are being utilized for a new road in course of construction in the south-east corner of the garden, to an old gateway there; this road will be very useful as manure and house rubbish, on arrival will be deposited in the rubbish yard adjacent to this road, and thus save the cutting up by the carts of the garden paths after repair. We have also been engaged cutting and clearing away various shrubs of jungle origin which, though they might have been found useful at first for the purpose of filling up bare spaces, can be spared now with advantage. Seeds have been sown in south flower garden and are germinating well. Various kinds of annuals, sown sometime ago, have been planted out in suitable places around the grounds. Many of the large beds around the lawn which, up to the present, have been occupied with inconspicuous plants in regard to beauty, have been planted out with large sized Crotons, which, when well into growth, will prove very effective. Sowings of various contributed seeds have been carried out as usual and also the potting of those which have germinated. We have reported the young plants of the forbidden fruit which were raised from seed supplied by Col. W. M. Lees in 1878-79. At first, on germination, many of the seedlings were entirely denuded of leaves by the larvæ of *Papilio Pammon*, and in consequence many died; still we have been able to save about 113 plants, which are ready for distribution. We have also a nice lot of *Pithecolbium Saman* plants, just suitable for planting out. I omitted to men ion that the road leading from the Belvedere grounds on the north-east has also been newly laid. Concerning the ferns presented by Mr. F. Lazarus, a few are doing fairly, but somehow the ferns sent us from Darjeeling by Mr. J. Lynam, have unfortunately not succeeded. This, I am surprised at, as they seemed so fresh on arrival and have moreover had the same treatment and position as the others. Contributions during the month were as follows:—The tenth consignment of Andaman seeds, of which the *Palmaceæ* and *Pandanaceæ* germinate fairly: other miscellaneous seeds have not succeeded so well. A small collection of bulbs from Mr. Bull which have been duly potted off. A collection of choice flower seeds from Messrs. Sutton and Sons of Reading, sown in south flower garden. Palm seeds from Mauritius Botanic Garden also sown. A climbing fern (Lygodium?) sent by Mr. O. H. Brookes, Andaman. A case of Cotton cuttings from the Queensland Acclimatisation Society; many of these are rooted slightly, but have lost all their foliage. If slight ventilation had been provided for, I think they would have arrived in better condition. Also received 6 plants of *Poivrea coccinea* presented by Mr. G. D. Vere, Bhowanipore."

TEA FROM THE ANDAMANS.

A report from Messrs. Moran & Co., altogether favorable, on a sample of tea from the Andamans, forwarded by Mr. O. H. Brookes, Settlement Officer, was submitted. It was agreed that this sample, the first received of the growth of the Andamans, be transferred for deposit in the Economic Museum.

FIBRE FROM KUMAON.

Mr. J. G. Bellairs, of Chowkooree Tea Factory, Almora, Kumaon, submitted certain samples of fibre and a small specimen of cloth made therefrom, with the following remarks thereon:—

"I am sending you down by post to-day samples of a fibre procured from a plant grown on this estate, and shall be glad to know what you think of the fibre, and whether in your opinion it would sell in Calcutta or London and at what price.

"Sample C. is the fibre ready for market unhackelled.

"Sample A. is the fibre after hackelling.

"Sample B. is Tow taken out of A. in hackelling, it has not been whipped.

"I have tested the fibre against that of rhea, and find what I send you far the strongest and for work under water. I question if anything will impair it; *carefully* twist up a thread to say No. 50 cotton size; and you will have some idea of the strength of the fibre. Fishing twine made of it. I find stronger and more lasting than any English made line I have ever seen weight for weight and length for length. For working up into dress stuff alone or with other material, I think the fibre will prove of value. I am now making in a rough loom coarse cloth, and a sample I will later on send you.

"I am prepared to place a few tons of the fibre on the London market, if the reports I receive on the fibre lead me to think the venture likely to succeed, and if the trial shipment paid, I could send any quantity yearly, as the plant from which the fibre is taken grows most kindly in this soil, in fact the quantity will be merely a question of capital."

Read the following minutes of the Fibre Committee on the above samples:—

Mr. John Stalkartt.—I believe this fibre is obtained from a species of nettle and have seen something like it in the Darjeeling Hills, but there it was very difficult to clean.

I think it very valuable, and that it ought to be sent to England for valuation to some silk factory, or to some of the makers of the higher description of linen or fancy goods, articles that ladies wear.

Mr. S. H. Robinson.—This is no doubt from one of the nettle tribe, very like rhea, but the crushed fibre is coarser, about double the size of the rhea under the microscope. The question as to its economical value depends entirely on the cost of its production, and Mr. Bellairs should let us know at what price per maund it could be laid down in Calcutta; it is much too coarse for use as cotton, but could probably be put to the same uses as rhea.

Mr. W. H. Cogswell.—I think the fibre is produced from the nettle, which in some of the Hill districts, grows to a great extent and is very luxuriant in the rainy season. It has been well prepared, but I think the colour might have been improved on. It is of good length, very soft, almost silky, and of great strength. I have not a sample of rhea fibre by me for comparison, but I am of opinion that this is not so valuable as the rhea.

It would be unsaleable in this market, but I recommend a very large sample shipment of it to be made to London to some flax-spinner, whose opinion would be valuable in all respects and its correct value* readily ascertained. It ought to pay as a cultivation, but Mr. Bellairs will doubtless furnish the Society with some details and also a specimen of the plant, with its flower also, if possible.

Resolved.—That copies of the above be sent to Mr. Bellairs, and his attention requested to the recommendations contained therein.

TEA BLIGHTS.

Read the following extract of a letter from Mr. A Grote, in reference to the specimens of blights and insects referred to in the Proceedings of June and July last:—

"I saw Mr. Moore to-day and shewed him the specimens of blights and insects enclosed in your tin box. The so-called blight sent to you by Mr. Pinney is the larva of a Flata which covers itself with those long white plumes. It is an Homopterous insect allied to the wax insect of China, and the plumed larva is always to be found in the insect collections sent down in boxes from Eastern Bengal. Feeding as it does, on jungle plants, it will prove probably to have been only an accidental visitor to Mr. Pinney's tea garden.

"The green beetle sent to you by the Munguldye Company is a Curculio allied as Moore thinks to C. tanymecus, but these beetles ordinarily bore into the stems and branches of plants and do not meddle with their leaves. Of these last you sent me some specimens, which undoubtedly had been pierced by insects; but is it certain that this particular beetle did the mischief? Our scientific Committee has not yet commenced its sittings, and I have therefore been unable to consult them. Still the whole family of weevils should, if possible be kept out of Tea Gardens. I hope Mr. Pinney and the Munguldye Manager will keep you informed if these pests show themselves a second year."

In connection with the above, the Secretary submitted the following extract of a letter from the Manager of the Kunchunpore Tea Company, (Cachar) regarding the Mosquito blight:—

"With reference to your letter of the 14th instant, regarding the cure of blight on the Lydicherra Tea Estate, by cutting the jungle round the tea, I beg to inform you it has been tried on various gardens without the least effect every year since 1867, and the Estate mentioned not having suffered severely this year, is one of the peculiarities of blight which baffles all attempts at understanding it. I know gardens that have no jungle whatever round the tea, it having been all cleared out, yet the blight is as bad, as when the jungle was there. With reference to next year, I have not experienced two successive years of severe blight, and there is no doubt the drought, &c., had a great deal to do with its being so severe, and we are not likely to have two successive bad seasons either: a good one has hitherto followed a bad, as witness 1867, 1868, 1870, 1871, 1875, and 1876. With reference to the cure of blight all we have found out is, that it is an insect resembling the mosquito, and as numerous; any number can be seen any day sucking the juice of the young leaves, but where it lives, lays its eggs, &c., and at what season, is only a conjecture. The loss by this pest is so enormous, that those interested in tea should combine and get a first class Entomologist to reside for a season in the tea districts and study and find out the habits, &c., of the insect; that known I think, the cure would easily be found, and I think it is the first thing to be done. I know Managers who would forfeit six months' pay if they did not make over a third more tea if blight was cured, and I know Companies who lose from 40,000 to 50,000 annually by blight alone."

VALUE OF THE JUICE OF EUPHORBIA AS A PROTECTION FOR IRON-WORK.

Read a letter from Col. W. M. Lees, dated Torquay, 6th November, of which the following is an extract:—

"I send you a cutting from the *Times*, as I am under the impression that some of the *Euphorbiaceæ*, grow as a weed in India, and as I remember some rather costly experiments being made at Calcutta to protect iron against corrosion and marine growth, the subject might be worth considering."

"The Euphorbia.—Some few years since a survey was being carried out in Natal for the Colonial Government, during which it was discovered by one of the officers engaged on the work, that when certain plants belonging to the natural order *Euphorbiaceæ* were cut with the clearing knives, the gum which exuded from the plants adhered firmly to the blades, and was very difficult to remove. It was moreover found that the knives so coated, did not rust, and this led to further experiments being made with the view of utilizing the gum as a preservative material. Iron plates were coated with the gum and subjected to immersion in the waters of South Africa, which are stated to be proverbial for their foulness, and for the rapidity of the growth of vegetation. The Euphorbia in Natal grows in close contiguity to the seashore, so that there was ample opportunity for securely testing its value as a protective covering for iron against corrosion and main growth. The experiments proving perfectly successful, it was then sought to put the discovery into a practical form. To this end the gum was dissolved in a preparation of sprits, and this was found to be a ready means of applying it as a coating for ships bottoms and for ironwork generally requiring such protection, the spirits evaporating and the gum being left on the surface of the metal. With this preparation, experiments were made a few years since by Sir. Andrew Clark, C.B., who had a sheet of iron coated with it and placed in the waters in her Majesty's dockyard at Chatham, where anything immersed becomes rapidly fouled. At the end of two years the sheet of iron was taken out and was found to be quite clean, and free from fouling and corrosion. The composition has also been successfully tested in Africa against the ravages of the white-ants. This success is attributed to the circumstance that the gum of the Euphorbia, which from the base of the fluid, is of such an intensely bitter nature, that it paralyzes the efforts of all insects to attach themselves to it, or to bore into any substance coated with it. These successes have led to its adoption in practice for the purposes above indicated, and it is now being introduced in England. We have examined several applications of this composition, which gives a glossy coating alike impervious to air or moisture, while,

according to results, its own peculiar protective property remains unimpaired."

Letters were read—

From Under-Secretary Government of India, Home, Revenue, and Agricultural Department, forwarding copy of a communication from H. B. Majesty's Consul at Manilla, regarding the cultivation of the *Musa textilis*.

From the same, a report from the Director, Department of Agriculture, N.-W. P., on the experimental cultivation of *Euchlæna luxurians* during the year 1878-79.

From the Director, Department of Agriculture, N.-W. P., respecting a process of grafting as communicated by the Superintendent of the Government Farm at Allahabad.

The above were transferred for publication in the journal.

Mr. W. Chick forwarded for the inspection of the Meeting one of his "patent economic ploughs," cost Rs. 11.8. Mr. Chick states that this plough weighs only 35lb. as against a hundredweight, the average minimum weight of an English plough. Though more expensive than the primitive plough of the country, he remarks that it will last four times longer, and can be easily drawn by native cattle.

MINERALOGY.

IN August last considerable interest was excited at home by the Indian Gold Mines Company which is probably the Company that Reuter told us lately had been formed in London, with a capital of £100,000 for the purpose of working the gold mines in the Wynaad. The Company hold the lease of the Seeputtee estates and other mining rights assigned by the trustees of the late firm of Messrs. Nicol & Co. and Messrs. Smith, Fleming & Co. For the rights they leased, the trustees were to receive £10,000 on completion of the assignment, and after the preliminary expenses had been repaid, the profits "up to £4,000,000 sterling" were to be applied as follows :—"50 per cent. to the trustees of Nicol & Co., and Smith, Fleming & Co., and 50 per cent. to the Company; and after the £4,000,000 of profit had been divided, 50 per cent. was to belong to the Company, 20 per cent. should be paid to the trustees, and 30 per cent. to the liquidators to the City of Glasgow Bank; but when the liquidators had received £5,000,000, the profits were to be divided equally between the trustees and the Company." These details of the agreement appeared incidentally in the course of a law suit, and may perhaps now be modified, but the formation of the Company seems to be an actual fact. If the capital has all been subscribed, as we are led to suppose by the telegram, the Wynaad gold field will be tested at last in a business-like manner, by the most capable experts, provided with the best appliances, and a problem that has dazzled one or two generations of speculators will be solved one way or the other.

FORESTRY.

THE French Forestry Department, according to the *Polybiblion*, are satisfying themselves that forests directly increase the supply of water in their neighbourhood. From observations at Senlis and Nancy, they have decided that it rains more abundantly in wooded tracts, and that, while the leaves and branches give back the water quickly to the air, they prevent rapid evaporation from the ground, and are thus favourable to the formation of springs.

IN 1878 there were imported into Great Britain 60,254 loads of oak, of the estimated value of £354,916, against 120,118 loads in the previous year, being a decrease of 59,864 loads. The various oak producing countries contributed as follows :—Russia, 3,151 loads; Germany, 25,048 loads; Austria, 3,014 loads; United States, 2,641 loads; British America, 25,402 loads; other countries, 998 loads. Last year, 37,990 loads of teak were imported to Great Britain, against 28,072 loads in 1877, showing an increase of 9,918 loads.—*Timber Trades Journal.*

NATIVE FORESTERS.

THE following extracts are from a resolution of the Government of India in the Home, Revenue, and Agricultural Department, dated the 23rd October :—

For the sons of native gentlemen and for other well-educated natives of India, there are two modes of obtaining access to the controlling branch of the forest service; either by passing the entrance examination at the India Office, and going through the prescribed course of professional education in Europe, or by obtaining admission to the executive staff, and afterwards earning their promotion to the controlling staff by distinguished service as executive officers.

A Central Forest School has been established chiefly to make it easier for the sons of native gentlemen, and of youths of other classes who have received a good school education, to acquire within a comparatively short time that amount of practical skill and theoretical knowledge which constitutes the professional training necessary for the executive staff. At the outset a minimum of educational acquirements is demanded from candidates, comprising only the ability to read and write, the elements of arithmetic, and a good knowledge of accounts. But this is only the minimum of requirements laid down, and it is left to local Governments to raise these gradually with the view of demanding eventually a good school education as an indispensable condition for the admission of apprentices to the Forest School.

It is hoped that young men of good education will be encouraged to seek the post of forest ranger. It has been thought that among the existing forest rangers some men may be found of superior qualifications and acquirements which may fit them to rise to the superior staff. It is also probable that there may be cases of young men of good social standing, sons of native gentlemen with a superior education, and possessing special qualifications for the forest service. The orders contained in the Circular Resolution No. 29 F, dated the 5th August last, were intended to meet such cases. In order, however, to provide more fully for the case of forest rangers possessing qualifications for promotion, as well as for that of native gentlemen not in the forest service, a revised memorandum of conditions has been framed which will regulate their admission and subsequent employment. This memorandum lays down that :—

The following classes of persons may be admitted as probationers :—

(a) Forest rangers and other forest officers in positions corresponding to that of Forest Ranger.

(b) Native gentlemen of good position and education who are not in the forest service.

Candidates should personally submit their applications to the Conservator under whom they are serving, or of the province to which they belong, as the case may be. Candidates residing in Native States may submit their application to the Conservator of the nearest British province.

In the case of candidates already employed in the forest service, the maximum limit of age will be 30 years, but in special cases of unusual merit exceptions may be made. Other candidates will only be accepted if above 18 and below 25 years of age.

Candidates must submit the following papers :—

1st.—A statement of their names and parentage, and a birth certificate or other satisfactory evidence of their age.

2nd.—A medical certificate of good health and constitution including good eye-sight and hearing, signed by a Presidency Surgeon of the Civil Surgeon of the station nearest to his place of residence.

3rd.—A statement of the schools and colleges at which they were educated since they were twelve years of age, together with a certificate of having passed the entrance examination at one of the Indian Universities, or such other examination as the Conservator may consider sufficient.

In case the Conservator is not satisfied with the certificate offered, he may require the candidate to pass an examination in the following subjects :—

I.—Orthography, to be tested by dictation of not less than one octavo page from a standard English author.

II.—English composition, to be tested by writing a letter or report on some general subject.

III.—Arithmetic in all its branches.

In such cases the examination will be conducted either by the Conservator of Forests to whom the application was made, or by the Principal of a College, or such other educational officer as the local Government may direct.

It will rest with the Conservator forwarding the application to decide whether the result of the examination is satisfactory, or, if he prefers it, he may consult the Director of the Forest School.

4th.—A certificate of qualification in surveying by the lower standard as laid down in paragraph 14 of the Forest Department Code.

The Conservator must satisfy himself that the candidate is proficient in the languages of the province in which he submits his application.

The names of candidates whose applications are accepted by the local Government will be registered, but registration does not imply any promise of appointment. Candidates will be eligible for appointments in the event of vacancies occurring.

They will be appointed as probationers, and will generally be sent to the Central Forest School at Dehra Dun for training in the School Forests during a period of two years. Should in any special case the local Government desire to employ any probationer at once instead of sending him to the Forest School, this may be done with the sanction in each case of the Governor-General in Council. In such cases the period of probation will be two years, and the conditions for admission to the superior staff will be similar to those fixed for probationers who are sent to the Forest School.

Probationers already holding appointments in the forest service will draw the pay of their grade, provided that the amount does not exceed Rs. 150 a month. Probationers not being in the forest service will draw such pay, not exceeding Rs. 100 a month, as may be fixed by the Conservator of forests by whom they were selected, in communication with the Director of the Forest School.

Half-yearly reports regarding the progress and qualifications of all probationers at the Forest School will be submitted on the 1st April and 1st October in each year to the Conservator by whom they were selected. The Conservator will forward these reports to the local Government.—*Pioneer*, 27th November.

THE GARDEN.

PÆONIES.

NO flowering plants capable of enduring our northern winters are more satisfactory than the Pæonies. Massive without being coarse, fragrant without being pungent, grand without being gaudy, various in form and colour beyond the possibility of being successfully superseded, they stand in the first rank of hardy flowers. They are derived principally from four species, each of which is beautiful—P. moutan, P. Sinensis, P. officinalis, P. paradoxa. A few varieties are from species of less importance. The Pæony belongs to the natural order Ranunculaceæ, which fact alone is a warrant of its worth.

I have had much experience in ordering Pæonies from catalogue description, and it has been so expensive, and the result so vexatious that I have about reached the conclusion that colour-blindness, carelessness, or worse, are all that is needed to write a descriptive catalogue of them. I have rejected a good load of roots, after giving them a trial; not that they were inferior in any way, but because I had others so near like them, that I could not readily tell one from the other. The object of this article is to call the attention of amateurs to some varieties which are particularly fine, and which differ enough from each other to give satisfaction. The old Pæony, officinalis, is the parent of several varieties. Of these rubra is a bright crimson and grandiflora rosea is of bright rose colour. These sorts are old and grand; but whoever discards them on account of their being old will make a sad mistake. P. officinalis tenuifolia fl. pl. is a floral treasure, though I do not believe that it is a variety of officinalis, as it has all the traits of a distinct species. It blooms early; its flowers are double and of a bright scarlet-crimson colour. Even without flowers it is a beauty, on account of its delicate fern-like foliage. Though this variety is perfectly hardy and easily grown, it does not seem to be very plentiful.

P. paradoxa.—The varieties in this division originated in Europe. The best is Nemesis. The flowers are very numerous and full, but quite small and of a rich crimson colour. All the varieties of P. paradoxa are crimson, of greater or less intensity.

P. moutan differs from all the others in having a shrubby top. There are no decided colours in this division; but a simple range of shades, from a dim white to a dim rose. Some of the flowers are very good; and, as they are borne on bushes or trees from 3 to 8 feet in height, they are quite conspicuous. The best white is Bijou de Chusa, and the best coloured is Gumpperii, a bright rosy-pink. I say to the amateur: Don't be in haste about getting Tree Pæonies, for the best are not yet in market.

For brilliancy, grace, and fragrance, the varieties from P. Sinensis must have the first place, as they may be had in a greater variety of shades and colours than those of any other class.

Bicolor is a handsome variety; outside rose-colour and the centre of a very good yellow. Festiva is pure white and very full.

P. fragrans, sometimes called the Rose Pæony, is one of the best. It is of a rose colour and very sweet. P. Humei resembles it in colour, but blooms much later and is the latest of all I have tried. Jules le Bon is a bright red. Mrs. Dagg is a very early variety, dwarf habit; flowers pure white, dotted with red. Perfecta, outside petals a peculiar shade of pink, inside petals lively salmon—a beauty.

P. purpurea superba is of a deep brilliant crimson. The plant a tall grower and very showy.

After getting more kinds than I have mentioned, the distinctions will begin to disappear between those you have and those you get. In making a selection, I would especially caution the amateur, when he takes up a descriptive catalogue of Pæonies, against making any great distinction between the colours which he finds mentioned as pink, rose, and lilac. Whoever considers these colours as differing much from each other will discover the true distinction when he sees the plant in bloom. A very good way is to let some reliable grower make a selection for you, as such a person takes pains to propagate the best varieties largely, and it often happens that he has a surplus of the best.

In raising Pæonies from seed, the seed should be soaked in water for a day or two, as it is very hard. About March 1, it should be sown in a brisk heat, and when the weather becomes warm the seedlings may be planted out, and will show their colour, the third year. They are usually increased by dividing the root; and, though this is commonly done in the autumn, there is nothing gained by it. March or April is a better time, as the new root will have a chance to get hold of the soil before it is called upon to endure our northern winter. The soil in which they are planted should be dry, rich, and deeply dug. The tubers should be planted 6 inches deep.

P. moutan is propagated by grafting on the root of P. Sinensis, and by an amateur may be performed as follows:—In the spring take some good strong single roots from the clumps of some Chinese variety, and plant them by themselves in a nice place, and grow them until September. Then cut a scion from P. moutan. It should be about 3 inches in length, and contain a bud. Sharpen it, and insert it firmly in the root which is used for the stock, and cover it with the earth that has been thrown out to make the experiment; and if the work has been carefully done, the graft will take care of itself.—*T. Independent.*

TEA.

IT is much to be regretted that the sudden rise in tea prices, which took place a couple of months ago, has not been maintained at later sales, and this decline has naturally re-acted on the Calcutta market, where prices have fallen to their old level, a level which leaves a very small margin for profit to the planters.

WE would direct attention to an interesting letter from NONDESCRIPT on the subject of *rasping* tea. Our contention is, not that this class of teas *per se* realises smaller prices than teas more perfectly manufactured would, as most likely, in the present state of the market they are fetching as high rates as any other quality would. Our argument is that the system is "ruinous," because it prevents Indian tea being properly known by the people at home, and in this way hinders its introduction as an article of commerce. It is beyond all cavil true, that Indian tea is liked wherever it is introduced in a pure state to the consumer, who is prepared to pay more for it than for China. Regarding our correspondent's reference to wine mixing, he is clearly looking at it from a wine merchant's point of view. We look at these subjects from a manufacturer and grower's standpoint, and to carry out his illustration, what would be thought of the wine grower who, with a view to secure the market hinted at by our correspondent, should devote his attention to making a crude wine for the purpose of enabling merchants to improve their "inferior liquors," and who by so doing would infallibly ruin his own name and mark. We do not think that there is any ground for anticipating ruin to the planting interest, from a universal and permanent reduction in prices, as we affirm that tea ought not to cost more than eight annas per pound, and should as a rule be made at a cost of from 4 to 6 annas, and that the day is not far distant when these will be the manufacturing charges. This economy will be effected by a severe wrench being given to those vested interests, which are at the present day helping to crush this rising industry, but which will be swept away as encumbrancies, under that pressure which permanently low prices will exert.

IN a recent tea circular, Messrs. Balmer Lawrie & Co. review the past season as follows:—"The year 1879 will long be marked and remembered as one of the most extraordinary experienced by tea planters: all districts had somewhat similar weather; a hot dry spring, and late commencement of the season; excessively wet June, July, and August; fairly favourable weather in September, a good October, a dry November, and an early close; the tea suffered seriously during the hot weather in the early part of the season, while the incessant rain that followed, being unaccompanied by a sufficiency of sunshine, produced leaf surcharged with water, and wanting the essential constituents for making good *strong* tea; all the early shipments were classed as weak, and there was little change until September; a difficulty in withering during the dull cloudy days and cold nights may have increased the evil; but the main cause of the bad weak teas seems to have been the want of strong sap in the leaf. As regards quantity, the outturn for the season will not nearly come up to estimates; looking at shipments to end of November, and taking into consideration that nearly all Darjeeling tea is down, while Assam and Cachar have probably less tea to send than they had last year, we the quantity available for export will probably be well within think 37,000,000lb.; possibly not more than 36,000,000lb. Notable features resulting from the unfavourable weather are the check given to transplants and young bushes, the bad crop of seed, and the prevalence of blight."

IN reviewing the state of the tea market last month, Messrs. J. C. Sillar & Co. remark that the rise in prices within a very short period is about £2,000,000, and oddly observe (evidently at the dictation of the senior partner, whose peculiar views on Indian and Eastern matters are notorious):—"When we reflect that this sum of money has to be paid by the public, and the greater portion of it has gone into the hands of the usurers, who have been primarily instrumental in destroying the importing trade, we will see the wisdom of the laws of the Christian Church, which condemn the sin and the responsibility which rests with the bishops and clergy for allowing these laws to become a dead-letter." Returning to business, the firm explain that the oldest and most experienced authorities in the China trade adhere to the opinion

that the total shipments for the season will fall short of those of last year by 12,000,000lb., which will make the total export not more than 153,000,000lb., or 2,000,000 less than previous estimates. Nineteen and-a-quarter million pounds of tea were sent this year from Foochow and Hankow to the northern ports for transmission to Siberia, Russia, &c., against about eight millions last year. This will partly account for the falling off in the exports to England; and, should speculation be renewed, we may see Mincing-lane in the state the Liverpool Exchange was a few weeks ago—"more like a race course than a mercantile exchange." Messrs. Sillar say that teas are still sold on the time-bargain system; that is to say, purchases made to-day need not be concluded until the 15th of February next year, usury and other deductions being allowed to the buyer as before. The gambling has extended to the cargoes of vessels now on their way from China, and we hear of sales to arrive which show a profit of fifty per cent. upon the invoice cost.

A VISIT TO THE TEA DISTRICTS BY F. E. D.

In a former paper I stated what appears to me the principal reasons why tea does not pay in the present depressed state of the market. As some readers may not have seen that paper, I may briefly repeat that these reasons are—the little work coolies do for their wages, and the want of unity amongst planters in matters relating to the labour.

My description of the works I saw progressing, showed that the tasks are usually such as a cooly can complete in five hours, and it is to this matter I should like those interested in tea to give attention. On some gardens these light tasks had so long been customary that nothing was thought of the matter by the manager; on others, the lightness of the tasks was a ground of complaint, but in these cases there seemed no remedy, except with the risk of losing the cooly as soon as his agreement expired; but what was done in some cases was to compel the men to go out in the afternoon and hoe *ticca*, for which they were paid extra sums from 2 annas to 4 annas per diem. This, while keeping the garden clean, allows the cooly to save a considerably larger amount than would otherwise be the case; and after three or four years he is able to take up a piece of rice land and settle down as an independent man; so while combating one evil another is created, and it appears to me that until there is more unity amongst the planters, there is little hope of radical improvement. Improvement, however, is possible, and I would recommend those planters who find their coolies with so much time on their hands, to see that there is no room left for improvement in the style in which the present task is performed, in preference to increasing the task by measurement. For in the work of cultivation in too many cases I noticed that the area got over was primary to any other consideration, and while the task (one cottah) is a fair day's work, if done well, it is equally a very poor one when coolies are allowed to get through it according to their own ideas. Complaints of the labour-task being too small were pretty general, but I noticed that some gardens were kept in better order with a proportionately smaller number of coolies than others under different management. This may be the result of one or many causes—smaller yield per acre, &c.,—but I satisfied myself as to the principal cause, and found it was superior cultivation. Whereas it is the rule to give the ground a light chop 2 or 3 inches deep, leaving all the weeds on the surface. I found the exception a good deep cut and turn over, which *buried* the majority of the weeds, and consequently the land remained much longer clean. That the latter style is not general, is somewhat surprising; for while we are trying to impress on the native cultivator the advantages of deep cultivation, on gardens under European supervision, our own maxims are lost sight of. I believe the gardens do receive a deep hoeing in the cold season, but it seems clear in theory—and I believe it would also be found in practice—that deep cultivation during the rains would be much more profitable. We have from the best authorities the opinion that tea requires a light, well-drained soil. It is certain Nature, when forming some of the sites, forgot the drainage, and it is for the planter to supply the want. Already some of the gardens are a net-work of drains; but with no intention of under-rating the value of these, I would recommend *deep cultivation*; water will find its own level, and when assisted through the surface soil, for which nothing is more effective than keeping this soft and light by deep hoeing, it will flow on in its natural channels. That the gardens are now supplied with labour sufficient for deeper cultivation during the rains is without doubt, with the exception of some gardens, where the coolies' light hoe 1½ cottah per task. The difference in a 7-hours' task and a 5-hours', one is just 40 per cent., and I am sure this would be about the saving on the cultivation charges, for the garden will keep clean longer and the leaf yield more abundantly. The earnings for plucking extra leaf, I consider out of all proportion to the work done. Allowing the months—May to October—to be the harvest, rates that allow a woman to double her wages for six months of the year call for reform. If these people were out from sunrise to sunset plucking quickly, they would be entitled to extra remuneration; but as a rule, I found it was half-past 6 A.M., before they commenced plucking; about 5 P.M. they were called in, having had two hours' leave at mid-day, so that they performed a day's work of only 8½ hours,—half an hour *less* than the working day laid down by Government in Act VII. of 1873.

But as I before stated, radical reform without risk of losing the coolies, is impracticable, until there is unity amongst the planters. The whole of the mischief appears to hinge on the competition for labour, especially the practice of taking it from neighbouring gardens, and I believe this is to be the principal reason why so many estates cannot pay their expenses, as well as of the present low prices which tea realizes. The practice unsettles the cooly, and the planter, for fear of losing him, is less particular in looking to the style of work performed. Take, again, the system of giving a present and extra pay, equivalent to Rs. 2 or Rs. 2-8 to coolies who renew their agreements. Could the planter be sure of getting good "Junglies," it would be cheaper to import direct from Bengal. If there is one set of men more to blame than the other for the above state of things, it is small capitalists, or, more correctly speaking, men who open out a garden *without* capital; men who start with a few hundred acres of land, which the present rules enable them to take up at a small cost, with some seed, and as many time-expired coolies and village labourers as they can get from gardens in the vicinity, trusting to their appointment as Manager of some company not far off to pay the monthly expenses. This charge may be thought malicious, but I can assure the reader there is nothing further from my mind than malice; I frame it solely on information gathered, to the effect that not 5 per cent. of those small gardens import a cooly until their third or fourth year. In some cases the sanction of the proprietors or directors, as the case may be, is obtained before these gardens are commenced; others are carried on for years without any information being given; but the evil in both cases is equal. When sanction has been given it cannot be rescinded; but in the other case proprietors have the matter in their own hands, and precedents are not wanting where managers have been given a specified time in which to decide on the alternative either of retaining their appointment and giving up their private interests, or preparing to give the latter their undivided attention. Supposing tea capitalists could get these small gardens amalgamated with larger ones, or import their own Bengallee coolies, there would still be much room for improvement; but an influential association of those interested is required to bring even this about. This should be formed in Calcutta, where tea is represented by comparatively few individuals; branches should also be formed in the several districts. Independent local associations will never be formed judging from the accounts I have heard of some of the attempts in that direction. The crying want is a leading man, but when you find him he has already too much on his hands. The subject for first discussion should be the best means to stop the systematic practice, as it is in some cases, of inducing coolies to leave the garden for which they are imported. An order from the agents or secretary would in all cases stop direct enticement; but this alone will not meet the case. Many planters who would not stoop to send out men with sums of money, and instructions to get as many of their neighbour's coolies as possible, promising a reward for each one brought, study the best means to attract coolies to their gardens of their own accord. For instance, one planter will supply his time-expired coolies with rice at Rs. 3 per maund, another will give a higher bonus or present to coolies when renewing their agreements, while others look to the lightness of their tasks as an inducement for coolies to go to them. These are the matters for first settlement, and when settled effectually, great good will be the result. The large percentage of coolies who abscond should also be a subject for discussion. To every inquiry,—"What becomes of these people?" the answer was "Goodness knows," or something equally vague. Possibly many find their way to small gardens in out-of-the-way places, but the hundreds who abscond during the year, as shown by the Government statistics, cannot be accounted for in this way. A cooly came under my notice who had absconded and been apprehended *three times*. I inquired "Why do you not have the man sent to jail?" The answer was:—"I have sent coolies there who have returned and absconded again almost immediately after: the jail is no deterrent to this class of men." From further information I believe this to be the general opinion. Now, instead of Government filling the jails with such people, would it not be better if the first time a cooly absconded, as soon as he is apprehended, he were taken before a Magistrate, the number of days he has absented himself endorsed on his agreement, and warned that in case of another conviction he will get a number of stripes.

This subject might be much enlarged upon, but I leave it to abler pens to do so, feeling sure all will agree that the matters I have referred to call for urgent reform. It is doubtless a matter of opinion, but to me it seems preposterous that labourers imported into the tea districts, at a cost of Rs. 90 to Rs. 100 per head, who often enough present themselves at the depôts hungry and almost nude, should after three or four years on a garden be semi or wholly independent, having in this time saved enough money to purchase cattle and settle down on Government land to cultivate on their own account. At the same time we find gardens just paying their working expenses, or in many cases working at a loss. Why should time-expired coolies, who receive a present and extra pay of Rs. 2 per month, receive rice from the factory godown at Rs. 3 per maund, when it often costs Rs. 5 to place it there? Simply because any Manager who takes the laid down cost, risks the loss of his cooly, who is almost sure to go to a neighbour

who supplies rice at Rs. 3. Matters of this kind require united action, and a great saving might be effected without being unjust or hard on the cooly.

I have only one little matter left to notice; this relates to the manufacture of the tea. There appears to be a great difference of opinion on some of the details. One planter will insist on the necessity of rolling his leaf twice; another will half roll, sift out the finer leaves, then finish the rolling; another requires his leaf to be fermented in balls, and so on. The most casual observer could not help observing that these manipulations require extra labour, and the first question is, are they necessary for the better manufacture of the tea? If so, by all means carry them on. If not, the labour should be otherwise utilised. The question must be answered by some one able to decide. Unless the Manager is prepared to remain in his tea-house whilst the tea is being manufactured, I would recommend him to simplify the process by every possible means.—*Statesman and Friend of India.*

CALCUTTA, 10*th December* 1879.

TEA CULTIVATION IN CEYLON.

WE attract attention to this interesting and practical paper.—ED., *Ceylon Observer.*

(Communicated.)

Inquiries are on people's lips (as these columns recently testify) as to what is the position and what are the prospects of this enterprise.

The following remarks are offered by one who has had an interest in tea for nearly three years, and who has had opportunities of observing tea cultivation in India.

There can be no question that in the normal state of the tea market, tea cultivation pays most handsomely where the conditions are favourable for obtaining a good yield and for working economically. That these statements may not be considered too broad let it be understood that a good yield is 400lb. (5 maunds) per acre, and that economical working is to grow this quantity for Rs. 50 per annum, and to pluck it, dry it, pack and deliver it on boardship at Colombo for 27½ cents. per lb.

(*N. B.*—High cultivation such as manuring is not provided for. This of course must be made to pay for itself in additional yield, which no doubt it will where the cost of transport is not prohibitive).

On this scale 400lb. of tea costs Rs. 160, or 40 cents. per lb. delivered on boardship. Recent London account sales of Ceylon teas have shown the charges (with freight at 45*s.*) to be within 8 cents. per lb, Let us allow 10 cents. The tea has then cost 50 cents. per lb. delivered to the buyer, who in the present state of the market pays about 1*s.* 4*d.* sterling for it. At the exchange of 1*s.* 9*d.* per rupee (allowing for the 10 cents. charges payable in sterling) this is worth 75 cents., which leaves a profit to the grower of 25 cents. per lb. or Rs. 100 per acre. The estate may be supposed to have cost Rs. 300 per acre to bring into full bearing, and we have the handsome return of 33 per cent. on the capital.

The figures upon which the above calculations are based have been carefully computed either from the usual Indian tasks being worked out in Ceylon money or from known local rates, and if of sufficient public interest, any detail can be explained or verified. Superintendence at Rs. 15 per acre is provided, so if the planter manages his own estate he gets that as income as well.

The value of 1*s.* 4*d.* per lb. in London is warranted by actual valuation and sales. An unsorted sample grown in the neighbourhood of Kitoolgalla and Yattiantotte (Yaodessa district) made by a native on Rs. 20 per month, the superintendent having no previous experience, was valued at 1*s.* 3¾*d.* Windsor Forest Pekoe Souchong recently sold at 1*s* 4*d.* Two or three years ago such teas would have been well worth 1*s.* 10*d.* to 2*s.*, and should the market recover, as it seems very probable it may, good estates will be worth Rs. 1,200 an acre.

The yield of 400lb. owing to the youth of the enterprise, has not been so widely verified by the present writer as to render this calculation *perfectly* satisfactory, but planters may judge for themselves what may be done when they know that double and more than double that yield is often procured in India under favourable conditions. (Some of our readers may probably have definite information as to yield per acre which we should be very glad to know). From observations which are now being made, there is reason to believe that the trees on an acre of coffee shed considerably more than 400lb. of dried leaf per annum, in addition to their yield of crop and husk.

The following table, which is calculated upon the basis above described, may be found useful, *viz* :—

A yield of	300	lb. per acre gives Rs.	62 50	profit per acre.
„ „	350	„ „ „ „ „	81·25	„ „
„ „	400	„ „ „ „ „	100	„ „
„ „	450	„ „ „ „ „	118·75	„ „
„ „	500	„ „ „ „ „	137·50	„ „
„ „	550	„ „ „ „ „	156·25	„ „
„ „	600	„ „ „ „ „	175·	„ „
„ „	650	„ „ „ „ „	193·75	„ „
„ „	700	„ „ „ „ „	212·	„ „
„ „	750	„ „ „ „ „	231·25	„ „
„ „	800	„ „ „ „ „	250·	„ „

Colombo, 21st Nov. 1879. S.

COFFEE.

FROM a communication addressed to the Commissioner of the Nilgiris, by Mr. W. S. Mullaly, it appears that the insect which causes the coffee leaf disease, or that is the result of it, has shown itself on the cinchona plants in the Droog Coffee Estate, may not this be another proof of the correctness of our hypothesis, that these diseases are caused by the abnormal treatment we give to these plants, treatment rendered necessary by the requirements of trade. It could never have been the natural habit of this plant to have its bark removed in the wholesale fashion which we follow, and may not the violent efforts which the roots are called upon to make, in order to recuperate the plant after the spoliation of its bark, be the cause of this disease. These diseases do not attack plants in their natural habitat, and while growing as Nature evidently intended them to grow.

FROM the *Straits Times* we learn :—The coffee crop of the Government estates appears to have considerably exceeded the estimate in Mid. Java. The crop in Kadu was estimated at 57,500 piculs, but 90,000 piculs have been received at the storehouses. The residency of Samarang was to produce by estimate 47,000 piculs, but the actual yield was between 60 and 65,000 piculs. Should this be the case everywhere in Java, the deficit in the Netherlands Indian estimates for 1880 will be easily remedied.

COFFEE AND CINNAMON IN NETHERLANDS INDIA.

(From the *Straits Times,* Oct. 31.)

"PADANG, 7th October.—We are informed that a couple of days after the last Government coffee auction here had terminated, four delayed telegrams were received by traders containing orders to purchase highland coffee at a limit of 62 guilders per picul. Had these telegrams been received in time, the stock of 25,600 piculs highland coffee sold at an average of 58·92 guilders per picul, would have yielded 50,000 guilders more, and the other descriptions of coffee offered for sale would have proportionately risen in price. Repeatedly have we and other persons pointed out especially the uncertain condition of telegraphic communication, and have urged improvement but always in vain. May we now hope that the considerable loss here alluded to will effect what years of complaints and representations have been insufficient to accomplish?"—*Sumatra Courant.*

The Padang *Handelsblad* states that orders had been issued to root out the cinnamon trees planted in the Government plantation on the west coast of Sumatra as shade for coffee from it having been ascertained that they are injurious to the coffee plants.

By the last accounts, the Sultan of Siak was at Batavia on a visit to the Governor-General of Netherlands India. A correspondent of the *Java Bode* writing from Bangkalis on the East Coast of Sumatra states :—

"It is reported that the voyage of the Sultan of Siak to the chief town of Netherlands India, has for object to testify his gratitude to the Government for the help and protection afforded him when his kingdom was threatened by Wilson, the English freebooter, and, what is probably the main object, to persuade the Government to grant him 200,000 guilders in return for certain concessions regarding his dependent states."

COFFEE IN MANILA.

"*Coffee.*—We have very satisfactory intelligence regarding the coffee plantations which have been established in several provinces in these islands, in consequence of the steps taken by H. E. General Moriones, the Governor-General, in favour of the development of this cultivation. According to very accurate information there are now four millions of coffee plants in the Phillippines, which may ensure a very considerable yield in a few years, and consequently an increase of wealth at which we rejoice in every way."—

Senor Sotomayor, a very wealthy capitalist, arrived at Manila on the 1st October, accompanied by a French engineer, with the object of finding employment in the Phillippines for capital amounting to several millions of dollars, on behalf of a company of Spanish and foreign bankers and capitalists. In commenting on his arrival, the *Comercio* says :—

"The Phillippines have a fertile and productive soil, and although the labour question is here the most formidable obstacle which stands in the way of industrial enterprise, it appears to us that want of capital is the reason why enterprises do not attain the prosperity desired, but mostly languish and die before becoming fully developed. Such being our opinion, we venture to assert that capital large enough to overcome every obstacle cannot fail to obtain that profit which, in the Phillippines, only awaits this magic rob to cause it to flow out as if by enchantment. Hence we

cordially welcome Senor Sotomayor, and we believe that we are not mistaken in stating that such are also the sentiments of men of business and the public generally here."

Coffee and Sugar.—Advices from Batangas state that the coffee crop this year which has begun to be collected is abundant, such as had never before been known there. Friends who have come from the provinces of Pampanga and Batangas inform us that the sugarcane plantations were in a most satisfactory condition, the cultivators expecting an overflowing crop."—*Diario.*

THE COMING BRAZIL CROP.

We are indebted to Mr. Pauncefote, formerly of this city, and now a partner in Messrs. Corrie & Co., London, for the following interesting return, which will be appreciated by Ceylon planters. The figures shew conclusively that the supply of coffee is likely to be considerably below the demand during 1880, there ought to be a continuance of high, if not higher prices.—Ed., *Ceylon Observer.*

Statistics of Rio Janeiro and Santos Coffee.

From 1st July 1878 to 30th June 1879.

Shipments.

Destination.	First 3 months.	Last 9 months.	Total.
States ...	482,230 bags.	1,776,170 bags.	2,258,400 bags.
Europe ...	601,460 „	1,736,340 „	2,337,800 „

Monthly average.

States ...	188,200 bags.
Europe ...	194,817 „

In first 3 months of Season 1879-80 :—

States took ... 715,125 bags }
Europe took... 409,981 „ } 1,125,100

Prospective supply 1879-80 :—

	Old crop.	New crop.	Total.
Rio de Janeiro	900,000	2,500,000	3,400,000 bags.
Santos ...	—	1,150,000	1,150,000 „
			4,550,000 „
Deduct quantity to be carried over, say about ...			200,000 „
Leaves available ...			4,350,000 „
Deduct sundry shipments ...			170,000 „
Leaves available for Europe and States ...			4,180,000 „

Assuming States or Europe will require 1,700,000 bags in last 9 months, only 1,350,000 will be available for the other, and if States want coffee at same rate as for first 3 months, or 238,000 bags per mouth, where is it to come from?

Some authorities give available for shipment from Rio, crop year 1879-80 ...	2,900,000
Santos ...	1,100,000
Total ...	4,000,000
Of which already shipped ...	1,125,000
Available for 9 months ...	2,875,000

Or but 320,000 per month

CORRIE & Co.

CINCHONA.

The Report on the cinchona plantation on the Nilgiris for the year 1878-79, has been issued, and shows continued progress. The total crop was 1,14,321lb., of which 1,03,444lb. were sent to London for sale. This latter realised a total of Rs. 3,79,789-11-5, being an average of Rs. 3-12-3 per lb., a very good average indeed. Extensive experiments are now being carried out, in order to test the comparative values of the mossing and coppicing systems, and we are promised the results in future reports. The total number of trees on these plantations is 1,10,889. The report speaks hopefully of the future of this industry, as we said before, it is now perhaps time that Government should dispose of their cinchona properties to private traders, they having established the industry as a paying concern.

CINCHONA CULTIVATION IN JAVA.

For the following translation of the Dutch Report we are indebted to the Straits *Times* :—

"Report on the Government Cinchona culture for the third quarter of 1879:—In this quarter also the weather continued rainy, so that only a few dry days were registered. Cropping has thereby been continually impeded, but the growth of the plants has been greatly promoted. To-day labourers, 1,843·20 guilders have been paid. The supply of labour is still short, so that the upkeep of the older plantations has had to suffer somewhat from it. Available energy has been utilized however for keeping the younger plantations clean. The very abundant rice and coffee crops have dispensed much money amongst the people and the inclination to work in the high mountainous districts is in inverse proportion to this wealth. Also the transport of collected bark has been retarded by want of labourers. During this quarter 26,123 Amstm. lb. of bark have been despatched. On the 2nd July 1879 the second portion of the 1878 crop—40 cases and 114 bales of cinchona bark—was offered for sale at Amsterdam, the average price brought being 209 guilder cents. per half kilogramme (the highest average was 560 cents. per half kilo.* for C. Ledgeriana)

THE PREPARATION OF CINCHONA BARK.

Messrs. Rucker and Bencraft, the London Brokers write as follows :—

Fine stem quill bark is generally bought by the druggists, the price is often, if not always, far above what the analysis would point to, or what a manufacturer could afford to pay. Such parcels are keenly competed for, the appearance of the bark being greatly appreciated by a portion of the trade. The length of fine stem quill bark should certainly not be less than a foot, we have seen fine specimens varying from two to there feet, and occasionally even still longer. The bark should be cut evenly and regularly, and it must never be sent to market flat, as we so often see the South American barks, but curled, as close and compact as possible. In all other cases, appearance, within reasonable limits, is not nearly of such importance as analysis. The branch barks would not be valuable so much on account of their appearance, but rather on account of their extracts. An even looking parcel is always slightly more attractive, than an uneven one, but the advantage gained in price would be almost infinitesimal. A most important matter, and one to which we wish especially to attract the attention of our Ceylon friends, is that the bark should be properly and thoroughly dried before packing. Bark ought to be so dry, that it is almost brittle, but never burnt or charred. The fine long quill barks should be packed in cases which are perfectly dry, but if other means are used to still further protect the bark, such as thick paper linings, varnished or tarred, it must be remembered that such advantages are more than useless, if the bark becomes in any way contaminated by these preparations. The quills must be packed carefully and closely, the fine long quill barks are naturally brittle, and as their values depend so much on their appearance, every endeavour should be made to bring them to market long, strong, and handsome. For all other descriptions bags are generally used. We recommend the bags made in M[illegible] and called Thomas Brigg's Patent Baggage. Messrs. S[illegible] B[illegible] our largest importers of South American Barks, use this baggage almost exclusively. We can easily procure small pieces of this Patent for any of our friends, and as we have shown a specimen to Messrs. Howard & Sons, we can state that this package meets with their warm approbation. Damage by sea water, fresh water, or damp has a most injurious effect on Bark. Sea damage is bad enough, but when a parcel gets damage in the country and afterwards sweats in an almost waterproof and air tight package, the effect is ruinous. The following is most important, and should be written in red ink to attract attention :—To analyze a sample of bark properly, about five days are necessary. The chemicals used are very expensive, and we believe we are correct when we state that something like 32 processes have to be gone through. It is, therefore, evident that it takes a good deal of time, labour, and money to test a sample of cinchona. Small lots, deplorable as they are in most trades, are almost fatal in the bark trade. No manufacturer will take the trouble to test them, and we heard only to-day on the very best authority, of a case where a small lot, knocked down at sale for somewhere about two shillings, proved on analysis afterwards to be a most valued specimen, and worth many shillings a lb. more money. A Sale Lot should not contain, under any circumstances, a smaller quantity than 5 cwt. In the Sale Room this is the smallest quantity that gets fair attention. Larger lots will still better, as more manufacturers test them, and thus more competition results. No package should weigh less than 100lb. and where possible, there should be at least 6 such packages in one Sale Lot. For a general rule it may be taken, the larger the bulk the better the price. Of course there is always the question of demand and supply, but on any given day, a large shipment invariably sells better than a small one. We note down the following remarks shortly :—

1.—Scrapings are best kept separate, we often call them twigs, as they are composed of small twigs and scrapings of white part of the tree; the larger the quantity, the better the sale.

2.—Ordinary quills may be mixed without reference to length, as they are valuable for their chemical properties, and not on account of their appearance.

3.—Large straight quills, of good colour, are bought by druggists at home and abroad, and generally at prices much above their value to manufacturers. It is important, therfore, that they should be packed carefully—they travel best in cases. All other sorts sell equally well in any package, as long as they come to market in a merchantable condition. The grower need only consider cheapness in package, and transit; bags and bales are most used.

* About 9s. per lb.—Ed., *Ceylon Observer.*

4.—If the parcel is large enough to do so without making the lots too small, the bark is best separated as follows:—

A Large Quills, B. Broken Pieces, C. Branch Bark, D. Roots if the trees are stubbed up, E. Twigy Bark, &c., all that which when dry is less than the thickness of a quill, B. C. & D. can be mixed if the parcel is not large enough to give at least 5 cwt. to 6 cwt. of each; but the very small twiggy bark should always be sent separate, as it is worthless to manufacturers, and is only bought by druggists.

5.—Drying in the sun is said to be injurious, but it is most important that the bark should be dried thoroughly somehow or other. If not dry, [illegible] mould, rot, &c., &c., follow. We believe artificial heat is [illegible] in some form of drying-room or stove, but these [illegible] are fatal, as the bark will show signs of charring, burning &c.

At a recent sale East Indian Cinchona sold at irregular, but rather dearer prices.

		s. d.	s. d.
[illegible]	...	0 6 at	0 9 per lb.
[illegible]	...	0 10 „	1 6 „
Succi[illegible]	...	1 7 „	1 11 „
mixed with			
Ro[illegible]	...	2 0 „	2 10
Officinalis fine	...	[illegible]	9
Succirubra Quill, [illegible] chiefly branch			8
„ medium	...		1[illegible]
Officinalis, fine broken small Branch	...		[illegible]

—*Madras Mail.*

SILK

[illegible] Switzerland [illegible] of Bale [illegible] occupy 2[illegible],000 [illegible] produce [illegible] of from [illegible] Its [illegible] manufacturing industry centres [illegible] Bale [illegible] the manufacture of silk ribbons [illegible] repeal of the edict of Nantes, by French [illegible] of which [illegible] descendants form to-day a part of the noble family of the [illegible].

In 1810 the canton of Bale had from 500 to 600 looms of silk ribbons of different kinds, plain or brocaded and [illegible], which the quantity produced was to the value of [illegible] million francs. About 1830, these figures had [illegible] in 1872 that the silk manufacture of Bale attained [illegible] total production in Switzerland, of [illegible] fra[illegible] alone made upwards of 60 millions. About [illegible] number of power-looms for ribbons amounted to [illegible]

	Looms
For Bale town and district	[illegible]
For the other cantons of Switzerland	[illegible]
[illegible]	[illegible]

It is estimated that the 7,562 looms of Bale employ about 6,000 workpeople, of both sexes, in the town and its suburbs, and 60 designers and others. They consume annually 300,000 kilogrammes of conditioned silk, and produce 12[illegible] million yards of ribbons. From recent statistics, published on the occasion of a new federal [illegible] labour in the factories, the silk industry of Bale only manufactured [illegible] 1877 a total value of 45 million francs.

[illegible] MANUFACTURE IN ENGLAND.

THE most beautiful of [illegible] materials used for [illegible] it displays to the best advantage the art [illegible] preparatory processes are also the most simple required by any of the textile substances, and as it is desirable to show the process of spinning, upon which in a great measure the beauty and quality of all cloth depends, the throwing of silk is, as in the case of weaving, therefore selected. Automatic spinning machinery was applied to silk long before it was invented for cotton, the former substance being, in consequence of the great length of its filaments, more adapted for the purpose, and the carding and combing processes, excepting for *waste* silk, are not required.

Mention is made of the silk manufacture in England so early as the year 1363, in an Act of Parliament passed in the reign of Edward III., but it was then of very slight importance. In France it was not introduced for more than a century later; but during the 16th century the mulberry-tree was extensively cultivated there, and the manufacture of silk was encouraged to such an extent that titles of nobility were conferred upon some manufacturers who had persevered and had been successful in the business. James I. of England observed that the French were deriving great benefit from this comparatively new manufacture, so he determined to encourage the trade in England. For this purpose he sent letters to all parts of the country recommending the people to cultivate the mulberry tree, and it became fashionable to do so. Thus it is related of Shakespeare, Milton, and others having planted trees of that description. The king also by a like proceeding requested his subjects in the American colonies to cultivate the mulberry-tree instead of that " detested weed " tobacco. He encouraged Mr. Burlamach, a London merchant, to introduce throwsters, and dyers from the continent, and in 1629 they became of such importance that the throwsters formed themselves into a company under the name of "The Master, Wardens, Assistants, and Commonalty of Silk Throwsters." In 1661 they are said to have increased to such an extent in London that 40,000 men, women, and children were employed in the business. But this statement, although mentioned in the preamble of an Act of Parliament, is probably very far from being correct.

Although the cultivation of the mulberry-tree was encouraged, it does not appear from that time to the present, that the production of silk has [illegible] been [illegible] England attended with any degree of success. The raw [illegible] upon which the manufacture depends, is procured from [illegible] favourable for its production, and large quantities are [illegible] Italy, India, China, and Japan. Before silk-throwing became [illegible] understood in England, the silk imported, at that time from Italy, came already thrown or spun. At first the English throwster could only spin [illegible] tram [illegible] the most simple process of spinning as required for weft. The [illegible] organzine" used for the warp was for a long time afterwards imported ready thrown.

In 1702 a gentleman named Crotchet thought he saw a good opening for profitable speculation; he, therefore, erected a small silk mill at Derby, but he did not succeed, and he became insolvent. Some time afterwards Mr. John Lombe, who was a good draughtsman, went to Italy to obtain the secret of the process, and he succeeded in doing so by corrupting the work-people at one of the Italian mills. His plans were discovered and he had great difficulty in making his escape.

On arriving in England he fixed upon Derby where to commence the [illegible] and rented from the Corporation of that town a small island [illegible] by the river Derwent where he built a new mill adjoining the one [illegible] by Mr Crotchet. During the building of the mill he obtained [illegible] the Town Hall, in which he carried on the process under protection of a patent obtained in 1717, with such great success that it is said the [illegible] mill was gradually built and filled with machinery from the profits derived from the work done in the Town Hall!

In three or four years after he had obtained his patent John Lombe died when the proprietorship devolved on his brother William, and subsequently to his cousin Thomas, who afterwards became Sir Thomas Lombe, and who obtained £14,000 from the Government in lieu of an extension of the [illegible] patent. Hutton says that the Lombes has amassed £80,000 before the expiration of the patent.

One of the conditions the Government exacted for the payment to Sir Thomas was that he should deposit in the Tower of London—perhaps the only available public place at that time—a complete set of models for the [illegible] showing the process used by him. These models, some [illegible] forty years ago, were destroyed by the order of the then Governor of the Tower. Three or four pieces remain, however, and are to be seen in the Patent Office Museum. They consist of a spindle belonging to the throwing mill, a reel, and a portion of a "sledging bench," or the rail.

There is a tradition that John Lombe was followed by a woman from Italy, and that his death was attributed to poison administered by her in revenge for his obtaining, surreptitiously, the secret Italian process of throwing.

The Derby silk mill was long afterwards considered a great wonder, although in reality the process was exceedingly simple, for it was in the combination of the numerous spindles into each machine that really formed the value of the new introduction. A second mill was shortly afterwards built at Stockport, and from that time Congleton, Macclesfield, and Leek followed the example.—*History and Principles of Weaving. By Alfred Barlow.*—*Japan Weekly Mail.*

TOBACCO.

AS the cultivation of tobacco is coming well to the front of late, we will devote more attention to it than formerly, and will be at all times ready to give due prominence to such new products, or at least such products as are new to India, bearing on the agricultural and commercial prosperity of the country. As many of the Government experiments are being carried on with a view to the elucidation of all that it is desirable to know in connection with these new products, we have introduced a new heading, and under the title of "official papers" we will from time to time reproduce such of these documents as we may deem interesting to our readers.

HARVESTING TOBACCO.

A VERY good way is to cut the plants just at night, and take them to the shed early next morning after the "dew is off." The plants are then cool and less liable to pale rot or sweat by adopting this method of harvesting. In hanging the plants avoid crowding, as space is as much an object with tobacco growers as with newspaper men, and if the plants are over-crowded, the leaves are apt to sweat and rot. In about two weeks, however, the danger is passed and the leaves will have commenced to "cure down," changing first from green to yellow and from yellow to brown, the natural color of the leaf. Too rapid curing is not desirable, since the leaf is apt to be dry and husky, rather than soft and silky. Keep the sheds as dark as possible if dark colored leaf is sought for, and open the doors if a lighter shade is wished for. Close the doors next to the sun at all times, and open on the other side, but open all during the night, unless the weather is very muggy—a most dangerous time for the curing process and the time when pole rot and sweat will ensue. After the plants or leaves are all "cured down," close the sheds tight so that the color may even up, but should a damp spell come on, open the doors, but not if the rain beats in on the leaves. Before cutting the plants see that all are thoroughly suckered, as the offshoots are liable to grow when hung up and the curing leaves coming in contact with them are apt to rot and be otherwise injured. Tobacco plants may be hung up either with twine or string on lathes as may be thought best. Both modes of hanging in the sheds have their advocates, many claiming that when hung on laths the leaves cure better and are less liable to sweat or rot. Well-ripened tobacco will cure faster than when only partially ripe; hence there is less danger from rotting when the plant is thoroughly matured. Havana seed tobacco must not be cut unless well-ripened, as the leaves will be bitter in flavor if cut when green. The plants of this variety should stand in the field so long as there is no danger of frosts, say from eighteen to twenty-four days after being topped, and in some cases even longer. On low grounds, where the early frost nips the vegetation, the plants should be carefully watched and cut, even if not ripe; since a severe frost, or any frost, even a "white" one, unfits the leaves for use, and since unripe tobacco is better than that touched by this merciless foe of the weed—*Scientific Farmer.*

TOBACCO CULTIVATION AND MANUFACTURE.

THE weather is now all that can be wished for, and no time should be lost, for one genial shower of rain is worth more to the plant bed than half a dozen waterings. 1st—Plough or dig the ground at least 12 inches deep, break all the clods or lumps of clay as fine as possible, and work in a good quantity of wood or vegetable ashes. I would prefer that the seed bed be six inches higher than the ground, so that the plants or seed may not be injured by excessive rain, and I would advise that the seed be sown in drills, not broadcast, for this reason; if you sow in drills, you can the more easily weed, water and pull the plants, without trampling on them. Your seed bed can be a part of the tobacco field, and a piece of ground 80 × 50 feet, will give you sufficient plants for several acres. Do not sow your seed too thickly. Any fairly good ground will suit for tobacco. I would prefer it a little sandy; you can always manure poor land, whereas, if it be too rich, the plants and tobacco will grow too thick and rank, and not be suitable for cigar making. In America, a good loose sandy soil is always preferred. As soon as the seed is sown, the planter should at once plough the ground for tobacco as deeply as possible, and let it be so for at least two weeks, so that it be subject to atmospheric influence, when it will be more easily pulverised, it should then be harrowed once or twice, before the second ploughing. If you have no harrow, you can improvise one by using a branch of tree, on which you can tie some large stones. If procurable, use the seed known as the "James River." I believe it can be got from the Secretary of the Horticultural Gardens, but I would strongly recommend the planter not to sow seed of his own raising. In England and America no farmer will sow his own seed, but rather that from a farm some miles distant. By no means water your plants in the morning, but after the meridian sun has passed. If you water the bed in the morning, your ground becomes hard and the water will evaporate, whereas if you water in the evening, the water has a chance to percolate to the roots of your plants. Neither water too much. You do not require to flood your plant bed; moderate watering is always the best. When your plants are one inch high, it will be well to scatter lightly, with the hand, wood ashes over them, as this will in a great measure keep away the fly and the bug. If the fly should appear, it would be well to water twice a week with a solution of six parts water, one of wood ashes, and one part lime; this will destroy the eggs, and not injure the plants in the least. When about three inches high, your plants will be ready for setting out. Always select the strongest as you thin out the plants; they will grow rapid, so you will be able to plant out every two or three days. It would be well to have some mats at hand, so that you can cover your plant bed during the heat of the day. Your planters should bear in mind that the more care and attention they bestow on the plant bed now, the better will be their prospects for a good crop of tobacco hereafter. While seed is growing, it will take all the planter's time to get his ground into proper order to receive the plants, and he should be collecting all the refuse matter he can to burn and scatter over the ground previous to his second ploughing; burnt wood or vegetable ashes is considered about the best manure for tobacco, which requires a considerable amount of salt to be in the ground, else it will not burn, or if it burns, the ashes will be black. In the first place you should select your leaf tobacco with care, and to do so, you must exercise the senses of sight, feeling, smell, and taste. Select a thin, sound leaf, for the wrapper or outer cover; try and get the leaf so that the wrapper can be cut from *between* the veins, and not across; the inside or filler should be a light, or what is called trashy tobacco; this tobacco is much more free from oil, or nicotine, than is a heavy thick leaf. See that your leaf tobacco is evenly cured and of an uniform color, and before purchasing, try it, and see that it burns to a white ash and fragrant smell. The night before the tobacco is to be worked, see that the tobacco, selected for the wrapper is thoroughly moistened with soft water (it would be better to boil the water and let it cool) then roll it in a blanket or large coarse cloth; by this means the wrapper becomes pliable and will not tear. See that your workmen do not wet the fillers too much, for in this lies the great fault with your Indian made cigars. As soon as your day's work is ended and cigars counted, they ought to be spread in the sun for three or four hours and then cooled in the shade. Then you can pack them away in a large box, but if you tie up your cigars in bundles as soon as made, the damp filler and wrappers cannot dry, and the consequence is the filler becomes mouldy and ferments, thereby giving the cigar a bitter taste, and causing an unpleasant sound, like unto that of a wet or dirty pipe. Drying your cigars gives you another advantage, for you can place them in the market within a week and they will have an appearance of age, and smoke well. Now, sir, your Indian cigar-makers, as a rule, do not use the scrap tobacco (or clipping) but sell it to snuff-makers, at a nominal price, but in America this is all used as fillers, and I believe it makes a better cigar, than that made altogether of long tobacco.

I have no hesitation in saying that Indian grown tobacco, if properly *cured*, is as good as any grown in America; for you can use nearly all the tobacco raised in India for cigar-making, whilst in America, the States only of "Maryland, Connecticut, Delaware, and Florid," are capable of growing tobacco suitable for cigar fillers, and they are obliged to purchase Cuban tobacco for wrappers.—*Madras Athenæum.*

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.

Calcutta, 1st Feb. 1876.

CONTENTS.

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

CORRESPONDENCE.

COFFEE MANURING: AN ATMOSPHERIC SUPPLY OF AVAILABLE NITROGEN.—ANALYSIS OF "CINCHONA SUCCIRUBRA."

To the Editor of the Ceylon Observer.

190, Kollupitya-road, December 6, 1879.

SIR,—The sanguine hope of M. Ville, that advanced agriculture, will yet be able to draw all the nitrogen required for plant food from the atmosphere, lends a new interest to a subject touched upon in my last, *viz.*, may not the secret of the lessened importance of the more active forms of nitrogen in our manures, compared to what obtains in temperate countries be explained on the supposition that our atmospheric supply of available nitrogen is greater, either absolutely or relatively, to the products we have to cultivate. I am not aware if any tropical rains, dews, or atmosphere have been made the subject of exact analysis. so, in the absence of observed facts, it may be excusable to speculate a little on the subject.

There can be little doubt that the atmosphere is the primary source of the nitrogen in plants. The atmosphere is anterior to the soil in our cosmogony is in fact the great agent by which the soils have been produced, and nitrogen not being a constituent of the primary rocks must have been absorbed from the atmosphere in the first instance; ergo, all the nitrogen in plants comes directly or indirectly from the atmosphere; so in this sense Ville's expectation is present reality When one considers how important atmospheric combined nitrogen is to plants, this element constituting. according to Johnstone and Cameron, 1¼ per cent. of their weight, it is matter for wonder that it should be present in such small proportion in the air, and one would be *a priori* disposed to credit the conclusion which Ville early arrived from his experiments of 1849-1855 that plants can assimilate ... nitrogen; but English chemists are diametrically opposed to ... It is so extremely difficult to estimate accurately the combine... in the air, that experimenters mostly confine themselv... estimation of that in rain-water. Perhaps the most reliable ... results are those of Dr. Augus Smith who gives the follow...

RAIN-WATER IN PARTS PER MILLION.

Where collected.	Ammonia.	Albumenoid ammonia.	Nitric acid.
Ireland, Valencia	·18	·03	·37
Scotland, five sea-coast country places, ...	·48	·1	·37
West			
Scotland, eight sea-coast country places, ...	·99	·11	·47
East ...	·53	·04	·31
Scotland, twelve inland country places ..	1·07	·11	·75
England, twelve inland country places ...			

Calculating the averages we would get ammonia ·78, albumenoid ammonia ·08, and nitric acid ·49, or a total of ·835 of combined nitrogen in one ... water is ·0361lb., and an acre contains 6,272,640 square inches. A rainfall of one inch therefore weighs 226,442lb. per acre, of which ·189lb. is nitrogen. A rainfall of 30 inches per annum would only supply 5·67lb. of nitrogen per acre, a rainfall of 100 inches, like that of Ceylon, 18·9lb. Suppose we take a crop of potatoes at not less than 4 tons per acre, of which ·35 per cent. is nitrogen; 31·36lb of nitrogen per acre would be carried away in a single crop of which the rainfall of the whole year could only supply 5·67lb.

Coffee contains much more nitrogen than the potato, *viz.*, 2·14 per cent not reckoning, for want of data, the parchment skin. A 5 cwt. crop nevertheless carries away only 12lb. of nitrogen while our rainfall of 100 inches as per Smith's analysis contains nearly 7lb. in excess of the demand for the crop. Mr. Horsfall assumes that 200 leaves are dropped per tree per annum. Mr. Fraser of Damboolagalla assumes 2,000;

we may assume that while 2,000 are dropped 200 are irrecoverably lost by wind and wash. This according to Mr. Hughes would remove other 6·6lb. of nitrogen per acre, still leaving a balance of ·4lb. to the credit of rainfall. If we knew what allowance to make for the parchment we should not have this balance; but in any case the result would be very different from a heavy crop like the potato which carried away 25·69lb. in excess of the calculated rain-supply. It is found, however, that the greater the rainfall the smaller is the percentage of nitrogen, *vide* table—east of Scotland has a smaller rainfall, but higher proportion of nitrogen than the west of Scotland, and dew has a much higher proportion than ordinary rain.

But there is still another most important factor to be taken into account. Boussingault found that when the atmosphere was in a highly electrical condition, the proportion of nitric acid in the rain was enormously increased. In ordinary circumstances he found only about ·02 per 100,000 parts; in a hailstorm, however, the atmosphere being highly electrical, the rain contained not less than 5·5 and the melted hail 8·3 parts of that acid (*Hassal*). Let us suppose the rain and hail together contained no more than 7; an inch of such rainfall (and thunderstorms of an inch of rainfall are not uncommon in Ceylon) would contain 15·85lb. of nitric acid, or rather more than 4lb. of nitrogen, and an inch and-a-half of such rain would contain more nitrogen than the whole annual rainfall of 30 inches calculated from Dr. Angus Smith's analysis.

I have been informed by a Colombo gentleman who has collected rain during thunderstorms in Colombo, that he has been surprised at the strong smell that was shortly developed in it. This odour could be of no other than nitrogenous origin. I think, therefore there is every reason to believe that the atmospheric supply of nitrogen to the plants in the tropics, is greater than in temperate countries, and when the soil is prepared to receive this nitrogen, it so far replaces the necessity for nitrogenous manure.

I meant to have said a word about the the fertilising power of gypsum in the soil being less, if at all, due to its power of fixing atmospheric ammonia than to other properties especially the liberation of potash; but my letter has already extended to sufficient length.

I conclude by handing you an analysis of cinchona succirubra I made the other day. The results are such to encourage planters:—

	per cent.
Moisture	... 11·67
Total Alkaloids	... 8·1
Quinine	... 1·8
Computed air dried crystalline Sulphate of Quinine,	2·42

M. COCHRAN, M.A., *Glasguensis.*

NOTE:—This has been kindly corrected and examined by Mr. Cochran for our use.—ED., *I. A.*

MONTCLAR'S SYSTEM.

SIR,—A plan suggested by Mons. Montclar to the coffee planters of Ceylon, is highly applicable to coffee and tea enterprise in India, I have the pleasure of sending to you for publication, the two articles which have appeared in the *Ceylon Times* on that subject.

A PROPRIETOR OF ESTATES.

THE MEDICAL DEPARTMENT AND THE COFFEE ENTERPRISE IN CEYLON.

I.

(*To the Editor of the Ceylon Times.*)

SIR,—When a man acts conscientiously and has the courage and frankness to state "that almost every stage in our coffee forced horticulture is on a wrong principle"—it is a startling assertion and one that, no doubt, sounds unpleasantly to many, who were regarded by the *Ceylon Observer* as model cultivators "far ahead" all over "the tropical world."

It is with such flattering assertions, as clearly pointed out in the *Ceylon Times* of the 25th October last, that the planting community has been induced to disregard the administrations of one who had come amongst us for the purpose of putting right, practically, our mistaken notions of coffee cultivation. But it is by the opinion and advice of thoroughly incompetent men that the planting community of a country may find itself "far ahead" in errors; even with cinchona the present "King!"

For our own interest let us by all means hear what he has to tell us, if we do not dare to see what he has to show us, not with microscopes but with crow-bars, pick-axes, &c.

As quotations can do no harm, I will quote from Monsieur Montclar:—

"In Ceylon, the planting community possess for their immigrant labor (which of course is not their property) its medical department, which costs about one rupee per acre per annum to the proprietors of estates. But as a great many coolies are unwilling to go to the district hospital, and prefer to be treated on the estate itself, by some empiric or by the Peri-dorai; it results that in extra medicines alone, many proprietors or superintendents of estates are put to the additional expenditure of another rupee per acre.

"Therefore, as far as my information is correct, we can put down two rupees per acre per annum for labourers' medical attendance and medicines.

"If for immigrant labourers the coffee proprietors of your colony are in the necessity of spending two rupees per acre per annum, for medicals attendance and medicines, it is strange to remark that since leaf disease has begun its ravage, it did not occur to the proprietors of very valueable estates to have done as much for their own immoveable property, *i.e.*, paying one or two rupees per acre, per annum, so as to have a permanent staff of scientific specialists under the direction of one head scientific agri-horticulturist of their own, so as to work out and put the coffee plantations in good and sound condition.

"Indeed with the liberal expenditure of £10 to £12 per acre per annum, as generally allowed for the last few years, your estates would have been put easily in good and sound condition, if the money had been properly expended.

"Proprietors of valuable estates should consider carefully this point, that it is much more difficult to treat a plant than to treat a man, or an animal. I cannot do better than reproduce here, for planters' careful consideration, what has been published by the *Ceylon Times* of 13th January 1879:—

"What physician called in to see a patient suffering from some external malady, would be content to treat that disease simply as an outward one; would he not rather first make inquiries and investigations regarding the previous life, and general bodily condition of the patient, and would he not try first to remove the cause, and to improve the general tone, in order that he might place himself in a position to overcome easily the so-called disease, which is probably but the outward evidence of internal and systematic mischief? So with the planter; if the coffee disease is to be effectually overcome, it will not be by looking at it with the eye of a mere *superficial observer*, but with that which sees deeper, and farther, as regards the matter in all its various aspects, and this can only be done by the scientific agriculturist.

"We must, in short, go to the source of the matter. It is utterly useless for planters to labour in the dark; they may go on manuring till doomsday, and the result will be not the manuring of the plant and the production of greater crops, but rather the manuring of the parasite and consequently, the encouragement of the fungus."

Now, let me compare what was stated in opposition to the above by the *Observer* on the 29th January last.

The *Observer* backing the life history of leaf-disease wrote:—"Just as the skilful physician diagnoses the disease as a preliminary to treatment, so Mr. Morris, as a preliminary to the account of the Wallah experiments, and as a guide to other experiments in the direction of a remedy, fully describes the nature, progress, and symptoms of leaf disease."

Is it possible to read a more monstrous statement than that Mr. Morris had "fully described the nature, progress, and symptoms of leaf disease" or that Mr. Morris has made "matured conclusions," &c.; when his belief from the very beginning was that "it matters little to us now how the coffee leaf disease came, and where it existed before it appeared in such force and spread with such rapidity among the coffee estates of Ceylon and Southern India."

Mr. Morris was introduced to the coffee world, by the *Observer*, as the greatest *savant* of our present age! and "Mr. Montclar's ignorance of the whole matter is so apparent, that it is almost descending to his level to notice him.

It is impossible for one man alone to adjust the several difficulties we meet with in the cultivation of coffee in Ceylon.

We have to alter the condition of the soil to receive renewed moisture, light, heat, and atmospheric action through it and to the roots in abundance; and with the aid of manure and stimulants used in the right direction, we shall no doubt strengthen the plant.

Mr. Hughes has made a great many analyses of soil, with what result Mr. Morris instead of studying the conditions of the coffee blossom, as a botanist, has fallen back on sulphur, and with what result is already known. Now, what can a mycologist do for planters?

Is it Dr. Trimen who can do what is desired?

Dr. Trimen will answer in the negative.

UNITAS SALUS NOSTRA.

II.

SIR,—In my last I quoted the words of Monsieur Montolar, allow me to quote further.

"My object is not to defend or criticise the old or new Medical Ordinance, but merely to make proprietors of valuable coffee estates understand, that their immoveable property is much more in danger in 1879, than in 1869 when leaf disease became apparent.

My object is to make them understand that the vegetable subjects on their property require medical attendance much more, at any rate as much as their immigrant labourers do, and to make them fully aware that it is what I had the honour of proposing to the planters of India and Ceylon in 1877.

It is a great misfortune that such proposal of *unitas*, so beneficial to the interest of proprietors at large, was not accepted and carried out at once.

Had my proposal, then, been carried out, not one estate in Ceylon would have been abandoned completely, as is the case now in 1879, causing losses to many.

Had my proposal been carried out, we should have been in a position to prove to capitalists that coffee trees can be invigorated and cured of the so-called leaf disease :—An estate of 300 acres of coffee, instance, should be divided into *two* portions of 150 acres each, so as to have one portion in a condition of bearing full crop, and the other one a small crop—and so on alternately every year.

Indeed, after a full crop, it is unreasonable to expect in your coffee-horticulture another successive full or good crop, because the roots and branches of the plant requiring pruning so as to renew the rootlets as well as branches, and manuring also required to strengthen them.

But the above to be effective requires of course a few weeks of hard work, and after a few months, this shows its effects before the blossom makes its appearance.

Therefore, it is clear that the portion of an estate so operated on cannot be ready to give a full crop that year. It is by the above mentioned division that we shall avoid the existing irregularity in the production of crop, by which irregularity both planters and capitalists are often discouraged.

That division will give time to the Superintendent of an estate to carry out the required operations alternatively every year on half of the estate, and such division is the means of regulating a yearly production by which capitalists will see clearly their way. The above will be obtained, and I guarantee it, if planters perform a complete system of cultivation.

But it is impossible to perform such a system on *steep lands*, as long as the rainfall escapes out of the land, and in that escape carries away the best soil, leaves, handlings, pruning, weeds, &c., to the ravines. If complete cultivation is carried out, as recommended and approved of by planters and others of experience, not only the leaf disease will disappear, but we shall have to moderate in some cases the foliage of the coffee tree, and in some cases its bearing. On that point I refer you to "the new coffee culture" which was published and advertized by the *Ceylon Times* on or about the 10th of January 1879, I refer you, in fact, to all what I have written in the *Ceylon Times* in the specification of my works, in the pamphlet on "soil diseases, &c."—about the true diseases of the coffee plant in Ceylon and India.

I have opposed Mr. Morris's system of sulphuring not jealously, as it was supposed by some persons, but by conscientious professional opposition, so as to avoid, if possible, great loss of time to planters by false hopes and expectations, knowing by long experience that one or two years' lost, in agriculture, is an irreparable disaster to many proprietors of estates.

In my conscientious endeavour I have failed even to be heard, I do not know when dispassionate consideration will allow me a fair and full hearing. My thanks are due to some impartial planters for having allowed me to show them what is the fundamental principle of my culture on steep lands, and it would have been of advantage to the planting community of this island, I think, if I had been allowed to prove my system fully.

To prove fully the above named great advantages, and prove particularly that the contiguity of the roots of your coffee plants should be obviated, so as to avoid further intermixture of the general infection, because the "root disease so alarmingly prevalent and fatal in some districts, and in some patches of every district" (*vide Ceylon Observer* of 31st January 1879), is due to the several causes explained by me already, and hence the ultimate death of the roots, and of course the death of the tree itself.

When the above points were to be secured at once, by one operation, and at a cost of Rs. 25 to 30 maximum per acre, as guaranteed by me, I am at a loss to understand how parties interested in the undertaking of coffee planting in Ceylon did not act in unity, so to allow a public trial on 100 or 200 acres of coffee, instead of rushing to sulphur, which is not a cure, and cannot be a cure in the case of the coffee plant. And believe me, had all the proprietors of estates paid one rupee per acre per annum, as suggested by me, the following would have been done since 1877, *viz*,

1st. Two experimental places of 100 acres each, in two different districts of Ceylon, would have been purchased, and full operations carried on.

2nd. A staff of five specialists engaged by me, for not less than five or six years.

After the cure of a plant, which has been affected by various causes, its vitality will tend to turn into too much foliage or too much bearing which of course, requires to be regulated, because the most important question is not merely the division of crop, but regulation in the production of the coffee trees.

They require to be regulated in the same manner that a good horseman regulates the proper speed of his animal, if he has to perform a very long journey. Indeed, if an imprudent horseman, having to perform a long journey of 1,000 miles, exhausts his animal before he has performed the first one hundred miles, it is almost certain then that horseman and horse will never reach their destination.

The case of the coffee tree in Ceylon and India, is exactly similar. Producers of coffee in Ceylon should endeavour to improve their production, and not let it go down, and not entirely turn their hope to cinchona the present 'King of the *Observer*, because it is far more probable that quinine will be before long produced artificially by chemists, than that caffeine will be."

Now, Mr. Editor, let parties engaged and interested in the coffee enterprize of Ceylon and India peruse carefully and dispassionately the above remarks and recommendations which I have quoted, and let them judge amongst themselves, if their valuable property (their estates,) does not require as much attention as their moveable labour (their coolies) and let them see if they can procure a better adviser and practical leader than the person I have referred to.

For our own interests, and before it is too late, let us consider this in

UNITAS SALUS NOSTRA.

CACAO IN NEW LAND.

(*To the Editor Ceylon Observer*).

DEAR SIR,—Cacao growers especially those who grow it in new land should endeavour to find a suitable and profitable product to grow in conjunction with it. Planted as it usually is, 12 feet by 12 feet, there is ample room to have some useful plant which might by its produce, for the time being, pay until the cacao came into bearing. After a very careful inquiry I have come to the conclusion that cacao in this country bears little or nothing until it is three years old, when if well advanced it *may* yield at the rate of 1 cwt of prepared cacao per acre. Thus it is generally deemed prudent to strip from the tree, to induce it to more firmly establish itself in size and dimensions, for the cacao, like a jac, sowersopp, or other tree-bearing fruit from *old wood* produces more or less respectively in accordance with the larger or smaller dimensions of the tree. Thus it is absolutely necessary if one wishes to have large crops at an early date, to adopt such methods as are most likely to enlarge and spread out the older and matured wood. Nothing will keep this back so much as early bearing. As a rule the finer fruit is on the oldest wood close to, if not growing actually upon the stem itself. Indeed it is very doubtful whether even a four years old crop is as advantageous to a proprietor as waiting until the 5th year, when fully 5 cwts, an acre in fair soil may be depended upon. With judicious treatment, at the 7th year the cacao estate has reached maturity, and its crop then will depend very much upon the treatment it has received and the resulting growths and extension of its branches. Well-developed trees may at that age produce very large crops indeed, while those which have been allowed to bear young often hang back, giving only small quantities of produce, disappointing in their outturn, and keeping back the full powers of the trees.

The West India method is to have other plants growing between cacao until the fifth year, when the land is usually given up to it alone.

In Ceylon, those who have planted it up largely, have usually quincunxed a Liberian coffee plant in between the cacao, which so far appears to be the best plant suited to the position. Even Arabian coffee should do well so situated in localities above 1,600 feet altitude, and if not planted too close, possibly having the cacao among it may have a beneficial effect upon leaf disease, most of such pests being the result of growing large unbroken expanses of one species of plant to the exclusion of others, for all experience so far goes to show that even should the germs of the *hemileia* fall upon the cacao and adhere there, they would not grow, but eventually die. In this manner land planted up with two

products, one of them being coffee, would be far more likely to keep freer of leaf disease, than if growing coffee alone.

Having a useful plant growing between cacao trees would better enable the proprietor to sacrifice his first fruits of the cacaos until they had attained large and productive dimensions and would not injure them as their roots at that age would not have fully occupied the soil.

Another advantage of an alternative plant is, that if anything happens to the cacao, it is there to occupy its place. As far as my experience goes, I have no hesitation in saying that I have found Liberian coffee the best plant to grow between cacao, and as I have not the remotest fear of its failure in the European markets, having had the opinions of foreigners upon it, shall continue its cultivation steadily. Holland has now, as well as America, pronounced it superior in quality to the old Arabian kind, which superiority is simply that being stronger in flavour it bears more chicory. There is, too, every reason to believe that plants raised from locally grown seed will produce larger, stronger, and more productive trees, for those now growing in my nursery are darker in leaf, thicker in stem-and-what the original trees were not are free apparently from leaf disease.

PIONEER.

TROPICAL CULTURE.

TO THE EDITOR.

SIR,—The *Indian Agriculturist* being the special organ of tropical culture (both native and European), it is clear that all information published by such a paper is of the highest interest to those engaged in agricultural pursuits in the East. Indigo, coffee, tea, cinchona, are the chief Agri-Industrial undertakings in India, to which Europeans, in general in India, have devoted their attention, capital and energy: when rice cultivation has been and will be, always, the grand general culture of the natives from Cape Comorin to Afghanistan.

Much having been said, already, about the principal cultivations undertaken by Europeans in Ceylon and India, I consider it fair and just that something should be stated in favour of the grand culture of rice—on which depends the 220,000,000 souls of the British Indian Empire.

For the Scientific-Agriculturist acquainted with the *barbarous* cultivation of rice in India, there is no doubt, whatever, that such culture can be improved very much, for the interest of the native cultivators as well as for the interest of the country at large, because rice when very cheap, means abundance, and abundance means no famine price but prosperity. Before proceeding to explain the new method of paddy culture I recommend, allow me to express a hope, in favour of humanity and progress, that my new method for paddy cultivation will not be opposed; as has been the new method of mine for planting coffee and tea on the lands on steep hillside of Ceylon and India.

When routine and ignorance oppose progress, it is *easy* by demonstration to convince routine and ignorance. Indeed nothing is more conclusive than much higher clear profits—and by them routine and ignorance disappear entirely to make room for progress, for still more improvements, which by degrees amount to these wonderful ameliorations we see in our days, of competition in every branch of Industry.

But when it is *too-much-intellect* which oppose a new improvement actuated by selfish interest and speculation, then it is a much more difficult mattter to turn the stream of speculators who live on the inexperience of new comers in India and Ceylon.

This has been the fate of my new method in Ceylon and India, *i.e.*, powerful opposition so as to prevent new openings of coffee or tea on the principle recommended by me!

Of course if new comers to Ceylon and India were to invest their capital in making new openings, according to the last perfected agricultural method, *in preference* to investing in estates already washed away, and thus requiring expensive manuring and other indispensable operations, (so as to avoid further progressive wash of soil and manures) by which it is clear that the market value of existing estates will be disturbed.

That consequence has been the cause that strong opposition has been made against the Montclar method, and that the sulphur cure was advocated in opposition to the said Montclar method.

But that opposition has been a suicidal mistake for the interest of the *mortgagees* of coffee and tea estates, because it is clear as daylight, that a method having for special and principal object the prevention of soil, manures, &c., being *further* washed away, is a method able to improve and make no injury to any estate situated on steep lands, but in fact a method able to give by and by more value to existing estates. It is true that if some 200, or 100, or 50, or 25 tons, of humus per acre have been washed away already to the rivers or to the sea, the method Montclar will never bring them back! . . . But when there are many estates on which 100 or 50, or 25 tons of splendid arable soil, per acre, are still existing, is it not a calamity to allow them to be washed away?

Indeed it is a calamity, and a calamity due to the voracious and dishonest speculators who have, at last, been so well depicted by the Ceylon Press under the names of "Coffee Sharks"—and "Pilot Coffee Sharks."

Having been much disappointed and discouraged by the doings of the abovenamed "Sharks and Company" I beg to be allowed for the present to take leave of the coffee and tea planting questions in Ceylon and India, and devote my knowledge of tropical agriculture to the improvement of the grand culture of rice, from Cape Comorin to Afghanistan.

I.

The statement that—"The present system of native agriculture is both wasteful and barbarous" is indeed, perfectly correct. It is the very primitive system of agriculture which was carried out 3,000 years ago. The judicious and important remark:—"Wherever there is water stored and available, fifty per cent. of it is absolutely allowed to run to waste," deserves full consideration from the Government of India because wastage of stored water for irrigation purpose is a serious question. Now, the other points, as mentioned by me, being entirely agricultural, I have much pleasure to add some more information, to prove how "barbarous" the paddy culture, as carried on in India is.—

1. The native cultivator "keeps the terraces of his field from four to six inches under water, as otherwise weeds would grow apace and choke the paddy plants. It is, therefore, not because the paddy wants to be constantly supplied with water that the plants are allowed to stand with their foot in water until the corn begins to ripen, but simply to keep down the weed."

2. The above "to keep down the weeds"—is one of the causes of wastage in paddy culture. But another cause of wastage of water is the necessity of preventing the sheet of water becoming *hot*, or else the productive powers of the plant would be weakened.

3. But there is, still, another reason for wastage of water as much as possible, *viz*:—

(*a*) The native cultivator is not a scientific man, it is true, but he is a *good observer*, and he knows fully well, that the more he runs *renewed water* in his field, the better it is for his crop.

(*b*) He knows, not by *science* but by *experience*, that *running water* benefits his culture, when stagnant or insufficient water injures it. Knowing that, he therefore uses as much water as he can, and his so doing is, no doubt, disastrous (particularly in India) to a country dependent on irrigation for its general grain cultivation.

4. But notwithstanding such disastrous wastage of water, by keeping the terraces of his field from four to six inches under water, he precludes *air*, *light*, and *atmospheric action*, acting through the soil and on the roots of the paddy plants, which circumstance, alone, is an immense disadvantage for the production of crop.

In acting as he does, the native cultivator has three objects in view.

The first object is to prevent the growth of *weeds*, and thereby avoid weeding operations.

The second object is to moderate the *heat* of the water.

The third object is to give to the *roots* of the paddy plant, *the benefit* of the oxygen contained particularly in *running water*.

5. If for weeding operations, (which are made by children and women) the native cultivator was to allow 20 per cent. more in his actual labour, and he was taught to make use of capillary irrigation, as I propose, not only 50 per cent. of water at least, will be saved, but his crop in grain and in straw will be more than doubled.

Double crop in grain, double crop in straw, and 50 per cent. saved in water for irrigation purpose—*versus*—20 per cent. of additional labour for weeding operations, are things of interest, I suppose, to the Government and to the people of a country.

Paddy cultivators should be aware that by allowing free access to the soil and roots, of air, light, heat, atmospheric action, and sufficient water (not wasteful) by *capillary action*, the above highly satisfactory results will be obtained easily.

There is no doubt, that the above are considerations of the greatest importance the complete practicability of which I am prepared to prove experimentally to the people and Government of India.

Here what I shall have to contend with is, not the opposition of self-interested speculators, but simply the habit of routine of the generally uneducated native ryots, who are afraid to undertake any agricultural experiments, as failure might be their ruin.

It is evident, then, that in the case of the ryots, generally poor, it is the duty of a paternal Government to take the initiative.

Indeed the improvements suggested are absolutely necessary as a preliminary to the application of suitable manures and stimulants (natural or artificial.)

Under the present system of paddy cultivation, the soluble portion, the best part of the manure and soil, must be *dissolved* and carried off with the running water to be deposited elsewhere.

To avoid much of this disastrous waste, I propose to water the paddy plant by the capillary attraction of the soil (according to the degree of the capillary power of the said soil) by means of a system of small water channels; making provision for irrigating the whole surface of the field, *intermittently*, should the soil be deficient in capillary power.

It is impossible to demonstrate agriculture on paper, specially for a foreigner writing in English; and what I can do just now is to demonstrate on paper the principle on which my system is based as clearly as I can.

(To be Continued.)

A. MONTCLAR,
CIVIL ENGINEER,

Member and Professor of the Philotechnique Institute, I. N.

Ceylon, 10th January 1880.

CATTLE MANURE AND MANURING.

Chemical Laboratory, 190, *Kollupitiya-road*, 26*th November* 1879.

DEAR SIR,—I read the letters of your two correspondents of 13th instant and your article of 25th, on cattle manure and the ashes of the same. I also read part III. of Mr. Caird's article in the *Nineteenth Century* " on India, the land and the people," where he gives the result of Mr. Robertson's interesting experiment with cattle manure in its natural and calcined conditions. We are of course bound to suppose that Mr. Robertson has furnished us with facts. All that we can strictly infer from this individual experiment is, that in the particular kind of light soil dealt with, and cultivating a green fodder crop such as cholum, the ashes of cattle manure are nearly equal in fertilising power to an equivalent of the manure in its natural state. From your remarks on box feeding of cattle at Saidapet, I take it for granted, that when Mr. Robertson, or rather Mr. Caird, mentions cattle dung, he means the total excrements solid and liquid. If this is so, the experiment referred to is farther evidence in favour of a considerable potash ingredient being desirable in our artificial manures. You are of course quite right in stating that the nitrogen of cattle manure has always been considered of paramount importance by writers on agricultural chemistry; thus the late Professor Anderson says:—" In the management of the dung heap, there are three things to be kept in view:—First to obtain a manure containing the largest possible amount of nitrogen; secondly, to convert that nitrogen more or less completely into ammonia; and thirdly to retain it effectually." As Anderson's remarks on the second and third heads bear so directly on the questions you have raised, and as I rather think his work is now out of print, I offer you his views in his own words, though the quotation is rather a long one. After speaking of the nitrogenous foods by which the manure is enriched, he says:—" Although it may be possible in this way to increase the quantity of nitrogen in the manure, there is a limit to its accumulation, due to the fact that it is contained most abundantly in the urine, which can only be retained by a sufficient supply of litter. When that is deficient, the dung heaps become too moist, and the fluid and most valuable part drained off, either to be lost, or to be collected in the liquid manure tank. In the well-managed manure heap, the quantity of litter should be sufficient to retain the greater part of the liquid manure, and to admit of only a small quantity draining from it which should be pump'd up at intervals, so as to keep the whole in a proper state of moisture. Attention to this point is of great moment, and materially affects the fermentation. When it is too moist, or too dry, that process is equally checked in the former case by the exculusion of air which is essential to it; and in the latter by the want of water without which the air cannot act. The exact mode in which the manure is to be managed must greatly depend on whether the supply of litter is large or small. In the latter case the urine escapes and is collected in the liquid manure tank, and must be used by irrigation, and in some cases this mode of application has advantages, but in general, it is preferable to avoid it and have recourse to substances which increase the bulk of the heap, sufficiently to make it retain the whole of the liquid. For this purpose, clay, or still better, the vegetable refuse of the farm, such as weeds, ditch cleanings, leaves, and in short, any porous matters may be used. But by far the best substance, when it can be obtained, is dry peat, which not only absorbs the fluid, but fixes the ammonia, by converting it more or less into humate. . . . . Good peat will absorb about two per cent. of ammonia, and when dry will still retain from 1 to 1·5 per cent., or nearly twice as much as would be yielded by the whole nitrogen of an equal weight of farm yard manure. Peat charcoal has been recommended for the same purpose, but careful experiment has shown that it *does not absorb ammonia*, although it removes putrid odour, and though it may be usefully employed when it is wished to deodorize the manure heap, it must not be trusted to for fixing the ammonia.

' Much stress has been frequently laid on the advantage to be derived from the use of substances capable of combining chemically with the ammonia produced during the fermentation of dung; and gypsum, sulphate of iron, chloride of manganese, sulphate of magnesia, and sulphuric acid have been proposed for this purpose and have been used occasionally though not extensively. They all answer the purpose of *fixing* the ammonia, that is, of preventing its escape into the air; but the risk of loss in this way appears to have been much exaggerated, for a delicate test paper held over a manure heap is not affected; and during fermentation, humic acid is produced in such abundance, as to combine with the greater part of the ammonia. The real source of deterioration is the escape of the soluble matters in the drainings of the manure heap, which is not prevented by any of these substances, and where no means are taken to preserve or retain this portion, the loss is extremely large, and amounts under ordinary circumstances to from a third to a half of the whole value of the manure Manure, therefore, cannot be exposed to the weather without losing a proportion of its valuable matters depending on the quantity of rain that falls upon it. Hence it is obvious that great advantage must be derived, especially in rainy districts from covered manure pits. This plan has been introduced on some farms with good effect, but the expense and doubts as to the benefits derived from it have hitherto prevented the practice from becoming general. The principal difficulty experienced in the use of the covered dung pit is, that when the litter is abundant, the urine does not supply a sufficiency of moisture to promote the active fermentation of the dung, and it becomes necessary to pump water over it at intervals, but when this is properly done, the quantity of the manure is excellent.' Regarding the box feeding of cattle he says:—" Whatever objection may be taken to this system so far as the health of the animals is concerned, there is no doubt as to the complete economy of the manure, provided the quantity of litter used be sufficient to retain the whole of the liquid; but its advantage is entirely dependent on the possibility of fulfilling this condition."

In European agriculture the retention of the nitrogen is thus regarded of so much importance that the calcination of cattle manure for this reason alone (apart from its mechanical virtues) would never be thought of. But as we find in Ceylon that highly nitrogenous manures such as guano are avoided, it would seem that here the nitrogenous element in manures is not equally important, and conditions of soil and crop to be cultivated may in certain cases even justify the calcination of cattle manure to save carriage, though it would be well to be first satisfied that there was a fair percentage of nitrogen in the soil. It would be interesting to know if besides other climatic conditions, a greater abundance of ammonia in the tropical dews and rains has not much to do with the question. 'In Paris 1,000,000 parts of rain water contain 3·19 parts of ammonia. At Rothamstead there is an average of 1 grain per 14 gallons. The atmospheric supply of ammonia is intimately connected with the storing of nitrogen in plants.' Some facts on this subject would form an interesting commentary on the Surveyor-General's returns of the rainfall of different localities.—*Ceylon Observer.*

M. COCHRAN.

THE PONDICHERRY ARTESIAN WELLS.

(To the Editor of the Madras Mail.)

SIR,—Having seen, in a local paper, the report to the Revenue Board of the Superintendent of the Geological Survey on the Pondicherry Artesian Wells, I shall be glad to make a few observations on a subject so worthy the attention of Engineers, and of those interested in finding water for irrigation or otherwise. The " gushing wells" existing in Pondicherry cannot reasonably be classed in the category of artesian wells, as their delivery is owing to the waters of the Ponear and Gingee rivers penetrating into the strata of the valley where those rivers run, and at a higher level than that of the spot where the wells have been bored. Such would probably be the case in the valleys of the Cuddalum, of the Vellaur, and of the Cauvery. Here it is necessary to record the opinions of Messrs. Degousée and Laurent, the latter an able geologist, partner of the former, who is so well-known for the large number of artesian wells bored in nearly every part of the world. They say:—

" *Artesian springs in the alluvium.*—The alluvial formation is composed similarly to the detritic one, by *debris* and fragments from strata and rocks; it differs from the detritic formation by a more regular stratification, the *debris* stratified having very often no analogy with the surrounding formations. The alluvial formations are generally composed of sands, gravels, rolled pebbles, marles, and clays; old deposits are found sometimes on elevated sites, covering an extensive tract of country. At the times when great currents were in existence on the surface of the earth, the then existing valleys were filled up by alluvial deposits, which could be seen now covered by rich vegetation and culture, and in the middle of which water runs more slowly than heretofore. The pervious nature of the alluvial strata allows the waters to penetrate underground, and to follow a subterranean course, reaching tracts far from their original bed and, although concealed, the waters underground are submitted to the same variations as if they were above the earth. The springs are more frequent into the alluvial than into the detritic formation; in fact as the surfaces in the former are generally much extended, the waters could run very far into the permeable strata, which are often covered by impermeable ones. If there exist, at a long distance from the spot of the infiltration a place at a level lower, the water, owing to its tendency to equilibrium, will ascend into any boring made at such

place. The more important alluvial formations known are those of Holland, of the valley of the Rhine, and upon the shores of the Adriatic near Venice. In this salt locality, Mr. Pasini thinks that the thickness of the alluvial strata may be estimated at 400 metres. If one ascends the country from the sea up to the foot of the Appennines, he will observe that the country is composed of strata alternately pervious and impervious, that the first extends over a larger area, and absorbs a larger part of the water from the numerous streams which run across the country. It was from these observations that we concluded the certainty of successfully boring artesian wells into that alluvium (Guides Soudeur, by Degousee and Laurent, vol. I., page 322)."

Evidently this description of an alluvial valley, into which artesian springs may be successfully bored, is eminently adapted to the Ponear, Vellaur, and Cauvery valleys on this coast. The valley or basin of the Ponear in which Pondicherry is situated, is composed like the Venetian alluvium, of strata alternately permeable and impermeable. This valley extends over an area fifteen miles S. and N., and from the sea westwards, twenty-five or thirty miles. It has the form of a triangle, the basis of which is represented by the coast extending from Gunnimode, near Marcanum, to Cuddalore. These strata deepen eastwards at a very small angle and their outcrops could be seen westwards of Pondicherry. The waters of the Ponear valley penetrate the pervious strata of this valley, and follow an underground course, being confined between layers of impermeable substances. As the valley of the Ponear is rising westwards at the rate of two inches per mile, there is nothing to be surprised at, if, by boring at the lower part of this valley, the subterranean sheets of water will ascend and overflow the ground, if the boring made is conducted deep enough, and through the stratum superincumbent to the water. Such result is entirely in accordance with the theory of artesian wells. We do not admit that, in the Pondicherry wells, ascension of water is produced by the pressure of the superincumbent strata upon a volume of water confined. In behalf of my opinion, I will record the remark of F. Arago, on the same subject; he is certainly an authority on these matters. He says (Œuvre Completes de F. Arago, by Barrat, vol. VI., page 307).

"I will examine now a very odd hypothesis. The water sheet into which plunges the tube of an artesian well, is always confined between two mineralogic impervious strata. The one above supports the weight of the superincumbent strata, and this stratum, it was said, must of necessity sink, thus pressing down upon the water below; this, it is added is the sole reason of the water's ascension. Admitting for a moment such flexion existing, then there will be three cases to consider, *1st.* The stratum, giving way and sinking constantly, will reach a level lower and lower, till it comes in contact with the stratum underlying the water, *2nd.* Or that stratum will cease to sink, and will take a position of equilibrium, *3rd.* Or finally the stratum may have an oscillatory motion. But neither of these hypothesis could agree with the regularity of delivery observed in the artesian wells. With the 3rd hypothesis the delivery would be intermittent. With the 2nd, after having diminished little by little, the delivery will stop. With the first there would be sooner or later a cessation of delivery, particularly if the water sheet has a moderate thickness."

I have said that my opinion was that the waters of the Someicherry "wells" were those of the Ponear valley, and in proof of the probability of this, I can mention: *1st.* That the same "confervæ" which are found in the rivers of Ponear and Ariancoupan are carried under ground, and "gushed out" by the water of the artesian wells now flowing at Pondicherry, and are deposited upon the beds, and sides of the streams produced by the wells. *2nd.* That it has been observed, when any flood occurs in the river of the valley, the delivery at the wells is increasing. I should, therefore, conclude that the delivery of water by the Someickerry wells being produced by the head resulting from the difference of levels between the entrance into the ground and exit at the boring, such wells can be safely considered as "artesian wells."

There are now three wells at Pondicherry, on 56 metres deep, another 78 metres, and the last 85 metres. The borings made at these wells have shewn the existence of four different water sheets; since the beginning of the flow, the waters have had their delivery at the same rate. Now, as regards the idea which has led to the boring of artesian wells, I can say that by the examination of the country surrounding Pondicherry, and particularly from the alluvial nature of the valley, it was thought long ago, by geologists, that there was some chance of finding artesian water, by boring through that alluvium. I will say in passing that, to my knowledge, several borings were commenced in Pondicherry and neighbourhood, with that object in view. M. C. Poulain, however, is the first who has solved the difficulty. Before attempting his boring, he consulted all the available documents to elucidate the question, and was principally led to hope a successful result, by the perusal of Lieutenant, Newbold's pamphlet, by the report of Mr. Blanford (1862), and that of Messrs. Foote and W. King, (1864). Adopting the ideas of these gentlemen, M. C. Poulain, notwithstanding the opinions of several scientific persons of the locality, began his work, and was, after much difficulty owing to the need of proper tools and apparatus, fortunate enough to tap a water sheet overflowing his tube on the 9th September 1877. A few months after M. Poulain bored another well, and found an overflowing water sheet at 37 metres below. The success of these two wells opened the eyes of the most incredulous and the French authorities, acting upon M. Poulain's suggestions, entrusted their Chief, Engineer with the boring of a well at the Colonial Garden. This last boring traversed three different water sheets, artesian, one at 37 metres, another at 69·10, a third at 73·60, and the last at 79·56. From the quantity of the delivery of these three wells, I fancy that the water enters the bearing strata not far up in the valley. The hydrostatic pressure at these wells has been found to be about 1·80m. to 2 metres but the delivery is not in accordance with such head owing to the obstructions of the strata at the foot of the tube acting as a kind of filtering apparatus.

There are more artesian wells in process of execution at Pondicherry The most important is the one under boring by Government in the northern portion of the town. There the depth arrived at is 150 metres, without any "gushing water" having been obtained. It is to be supposed that the water bearing strata are dipping northwards. This seems to be confirmed by the geological theory which states that at the time a strong current was denuding that portion of the cretaceous formation which could be seen now near Valdaraur, this current had its exit on the sea near Marcanum, and it was then probable that the erosion of the tertiary formation at the foot of the Pondicherry red hills must have been very deep; and if such is the case, the alluvium must have a great thickness at the spot where the Government boring is being executed. In conclusion, I will say, it would be very important to have the Superintendent of the Geological Survey sent to examine the valley of the Ponear. His observations will have a great weight as regards the selection of sites for boring artesian wells, and this also could be said of the Vellaur valley and of the Delta of the Cauvery.

Yours, &c.,
A. DeClosets, C.E.

☞ Mr. King, of the Geological Survey has already started for Pondicherry to make inquiries regarding the Artesian wells.—Ed. *Madras Mail.*

THE JACK FRUIT TREE.

Sir,—I am told by some natives that the jack tree (Artocarpus integrifolia) will not bear fruit if reared in a nursery and transplanted, or at any rate the fruit it bears will be of bad quality and sparce; these people say that the seed should be sown where the tree is intended to remain. Others, again, tell me it does not matter at all—can you tell me which is right? I find the young trees bear transplanting well and thrive.

INQUIRER.

BAMBOO FOR PAPER STOCK.

TO THE EDITOR.

Sir,—A correspondent, who it appears has followed the controversy between Dr. King and myself in your journal, somewhat quaintly illustrates the position by quoting the story of "The two Knights and the Shield," meaning that the question at issue may be regarded differently from different points of view.

Be this as it may, it is useless now further to discuss, whether the system of cropping bamboo followed by Dr. King which has resulted in failure was, or was not the system I recommended.

Agreeing then in the new departure taken by Dr. King in his last Annual Report, wherein he puts forth three questions for settlement, the 1st of which, *viz.*, the formation of plantations is now under the able direction of Dr. Ribbentrop, Conservator of Forests in British Burmah; the 2nd question to determine is, quoting Dr. King's own words "Whether "commercial success can be obtained by collecting the immature "shoots of wild bamboo in the Forests, and carrying them to a Paper "Factory." Dr. King's third question of a Floating Paper Stock Factory, need hardly be further referred to, as I have shewn *that*, to be impracticable.

Judging then from the results I have already recorded in your Journal, as realised in British Burmah, there can be little reason to doubt that where floating facilities exist which happily generally occurs where bamboos abound, the young season shoots can be delivered (floated upwards of 120 miles) for Rs. 15 per 1,000, each thousand when crushed and dried being more than sufficient to manufacture one ton

of paper stock ; and I may add that I am credibly informed, that from other localities bamboos are procurable at much less than Rs. 15 per mille.

Due to the scarcity and high price of Esparto Grass, paper-makers are now paying from £6-10 to £7 per ton for the lowest quality ; we are reduced to eke out our supplies of raw material, to use straw, which imported in large quantities from the continent now commands from 55 to 60 shillings per ton, therefore just double the cost of bamboo, far inferior, however, in quality to the latter, and not yielding one-half the quantity of paper-making fibre, so far therefore as regards the mere cost of raw material is concerned, there is ample margin, and as regards quality, I can merely repeat that bamboo as a paper-making material is as far superior to Esparto, as Esparto is to straw.

It must be noted, however, that as with Esparto and other raw vegetable products, there exists great variety of quality, so with bamboo, (General Munro indeed in his Monograph on the Bambusaceæ published by the Linnean Society, describes more then 170 varieties or species of bamboo) therefore in collecting the young season's shoots from the native forest, not only must proper selection be made of the variety of bamboo collected, but careful supervision be exercised as to their quality, age, stage of growth, and other necessary points of detail ; some bamboos being far more suitable for paper-making material than others, but to their essential points, I will refer to in another letter, remaining, &c.

THOS. ROUTLEDGE.

WATTLES FOR TANNING.

(To the Editor of the Australasian.)

SIR,—Being anxious to collect some good seed, I am at a loss to know how to tell that which is the best. That black and golden varieties are he best I learn from the report of the Wattle Bark Commission, and while the broad long leaf enables the golden to be easily distinguished, nothing that I met with in the report enables me to distinguish the black from the silver or other varieties. I find that bark strippers are not at all agreed about the names of this tree. In my rambles I meet with a black bark, a green bark, a bark covered with white spots, rough and smooth barks—trees on creek banks, flats, and ranges. Excepting the golden the leaf in all appears to me alike. I have been told that a white flower distinguishes the silver wattle, and that the bark with which spots is silver wattle ; but I observe this latter bearing a yellow flower, while the white flower I have not seen at all. Pertinent to the information I am seeking, does it matter whether the seed be taken from a young or an old tree, from the bank of a river or mountain side, or a tree with extensive or sparse blossom on it ?

SCHOOLBOY.

The real black wattle, or true tanning variety, is the acacia delbata. The silver wattle, which is considered inferior to the black, is the acacia mollissima, which can be easily distinguished by the silvery appearance of the under part of the leaf, and the glaucous appearance of the bark ; the flowers of the latter are a bright yellow, that of the former a dirty yellow. The silver wattle is in general found on the banks of creeks, the black wattle on high dry ground. The seed, so long as it is good, may be gathered from any tree.
—ED. A.]

KOTEGURH NOTES.

SIR,—The weather has been dry. A few flakes of snow fell on Christmas day, and though we cannot say we had a white Christmas, still we can say that snow fell on this festival in 1879. On the 27th and 28th snow fell, here and through not much in quantity, yet it will do good to the roots of all kinds of vegetation.

The following is a comparative table of the past five seasons :—

	1875.	1876.	1877.	1878.	1879.
Rainy days ..	2	1	5	0	0
Snowy days ..	1	0	2	0	8
	Snow at the beginning : dry during middle and to the end.	Dry.	Tolerably dry for the first three weeks : wet towards the end.	Very dry, wheat and barley stunted.	Dry during the first three weeks : slight snow, about 2 inches towards end.

Wind N. E. and N., the latter bringing down the snow. Atmosphere still continues very brilliant.

The thermometer (Fahtrenheit) hung in an open verandah W. aspect ; averages 41° in the morning, 47° in the evening—highest 50°, lowest 35°. In the open air the thermometer is about 8 degrees lower during the night. Sun rises about 7-10 A.M., and sets (*i.e.*, its last rays depart from the peaks of the snowy range) about 4-45 P.M.

Subjoined is a comparative table of the averages of the past five years :—

	1875.	1876.	1877.	1878.	1879.
Wet days ..	93	91	91	82	94
Haily " ..	3	5	10	11	9
Snowy " ..	5	7	7	4	8
Days on which moisture fell..	101	103	108	97	111
	Dry spring, suitable for cereals, though unsuitable for tea. Wet towards end of year.	Dry spring : unsuitable for tea. End of year dry.	Wet spring, suitable for tea. Rainy season very moderate, and therefore bad for tea. Wet towards end of year, about 60 inches of snow fell.	Mild and dry spring, wet in May, retarding growth of cereals. Wet August, good for grass crop. Dry autumn and to end of year.	Very dry up to the middle of May, causing thousands of tea-plants to dry up and die. Rainy season very wet, especially in August. Dry autumn and so to end of year.

The above averages give 90 1/5 rainy days, 7 3/5 haily days, and 6 1/5 snowy days as the annual fall of moisture. The longest period of nearly continuous drought was from September 23rd, 1878, to 30th May 1879, for although moisture fell on 37 different days, yet the quantity, each time, was so small that it was almost inappreciable ; the snow was especially deficient in quantity, hence the ground derived but little benefit when it melted, as there was barely sufficient to penetrate into the ground deeper than a couple of inches.

The average temperature (taken at sunrise and sunset) for the year is as follows :—

	January, February, March.	April, May, June.	July, August, September.	October, November, December.	Year.
Monthly Temp.	43°-51°	62°-69°	65°-69°	47°-54°	54°-61°
Do. Max.	64°	80°	76°	68°	80°
Do. Min.	36°	48°	59°	35°	35°

the thermometer (Fahrenheit) was hung in an open verandah W. aspect 6,400 feet above sea level. In the open air the thermometer would be about 8 degrees less during the night. Out in the sun in summer, it reaches to 138°.

The mean temperature at Assam is 77°, at Dehra Doon 70°, and Kangra 69°, the two latter places being found just cold enough to allow the tea plant to flush sufficiently, to enable a moderate income to be realized without any risk of climate. The mean temperature of Kotegurh is 57°, evidently much too low for the profitable cultivation of the tea plant.

The pretty little blue forget-me-not still continues in blossom, the yellow cistus has just come into flower in warm situations. The box tree is also in blossom. Mistletoe (vern. *ris*) is in berry, this parasite grows chiefly on the apricot and peach, it is also met with on the walnut, pear, poplar, olive, elm, and, rarely on the horse-chestnut, alder, oak, mulberry, and hawthorn ; in some places it is given to cows in winter, to increase the supply of milk, so that it is useful for another purpose than mere flirting, under the point of view adopted by so many young ladies concerning it ; I do not recollect seeing it in the plains, though I have seen it up at Narkanda and neighbourhood which is about 9,000 feet high. The holly tree (vern. *kaderu*) usually has berries (red) during this month, but this year I have not noticed any ; I saw a few green berries on one tree, in November, but they never reached maturity ; sheep and goats eat the leaves.

Green parrots migrate towards the plains during the early part of the month. The white-necked laughing thrush is now met with. Painted partridges fit for the table, and are very good eating.

Rats still continue very numerous, the frost not having yet been sufficiently severe to kill them off, or at all events get rid of a large portion of them.

The villagers, during the beginning of the month, gave their last ploughings, principally in the fields just previously cleared of the Amaranth (vern. *batu*) and hill potato (vern. *pahari alu*). They are also, while the weather is fine, continuing to cut and stack hay for fodder for their cattle, and collect pine leaves for bedding. Ropes are now manufactured from the little plots of hemp grown near the houses and brought round for sale : they are about ½ of inch in diameter, 30 feet long, and composed of 3 strands, and cost one anna each ; they are merely hand-twisted. Manure is being carried out to the wheat and barley fields, for a top dressing ; as stated last month, this is done as much as possible before the snow falls, so that when the latter melts, it may carry the manurial properties into the ground for the benefit of the crops ; even if the manure has to lie for a month, at this time of the

year, it receives no harm, as the weather is so cold that no exhalation (or if any, only to a slight extent) occurs.

Food grains continue dear, wheat 8 seers (1 seer=2lb. av.) per Re. in bazaar, 10 seers in the villages, unground; barley 10 and 12 seers, scarce; Indian corn about the same.

An experiment has been made with growing Chinese sugarcane, the result tolerably satisfactory, shews that the production of saccharine matter depends on elevation, that whereas it yields none in the plains, it does so up here (6,400 feet above sea level), and judging from this experiment, I should consider an elevation of about 4,500 feet to be highly suitable for a paying yield of good saccharine juice. It ripens between the middle of October and end of November.

In the garden we have still snap-dragons, petunias, lobelias, pinks, nasturtiums, wallflowers, double and single chamomiles, candy creeper, mignonette, coreopsis, candy tuft, daisies, and sweet alyssum in flower. Some of the geraniums put into grass casings last month have flowered quite unexpectedly. Hyacinths, in pots on verandah, are sprouting; carnations flowering. Exotics, in pots, are now being put under cover to save them from the frost at night.

The chief operations in the garden are pruning, cleaning paths, opening drains, manuring.

G. P. P.

Kotegurh, Dec. 31st, 1879.

The Indian Agriculturist.

CALCUTTA, FEBRUARY 2nd, 1880.

WELL IRRIGATION.

IRRIGATION as a means of improving our crops has lately occupied the attention of those Government officials more immediately concerned with agriculture, and for the time, the subject of irrigating from wells, has been discussed rather fully. It would be tedious to our readers were we to go over the entire literature that has appeared on the subject, including the interesting report of Mr. F. N. Wright, B.A., who was detached on the special duty of inquiring into the whole question, and the able Minute by Sir A. Clarke, with the practical suggestions of Mr. E. C. Buck and others. We will notice first the arguments for and against well irrigation, and next, the best mode of accomplishing their construction.

The first point to be ascertained is the value of water for irrigation purposes, and in spite of all that has been said against it, we must give our adhesion to the opinion that the use of water is of great service. We have been repeatedly told that the continued use of canal water has been steadily washing all the nutrition from the fields, but a little reflection will show that it is the abuse—not the use—of the water that has brought this about where it really exists. The mofussil resident does not require to be told that our system of using the canal water, is one subversive of all ideas of common sense. The rayat asks the chuprassie to turn on the water to his fields; this is done, and the water flows on and floods the entire area, to an extent undreamt of in the ordinary operations of Nature. At least twenty fold the quantity needed is used, and it is natural to expect that the excess on its way riverwards again, should carry away much that is valuable. It should not be forgotten that at each watering of a field, a depth of three feet is sometimes used; and that this is very much in excess of the ordinary rainfall. One watering by Nature does not usually exceed one-third of an inch. This waste of water is brought about by the system of charging so much per acre, instead of so much per inch in depth or per 1,000 gallons. There are of course difficulties in the way of a more exact mode of charging for water, and we may yet come to see the use of slightly increasing the land revenue where water was available, and thus having no separate charge at all, making all pay, who can have the use of it, and this whether they use it or not. Then it should be distributed in a sensible manner, and so as to make it impossible that it should be wasted, or that the land should be destroyed by it. It is now used at too long intervals; whereas it ought to be used more frequently and sparingly. In this the well will have a great advantage over the canal, inasmuch if the rayat prefers an excess of water, he will have to bear the expense of lifting it, and this he will not be so foolish as to do, the more so that he knows perfectly well, that a smaller quantity frequently supplied, is much more beneficial than thorough floodings at longer intervals. Two great objections are urged against irrigation from wells, and these are the absence of silt in well water, and the excessive cost of the system. These objections ought not to be permitted for a moment to interfere with the proposed action in the matter. Doubtless the water from our rivers, contains in solution much that, is valuable, hence the superior nature of alluvial soils, at the same time it must not be overlooked that the great object of using water at all, is to help in reducing the food constituents already in the soil, or placed there in the form of manure, to a form in which they become available for plant food, and this well water will do much more satisfactorily than canal water, and for many reasons. It will not, as a rule, be used in excess, but as it may be required, and this we consider one point gained, again, the agitation of the water consequent on its being drawn from a considerable depth, will ensure its æration, another point of importance, but the greatest benefit to be credited to well, as against canal irrigation we take it to be the more frequent waterings the land will get, and the small quantity of water that will be used at a time. And as to cost, the estimated cost of each well is put at Rs. 600, and the supply of water sufficient for 50 acres. This means a capital of Rs. 12 for each acre, which represents at 5 per cent. an annual charge of say 9⅗ annas. To this will have be added the cost of raising the water, all this would ultimately have to be borne by the cultivator, still we do not think it would amount to so much as he now pays for canal water. The experiments instituted by Mr. Wright, were made in the neighbourhood of Cawnpore, and we will take the canal charge of the North-Western Provinces for purposes of comparison. The total area of land irrigated in those provinces in 1878-79 was 1,735,978 acres, and the gross revenues from the canals was at the rate of Rs. 2-11-4 per acre irrigated, and we do not imagine that well irrigation would cost any more, another point that must not be lost sight of is that these wells being *pucca* would be easily kept clean, and pure water would always be available for drinking and cooking purposes. At present where rivers are not at hand, the water from filthy pools and *kutcha* wells is used to the detriment of health.

How are these wells to be constructed. Three ways are proposed. Government is advised to advance money to the cultivators or to the zemindars, or to construct the wells on State account. The latter seems the most advisable mode of carrying out this great work. Let the State construct walls wherever needed, and increase the revenue charge to such a rate as may be deemed sufficient to meet the extra cost of these wells. An addition of 12 annas per acre to the jumma will suffice, and the separate canal charge will be got rid of entirely. We do not anticipate that the rayat will raise any objection to this charge, as he will be provided with a plentiful supply of water for all purposes, whenever he may desire to use it, and not as is too frequently the case with canal water, when he chooses to bribe the departmental understrappers, and he

will be freed from one visit of the tax-collector. Separate charges for each item for which he is taxed are made on separate occasions, and each is made the occasion for further extortion by the putwaree or his chuprassie, or by both most probably. The charge added to the Government demand, added to his own subsequent expenses in raising the water will not amount to so much as he now pays for his intermittent supply. This latter portion—his own expenses—he does not reckon very highly, as he has his bullocks at any rate, and by a little judicious management can so arrange his work that the water raising will not interfere much with the ordinary work of his cattle. One point in levying this charge is worthy of attention, and it is this. The charge should not be made on the area irrigated by the well water, but on the area irrigable by it. The wells are not to be made for the rayat's convenience, but for his use, and it must be made his interest to use the water freely; with canal water the case is different. If one villager does not desire to use it, there is presumably more left for others, and thus the Government Canal Revenue may not be so very fluctuating after all, but with well water it is different, if a rayat declines to use the water in the well on his land, in many cases no other will be able to do so.

We trust soon to learn that some extensive and important district has been provided with these wells,' that the experiment may have a fair trial, and if successful, the speculation ought to pay, or the money can be had for four per cent., while the returns will be about five, thus allowing ample margin for collecting expenses.

FOODS, AND FEEDING STUFFS.*

THE blood has been compared to a river, bearing on its tide the imports from other countries and setting them down at intervals along its bank, and at the same time exporting from the whole area which it drains, materials given in exchange for those received. More correctly speaking, however, the blood flows over, and comes into the most intimate contact with every particle of the living body; and it not only takes up and ultimately carries out of the system the waste produced in the varied processes and operations of life, but at the same time it lays down wherever it flows, new material to build up and maintain the body in health and vigour. To repair this constant waste, and to supply the blood with materials to enable it properly to discharge its functions, food of a suitable kind and quality must be supplied.

Foods have been classed in various ways as 1st, flesh-formers, albumin, caséin, fibrine, gelatine, or proteids which always contain nitrogen; 2nd, fat-formers, fats, oils, &c., which do not contain nitrogen, but consist only of carbon, hydrogen, and oxygen, and 3rd, heat-producers, starch, gum, sugar, or amyloids, these like the fat-formers are destitute of nitrogen.

The distinctions between fat-formers and heat-producers is probably one which has no existence except in books; the truth seems to be that all foods are heat-producers; and that while those substances classed as fat-formers produce fat more rapidly than others, both proteids and amyloids assist in the process, and are in reality fat-formers, though in a lesser degree than fats and oils. Proteids are essentially necessary not only to produce muscle, but to repair the waste of nitrogen thrown off from the body in ammonia (H_3N). This class of food contains nitrogen, which is absent in the others.

Foods have also been classed under the following six heads:—

1st.—Water.

2nd.—Heat-giving, such as starch and sugar.

3rd.—Oil or fatty matter.

4th.—Flesh-forming material, gluten of wheat, legumen of peas, &c.

5th.—Ash or mineral matter, such as phosphates and carbonates, &c.

6th.—Woody fibre though chiefly indigestible, gives bulk to food.

1st. The importance of water as an item of food has in these latter days come to be regarded with much greater attention than formerly. The diseases that may be induced, and the mischief that is wrought by impure unwholesome water, contaminated by unspeakable abominations, is being more generally recognised and partly guarded against. That much yet remains to be done, even amongst highly civilised and wealthy communities is well known, and we rather fear that cattle and live stock of all kinds have yet to a very large extent to benefit by an adequate supply of wholesome water. The horse and cattle ponds of rural Britain and Europe generally, and the multifarious abominations of tank and nullah water in India are well known. Water is one of the most important articles of food for stock of all kinds; hence the advantage of turnips and other root crops for live stock. "Root crops" contain a very high percentage of water—in round numbers about 80 per cent. which has passed through the laboratory of Nature; and is of the wholesomest, sweetest, and most suitable kind. In turnips and other roots, cattle, in addition to this large percentage of water, receive about 20 per cent. of proteids and amylaceous substances. Drinking troughs for stock arranged to avoid the possibility of defilement from the excrements of the animals, and the mud carried into their drinking water by their feet and legs and stirred up by the animals entering the water, are highly desirable.

2nd. Heat-giving materials are present in all foods in greater or less abundance. The colder the climate or the season, the more of this class of food-stuffs will stock of all kinds require. If stock are exposed to the rigors of winter, or badly housed, they will require more heat-forming food, and be more subject to disease, so that in the long run it will be found a wise economy, properly to house and shelter farm animals; so that during great heat, or the chill of winter, a suitable temperature and protection may be attained, while at the same time the ventilation and sanitation of their surroundings are duly attended to.

3rd. Foods containing starch and sugar not only produce heat, by their combustions in the body, but they also produce fat. Oils and fats on the other hand are specially suited to produce fat, while at the same time by their oxidation in the blood they evolve heat. An animal, however, can as a rule take on fat more readily from substances rich in fats and oils than from compounds not fatty in their nature. For fattening purposes it has been estimated that a pound of fatty matter is equal to two and-a-half pounds of starch or sugar. Linseed (flax-seed) contains about ⅓ of its weight of oil; and when properly prepared and used, is one of the most rapid fat-producers known. The seeds boiled to a jelly, and mingled with chopped hay or straw, a little crushed oats, a little salt and cold water, make a bulky, highly nutritious and palatable feed. This method of preparing and using linseed has been recommended by a Veterinary Surgeon of very wide experience in England, who had ample means of verifying the results attained by this use of linseed. Oil cake or linseed cake is manufactured by extracting the oil by pressure in rolling mills. The residue or cake obtained contains about 12 per cent. of oil, and sells as high as £13-5 per ton, in the English market. Oil cake formed from linseed and free from adulteration, is perhaps one of the best substances that could be used for fattening. When used in excess or injudiciously, like all other foods, natural or artificial, it produces derangement of the digestive organs.

Rape seed is pressed in a similar way to linseed, and colza oil extracted. The residue, rape cake contains 11 per cent. of oil. Rape cake is cheap, compared with linseed, it does not however seem to "agree" with cattle or sheep so well as oil cake; and besides it has sometimes been adulterated with wild mustard (*Sinapsis Niger*) which produces inflammation of the bowels, and in some cases death. Many valuable animals have been lost by the injudicious use of this and other cakes. It is an easy matter to determine if the cake be adulterated. Make a small quantity into a paste with water; the characteristic smell of mustard will reveal itself if present. All danger from this source may easily be avoided by procuring the cake from some respectable dealer, who will guarantee its purity, and whose interest it is, that his wares should be comparatively, if not absolutely pure and wholesome.

In this connection it may not be inappropriate to quote the results arrived at by the late Professor Anderson, Professor of Chemistry in the University of Glasgow, and chemist to the Highland and Agricultural Society of Scotland. The following is an extract from a lecture delivered by the Professor at a meeting of the Society of which he was chemist. "During the past year (1867) I have found "bran, grass seeds, carob beans, French nut cake, and "a variety of other seeds, in oil cake of British manufacture. "Many of these are undoubtedly due to the inferiority of "the linseed used. For cargoes are often met with, con- "taining not more than 60 or 70 per cent. of actual linseed, "the remainder being the seeds of weeds, and in such cases "the manufacturer is able to shelter himself behind the "statement that he added nothing to the linseed; but in "other cases there can be no question about the deliberate "addition of the extraneous substances. This is always "the case with bran, carob beans, nut cake, and the like; "and in one case I was able to trace the fact, that French "nut cake had been brought from Hull to an oil mill in "one of the large towns of Scotland, where it was ground "down and mixed with oil cake."

Cotton cake is obtained from the seeds of the cotton plant. Made from the whole seed it contains 6 per cent. of oil, probably more. When first introduced as an artificial feeding stuff, the husk of the seed was unbroken because the seed had not been ground. This caused considerable loss, for the indigestible husks frequently lodged in the bowels, and caused inflammation and death. Deprived of its husk, it is now known as decorticated cotton cake. It contains about 10 per cent. of oil, and answers very well when cattle are first put up to fatten; but as they increase in weight, practical results seem to point to the fact, that no cake pays better than oil or linseed cake. During the year 1874, the best brands of decorticated cotton cake brought as high a price as £10-5 per ton.

Palm nut meal when the animals well eat it, is unrivalled for producing a large increase of milk or butter. To the bulk of animals, however, it is not usually palatable, but it may form one of the articles in a judicious mixture which the agriculturist who has an intelligent understanding of the merits and properties of food-stuffs may safely be left to make for the use of his own animals. It is much cheaper than linseed cake being only about £8-10 per ton.

Cocoanut meal is, like palm nut meal, valuable for its milk and butter-producing powers.

4*th*. Flesh forming materials must form a part of all feeding stuffs, whether natural or artificial, if the animal is to be kept in health and condition.

The proportion of proteids necessary in food-stuffs will vary with the waste of tissue. Hard-wrought animals require a large proportion of flesh-formers to make good the tear and wear of muscle nerve and viscera. The judicious use of maize as feeding for hard-wrought horses, and the good result obtained in fattening from the careful employment of Indian meal, ought probably to be better known. Disease, irritation, or a restless disposition, as well as irregularity in feeding, increase very much the waste of protieds in the system. A sheep in "rot" (liver disease) produces less mutton, and of an inferior quality, than out in health. A restless cow thrives worse than one of a gentle disposition. Regularly fed cattle always thrive best, and at least cost, provided they get sufficient exercise, are kept comfortable and sufficiently warm to prevent either undue perspiration or the dangers that may follow chills. The quieter that cattle "put up to fatten" are kept, the greater weight of beef they are likely to lay on from a given quantity of food-stuffs. These short general statements common place and trivial as they may seem, are, it seems to us the foundation principles, some of them at least of the management of stock.

5. The importance of the mineral constituents of foods cannot, we think, be too much insisted on. There must be phosphates and carbonates to form bone, or the legs of pigs, sheep, and cattle will give way, and the general health of the animal will suffer. The use of common salt is far too little known, or if known, then not practiced. Breeders of stock of all sorts would do well to provide their farm animals with salt, pigs and horses can have it in their *mash*; and cattle can have rock-salt to lick. The addition of salt to food, is as beneficial, and can be relished as well by farm stock as their owners; and tends to prevent disease, as well as supplies a most important food constituent. All foods, whether natural or artificial, should have salt added to them. The other mineral constituents necessary to build up a healthy frame, are present usually in sufficient abundance in the various food-stuffs supplied to stock, whether natural or artificial.

The question as to the methods of feeding and the proportions of feeding stuffs best suitable for farm animals, is one of the highest importance, and forms a series of the most difficult problems within the whole range of farm economy. Minute and elaborate experiments have been carried on by chemists, physiologists, and others, who in addition to their scientific knowledge have exhibited a masterly grasp of the practical details of farm management. The details of these experiments are very well worth the careful study of the professional agriculturist; but it cannot, we think, be too frequently insisted on, that even the very best experiments conceived and conducted with the greatest care will frequently result in disappointment; because the sum of the conditions necessary to produce desirable results, are sometimes beyond the power of the experimenter to bring together.

The intricacies of the problem of the breeding and rearing of farm animals—so that at the least possible expense, and in the shortest period of time, the greatest and most nutritious weight of pork, beef, mutton, fowls, milk, butter, &c., can be placed in the market and command a ready sale—are of a kind that demand ceaseless vigilance and the constant supervision of trained observers. The *breed*, *age*, and *constitution* of the animals are each of them, matters which the agriculturist should study and provide for; and due provision has to be made for the evils that follow from the extremes of *climate* or *season*; and any advantages these may offer, seized on and made available for the general purpose in view. The course of feeding or treatment suitable for one breed may not prove so successful with another. The various breeds of farm animals differ as much perhaps as it is possible for animals to differ, and yet retain the same general characteristics.

The causes of the production of these breeds and varieties may generally be classed under two heads: 1st, Natural Selection. 2nd, the interference of man conscious or unconscious; and one of the leading results to be sought after unceasingly by breeders and rearers of farm stock of all kinds, is to produce a race or breed of animals which, while inheriting the general qualities of the species or genera to which they belong, shall possess in a marked degree, and unite in *one* breed or class of animal the special qualities inherited by sire and dam. How successfully this has been accomplished is visible in the improved breeds of all animals. Some of the dangers resulting from what we may venture to call *high breeding,* we pointed out in our remarks on the general treatment of farm animals.

EDITORIAL NOTES.

We have lately been testing a new plough made by Mr. Wm. Martin, Phuppoond Indigo Concern, Etawah. When it was first brought to our notice, it struck us as being the very thing that was wanted, and a subsequent trial on the field confirmed this impression. We had it tried the other day, and compared it with the work done by sundry other ploughs of recent make, as also with the common village plough, and during the whole time there never existed a doubt as to the great superiority of the new plough. The villagers who tried it, were in perfect raptures about it, and the Bengalee is not as a rule, very demonstrative. They were loud in praise of it, as it entailed very little work on their cattle, and besides making a wide furrow, it turned the entire sod upside down. Mr. Martin has wisely steered clear of glaring innovation; he has simply taken the common country plough, and exercised a deal of common sense, and experience of Indian cattle, in effecting a very slight alteration in the share, which he continues upward with an eccentric curve, thus forming the mouldboard, which inverts the sod without any perceptible effort. The advantages it has, are many; we may enumerate a few.

1. It is not a new plough in the sense of an innovation, and is therefore not an eyesore to the rayat.
2. The construction is of the simplest, and it can be made or repaired by any village carpenter and smith.
3. It costs little, Mr. Martin, we are told will be able to sell them at about Rs. 4 each.
4. The draught is exceedingly light.
5. The plough itself is light, weighing only 13½ seers.
6. The ploughman can twist the bullocks' tails, an important item in his (the ploughman's) estimation.
7. It does its work so thoroughly that one ploughing will do as against four of the country plough.

There are other advantages possessed by this plough, but let these suffice. We understand Mr. Martin is taking out a patent for the invention, and if the obtaining of a patent is contingent on the article actually possessing advantages, he should have no difficulty in securing it.

The Punjab Agri-Horticultural Society has closed a busy season, that of 1878-79 having resulted in a large distribution of fruit trees, which, if continued, cannot fail to have a beneficial effect on the future of the province. It does seem strange that, with such a climate as prevails in the Upper Provinces generally, fruit and good vegetables should be so scarce, but such is the case. Visitors to Calcutta from those provinces, express their astonishment at our supplies of vegetables, whereas with one of the finest climates in the world, they themselves should grow everything necessary for table use to perfection. As an instance, showing what can be done, we have known a gentleman cultivating peas all the year round, although the *malees* persisted in deprecating their growth except at the usual season. All the extra treatment they required was, that during the rains, they had to be protected by a slight covering of mats to prevent their being beaten down. At present there are no fewer than 1,436 trees bearing fruit in the Society's gardens. And during the season the distribution amounted to 3,708 fruit trees and an immense number of plants, shrubs, and flowers. A good deal of attention was devoted to the raising of vegetables, the object being principally to provide a supply of acclimatised seed, and in this the officials report success. Of peas alone nine maunds were raised, and have been kept as seed for the following year. The Garden school is an interesting feature in the Society's work. There are 15 boys attending it, and they are taught practical gardening and a smattering of English, sufficient to enable them to read the names and numbers of the plants.

The experiments with cusco maize do not seem to have been successful, and this may be said generally of the trials made in different parts of the country; neither did success follow the trial of Bamieh cotton. This is much to be regretted, as this variety is a great improvement on the indigenous class of cotton, and had it been found to suit our climate, it would have proved an additional source of wealth to our agricultural classes. Besides, our cotton industry is languishing, and we require a new infusion of seed by way of improving the *jat* of our indigenous plant.

A good deal of attention has lately been bestowed on the advisability of giving prominence to the value of the ground-nut as one of our agricultural products. This nut is valued as an article of food in many parts of the world, notably in Spain, and in the United States, but is only cultivated here to a very limited extent. And this indifference is all the more astonishing when we reflect on the difficulty we frequently have here, in providing food for the people during the times of famine, &c. It has besides other good qualities; for instance, a good quality of oil, suitable for soap-making, is extracted from it, and the refuse is capital cattle-food. It does not cost much to cultivate, and the returns are liberal. In a district in the Berars 259 acres were sown, and the return was at the rate of 800lb. per acre. If an acre can produce 2,240lb. of food for human beings, the plant ought to win its way among us. The food is of a sort agreeable to the palate, and from the quantity of oil it contains, it should be nourishing. The quantity of oil already obtained has varied from 33 to 50 per cent., and the cake which remains has been found quite as nutritious as linseed cake for cattle-food. An analysis of the nut, with a view to its being valued as food, shows it to be "richer than lentils in flesh-forming constituents, while it contains more fat and more phosphoric acid than lentils or peas." The present cultivation in India amounts to:—

Madras ...	... 31,632 acres,
Bombay ...	... 70,350 „
Bengal ...	... To a very limited extent,
North-West Provinces	... Very little grown,
Punjab ...	... Almost none,

and in proportion in the other districts of India. The consumption of this article in France alone is 111,443,366 kilogrammes, equal to about 110,000 tons, 92½ per cent. of which she imports from the western coast of Africa, and there is nothing to prevent India taking a leading part in this trade.

Sundry experiments have lately been tried in Queensland Australia, in the cultivation of rice, and so far they have been very successful. In October, corresponding with our April, a crop was sown, and reaped in the following January. Immediately thereafter the fresh seed was sown, and a second crop reaped in April. Thus the land produced two crops between October and April, or in six months, the quantity of grain aggregating 68 bushels per acre. As the bushel contained 50lb., this represented a total production of 3,400lb. per acre. How, then, does India look with her average of 1,200 to 1,500lb.? It seems that with the finest climate for agricultural purposes, we are allowing every other country to go ahead of us. Our cotton cultivation has fallen to a very low ebb indeed, so far as outturn is concerned, this latter being about one-fourth of that of America, and now we are likely to be beaten by Australia in a grain which is peculiarly an Indian produce. Extensive tracts of land exist in Queensland suitable in all respects for this cereal, and from the known energy of the colonists we may conclude that a large trade will speedily spring up. It seems only a few years since we heard that the cultivation of the vine was being tried on a commercial scale, and now we

occasionally read of the near prospect of Australian wines competing with those of France, Spain, and Germany. In this country an extensive system of irrigation is necessary for the successful growing of rice. In Queensland this is not required; the soil is good and thoroughly suitable, and the moisture is obtained from occasional showers and heavy dews, and hence the cost of cultivation is materially decreased. Labour is more expensive, but the amount of work that can be done with machinery is great, and if labour be found to be expensive, the use of machinery will be resorted to, in order to overcome this difficulty; and while we are plodding along with our primitive ploughs and our cultivation of about three inches, these colonists will be turning up fresh soil to the extent of 10 to 15 inches, and producing two to three times as much per acre as us, at an infinitesimally increased cost, and thus we will find another branch of commerce taken out of our hands.

The Ceylon Planters' Association invited Professor Hughes to visit Ceylon, and make a careful examination of everything connected with their great industry coffee. He arrived in Ceylon in November 1877, and immediately made a tour through the island, collecting information and samples of soil, leaves, &c., and to enable him to complete his critical examination. His report is now published, and we have been favored with a copy. In it will be found all that a coffee planter need know of the scientific branch of his profession, the explanations and general remarks being particularly plain, and at the same time full. The section which treats of manure, and which covers the greater part of the book is exceedingly interesting, the most minute details of analysis being given. A chapter is devoted to the important subject of cattle-feeding, and a table given showing the value of manure produced from 32 different kinds of cattle food. It appears from this table that decorticated cotton seed cake stands highest, a ton of it producing manure worth £6-10, while a ton of carrots—which are at the bottom of the list produces manure to the value of four shillings only. The book, as we have said, is of peculiar value to coffee planters, but will also prove useful to all engaged in agriculture, and copies are we observe, to be obtained from the Secretary, Ceylon Coffee Planters' Association, Kandy.

The Report of the operations at the Bhadgaon Farm, Kandeish, for the year 1878-79 is to hand, and deals fully, very fully, with what has been done during the year. Some experiments were made with Hingghat cotton, which resulted in an average production of 69lb. per acre, which the Superintendent considers good. We can scarcely understand this, as a couple of paragraphs further on he describes a small plot which produced at the rate of 230lb. per acre. Surely 69lb. make a small outturn. In America, the average is close on 300lb., and although we do not look for such a large outturn here, where agricultural science is very backward, still we think that 69lb. per acre should not be called "good." The experiments made with Bamieh cotton were all failures, and this the Superintendent attributes to the soil of Khandeish being "too stiff," and "the heat and rainfall too severe." A series of experiments with jowari, has resulted in an outturn of 399lb., per acre on the average of four years, which "is considered a good fair crop." If, after several years' work, these experimental farms can only show a good fair crop, we fail to see any reason for congratulation. We imagine their object to be to show the ryot how to improve his farming, and how to raise much larger crops, and if they do not succeed in raising better crops than those called "good fair," we are forced to admit that they have failed largely in the object for which they were instituted. The Superintendent mentions a curious fact, *viz.*, that the students object to such training as would take them out of doors. How youths are to become practical agriculturists without instruction in the field is beyond our comprehension. And if the natives of this country wish to become good agriculturists, they must make up their minds to learn the work thoroughly.

During the year the farm was worked at a loss of Rs. 950, and no charge for superintendence is made, and yet we pretend to be astonished at the indifference of the ryots, who will not be induced to follow in the footsteps of these experiments. They are very conservative we know, but when the farms point out to them a palpably better *and more profitable* mode of working, they will not be slow to take advantage of its benefits.

We have been favored with a copy of the prospectus of the Maiji Exhibition and Horse Show, Khandeish, to be held in March ensuing, the opening day to be 1st March. The classification is particularly minute, and the prize money high. This should give all who care to compete a chance. For mares as high a sum as Rs. 100 is offered as a prize. Under the heading of agricultural products, every conceivable sort of grain, fruit, vegetable, and root is represented, and under "miscellaneous," a variety of articles are ticketed with prizes, as articles of clothing of local make, carpets, blankets, &c., nor are farm implements neglected, for we observe in the list carts of various sorts, and native field implements. We would direct the Collector's attention to the value of the maxim *Bis dat qui cito dat*, in connection with the rewards, as we are credibly informed that several prizes and certificates of honor obtained at the Katiawar Exhibition of 1877 have not yet been distributed to the anxious would-be recipients.

The Administration Report of the cotton department for 1878-79 is to hand, and while it contains much that is interesting, it does not offer food for satisfaction, or for much hope regarding the future. The small and irregular outturn is a cause of astonishment. In one district we find it 30½lb., and another 336lb. The average in the Bombay Presidency, including Native States is 37½lb., and how rayats continue to grow this fibre year after year, is a marvel to us. Cotton sells wholesale in Bombay at Rs. 224 per candy, which is 4 7/12 annas per lb., and we do not suppose the rayat gets more for his crop then 3½ annas; this means a gross income of Rs. 8 per acre. That this estimate is as nearly correct as may be, is proved by the return of average prices ruling in the different districts, which is 3 annas 8 pies per lb.

Notwithstanding the fact that isolated prosecutions were instituted under the Cotton Frauds' Act, it would appear that Indian cotton compares well with American in cleanness. In four bales American an average of 15 per cent. was lost in the manufacturing process from cotton to yarn, while in four of Indian the average was 14 per cent.

Mr. Hume, in his *Hints on Agricultural Reform*, relates an incident in the private life of late Lord Mayo, which indicates the true insight which the lamented Viceroy had into the condition of this country, when he resolved to set up a new Department of State to look after the interests of agriculture. Lord Mayo, he says, was probably the only Governor-General who had farmed for a livelihood, and made a living out of it. When he came of age, his father could not afford to make Lord Mayo any allowance, but he turned over to his son one of his farms to make what he could out of it. This Lord Mayo managed himself, and made enough out of it to enable him to attend Parliament regularly from after Easter to the end of the Sessions. The lessons of thrift and economy thus learnt by Lord Mayo in the management of a farm on a small scale, he turned to account in the government of an empire. He found India to be a vast estate of which the State was the landlord, and instinctively perceived that the salvation of the country chiefly lay in its agricultural improvement. He accordingly organised the department, and would have worked out its results in the way he had contemplated, had his life not been cut off in the midst of a most useful and honourable career.

Our correspondent in Johore writes as *Straits Times* as follows under a recent date:—"The traveller bound for any one of the now famous mountain ranges here is struck at the number of the pepper gardens and Gambier plantations he meets with, not only on account of their number but on account of the sightliness of some of them, more especially the pepper gardens, round about which hardly a single weed is to be met, and the plants being almost all in the most perfect trim and planted at regular distances of about six feet from each other. The Gambier plantations are also worthy of some attention, one sees the Chinese busily engaged in boiling the leaves and preparing the syrup into squares for the Singapore market; and to their credit be it said that of the many thousands who support themselves by this cultivation, the majority are orderly and strikingly industrious labourers. It is to be hoped that now Europeans are settling in the country, that the Tow-kays will

impress upon their men to deal fairly with the new settlers, from whom they will, in all probability, benefit in the shape of profitable employments."

THE *Monitor Sul-Mineiro* warmly advocates the general cultivation of the so-called Batata de Demarara (Jerusalem artichoke) because of its great ease of cultivation, its large yield and its wholesomeness. It does not require virgin soil, it suffices to plant pieces of the vine or stalk, it requires no after cultivation, as it takes possession of the ground completely, it yields three crops of tubers a year, and it needs no replanting, as sufficient small tubers and pieces of vine remain to renew the crop. In starch it is at least as rich as mandioca and is excellent food, above all when cooked, for domestic animals. Besides which, if suitably fenced, hogs can be allowed to dig for themselves and thus learn practically the g old maxim : "Root little hog or die."—*Rio News.*

A WORLD's fair is to be held at Krishnagurh in February next from the 12th to the 17th, in combination with an agricultural exhibition and cattle show. Besides the usual inducements held out to exhibitors of agricultural produce and machinery, animals and poultry, prizes will be offered for proficiency in athl etics.

A WELL-KNOWN arboriculturist, M. Alphonse Lavallée, Treasurer of the Société Centrale d'Horticulture de France, publishes in *L'Agriculture* the results of an attempt made by him to banish the terrible phylloxera out of the vineyards. In his immense plantation and tree-nursery at Segre, M. Lavallée has cultivated for some years a number of Asiatic vines, and these have been always steadily and, as he thinks, purposely avoided by the insect. Although the latter has been conveyed to other vines in their neighbourhood, it has refused to forsake the occidental vine for the oriental. M. Lavallée has sent specimens of these Asiatic vines to various persons and societies occupied with the campaign against the phylloxera ; but in almost all cases they have refused to have anything to do with them on account of the unprepossessing appearence of the twining oriental grape-vine, which some described as too exuberant and honeysuckle-like. On the other hand, Madame Ponset, the owner of the great vineyards of the Lande de Pomerol, accepted his presents and counsels; she methodically followed out the latter. She planted three species of Asiatic vines—the *ampelopsis acanitifolia* of Northern China, and the *vitis peterophylla* and *vitis inconstans* of Japan—in the immediate neighbourhood of plants peopled with the insect. Whilst the devastations of the phylloxera went on all round, three Asiatic immigrants throve prosperously and were externally unaffected. Madame Ponset, according to her adviser's counsel, next had the roots probed by three experts, all of whom reported that the vines were perfectly sound and free from the suspicious knotty swelling which is a symptom of the presence and operations of the phylloxera. M. Lavellée now proposes to graft the various French vines upon Chinese and Japanese roots.

A DIFFICULT ag ricultural problem is thus treated by the *Bombay Guardian* : A friend from the South of India was speaking to us the other day of the great benefit that had accrued to the fields in the famine districts from the respite which they had had from cultivation in the last two years. Such harvests as have appeared this last season have not been witnessed for a great many years. This brought to our mind the institution of a Sabbatic year given to the Jews by God, but of which they do not appear to have had faith to avail themselves. There can be little doubt that it would have been for the good of the fields, and consequently for the good of the people, if they had observed this command and allowed the lands to lie untilled one year in seven, providing for the necessities of that year in the six years of abundance. The Jews, as we said, did not observe this law, and after the lapse of about 420 years from the time of David, the Lord claimed the 70 years due him and carried the Jews into captivity for that period. Immediately after the six days' creation, God sanctified the seventh day, and the Sabbatic rest belongs to creation, though through man's apostasy it is at present deprived of it.

OUR readers will find the Index for last year's volume with this number.

HIMALAYAN LEPIDOPTERA.

II.

(Continued from page 11.)

LEMONIIDÆ.

Libythea, *Fabr.*

L. MYRRHA, *Godt.* This insect is most frequently met with near water, though I have taken it in many other places. It frequently settles on rocks and stones, often at the end of a dead twig, where it so exactly resembles a dead leaf that it is almost sure to escape observation. Expanse from 2in. to 2·1in.

L. LEPITA, *Moore.* Far commoner than the preceding. It is on the wing also from March to November, and has exactly the same habits. Expanse from 1·8in. to 2·2in.

Dodona, *Hew.*

D. DURGA, *Koll.* Met with everywhere throughout the year. I have taken perfect specimens as late as the middle of November. Expanse from 1·2in. to 1·7in.

LYCÆNIDÆ.

Lycæna, *Fabr.*

L. PHLÆAS, *Linn.* This insect is more commonly known under its generic name Chrysophanus Phlæas. It is a common insect throughout the N. W. Himalayas, occurring plentifully on grassy hill sides, in gardens, and in fact it is ubiquitous. Expanse from 1·2in. to 1·4in.

L. PAVANA, *Westw.* Not quite such a common insect as the preceding, but occurs in similar places, and also from early spring to late autumn. Expanse from 1·1in. to 1·3in.

Cupido, *Schrank.*

C. BÆTICUS, *Linn.* A very generally distributed insect, occurring commonly in the plains in the winter and in the hills throughout the year. It has a very rapid, jerking flight, but settles continually on flowers, &c. Expanse from 1·1in. to 1·3in.

C. DIPORA, *Moore.* This pretty little "blue" is common wherever there is grass, on hill sides, meadows, &c. It is on the wing from March to November. Expanse ·8in. to 1in.

C. NAZIRA, *Moore.* I have met with this insect most frequently near water, though it occurs occasionally in other localities. I have taken good specimens at Simla as late as November 15th. Expanse from 1in. to 1·3in.

C. KASMIRA, *Moore.* This is the commonest of all the "blues" in the hills, it actually swarms wherever the berbury, its food-plant, grows. There seems to be a constant succession of broods, perfect specimens are to be taken at all seasons. Passing through the lovely Kulu Valley in July this year, it was the commonest butterfly on the wing, literally thousands were observed sucking up moisture in damp spots. Expanse from 1·3in. to 1·5in.

C. CHANDALA, *Moore.* This insect is a regular "groundling," never flying above the earth more than a few inches, and always settling on the grass or equally low-growing plants. Common in the hills throughout the year. Expanse from ·9in. to 1·1in.

Zephyrus, *Dalm.*

Z. SYLA, *Koll.* I have only taken this insect amongst oak trees, on the leaves of which it settles, and on which most probably its larvæ feeds. Common during the summer wherever oaks grow, and worn specimens are to be met with late on in the year. Expanse from 1·2in. to 1·4in.

Ilerda, *Doubl.*

I. TAMU, *Koll.* This insect was very common last October, but the specimens were all worn. I have taken specimens in Simla early in April, again about midsummer, and there is also an autumn brood. I have always taken it near water amongst rank vegetation. Expanse from 1·2in. to 1·7in.

I. SENA, *Koll.* An ubiquitous insect, occurring everywhere at all seasons. Expanse from 1·3in. to 1·4in.

Deudorix, *Hew.*

D. EPIJARBAS, *Moore.* Very plentiful throughout the autumn near water in the hills, and on the Poinsettia flowers in Calcutta during the winter. Expanse from 1·2in. to 1·8in.

D. VARUNA, *Horsf.* Also occurs both in the plains and hills. In Calcutta it is the commonest species of the genus during the winter, and is fairly plentiful in the hills during the autumn. Expanse from 1·3in. to 1·5in.

D. NISSA, *Koll.* This insect chiefly frequents oaks, but also occurs amongst bushes and rank herbage on the borders of streams It is on the wing from June to October. Expanse 1·3in. to 1·5in.

Amblypodia, *Horsf.*

A. RAMA, *Koll.* More frequently met with amongst oaks han elsewhere, though this November I have observed many males "imbibing" by the sides of streams at Simla. There are several broods, appearing all months from March to November. Expanse from 1·2in. to 1·5in.

PAPILIONIDÆ.

Eurema, *Hübn.*

E. BRIGITTA, *Cram.* This insect is more usually known by its name Terias Drona. Very common in the hills throughout the autumn, thousands of males may be observed sipping up moisture on the banks of hill streams from August to November. They gather in little groups for this purpose, flying off when disturbed only to return to the same spot hereafter. Expanse from 1·5in. to 1·7in.

E. HECABE, *Linn.* Also a common autumnal hill insect, but it is also to be met with in the plains in the winter. Expanse from 1·4in. to 1·8in.

Pieris, *Schrank.*

P. BRASSICÆ, *Linn.* Generally known in India as P. Nepalensis. This insect is double brooded, the first appearing in March and April, the latter in late summer and autumn. Most commonly met with in gardens and fields. Very common in Cashmere, and I took specimens far up in Ladakh this summer. Expanse from 2·5in. to 2·7in.

P. CANIDIA, *Sparrm.* P. Glicirla, the common name of this insect in India, appears to be merely a synonym of Canidia. This butterfly is not apparently restricted to two broods like Brassicæ, specimens are to be taken everywhere throughout the year. Also very common in Cashmere and as far east in Ladakh as Leh. Expanse from 1·7in. to 2·3in.

P. MESENTINA, *Cram.* Distinctly double brooded in the hills, the first appearing in April, the second in October. I have taken a few specimens in Calcutta in March. It has a very swift flight, and but for its settling occasionally would be a very difficult insect to capture. Expanse from 1·8in. to 2·2in.

Delias, *Hübn.*

D. BELLADONNA, *Fabr.* This insect is very uncertain in its appearance, some years it is fairly common in the hills, others not a specimen is to be seen. I took three specimens at Kotgarh last year, and several in Simla, but I have not seen a single specimen this season. It is either double brooded or it hybernates, I am not quite sure which, at any rate I have taken worn specimens in the spring of last year at Suni near Simla. It has a weak flight, and seems particularly fond of the flowers of the Dahlia. Expanse from 2·4in. to 3·3in.

Catopsilia, *Hübn.*

C. PYRANTHE, *Linn.* The generic name is more known as Callidryas. All three species that occur in the hills make their appearance about the same time, *viz.*, during the rains, and a few specimens of each, hybernated, are met with the following spring. All are equally common in Calcutta during the winter. They have a very strong, swift flight, and but for their continually settling on flowers, &c., it would be very difficult to make up series of these insects. The expanse of Pyranthe is from 2·1in. to 2·4in.

C. POMONA, *Fabr.* More generally known as Hilaria. Expanse from 1·8in to 2·8in.

C. CROCALE, *Cram.* Also commonly known as Alcmeone. Expanse from 2·1in to 3·2in.

Gonepteryx, *Leach.*

G. RHAMNI, *Linn.* Kirby relegates the Indian variety of this insect named Nepalensis to the limbo of synonyms. It has just the same habits and appears at the same time as the home "Brimstone," and as far as I can see is identical. Expanse from 2in. to 2·7in.

Colias, *Fabr.*

C. CROCEUS, *Fourcr.* The well-known name "Edusa" must give way to Croceus, that name having been given to this insect in 1785, two years before Fabricius named it Edusa. I am of opinion that this insect is double brooded, the first appearing in the spring, the second late on in the summer. The former is the most numerous. It occurs throughout the Simla Hills, is very common in Cashmere about midsummer, and occurs throughout Ladakh in favorable spots. Expanse from 1·4in. to 1·6in.

C. HYALE, *Schmett.* Kirby gives this as a variety of Croceus. Of the two it is much the rarer, but occurs at the same time and in similar localities. Expanse from 1·5in. to 2·1in.

Ixias, *Hübn*

I. PYRENE, *Linn.* I took good specimens in October, 1878, and again in August this year. It is a most variable insect, my specimens from Darjeeling are nearly double the size of those taken by me at Kalka in October, 1877. My Simla, Kotgarh, and Calcutta specimens are all about the same size. The females differ very much, my Calcutta ones are yellow, my Kotgarh ones nearly black, and I have taken quite white ones in the Bheerbhoom District, Bengal. My plains specimens were all taken in gardens or near hedges bounding fields, my hill ones always near water. Expanse from 1·7in. to 3in.

Callosune, *Doubl.*

C. ETRIDA, *Boisd.* I took two or three specimens of this pretty little "Orange Tip" on the Hindustan and Thibet road above the station of Kotgarh in October last year, also a few specimens at Fagou and also in Simla the same season. This year I have only taken one specimen in Simla. It does not seem to be peculiar to any one class of locality, I have taken it on the summits of hills, and in valleys near water. Expanse from 1·3in. to 1·6in.

PAPILIONINÆ.

Parnassius, *Latr.*

P. HARDWICKII, *Gray.* I have never taken it in Kotgarh itself, but as it occurs at Narkunda, the next stage, I have included it. I have only taken this insect in the Simla district on the tops of bare hills covered with grass and short herbage, but on the Rotang and Jalauri Passes, it occurs amongst trees and bushes where the grass and vegetation is above a foot in height, and wild flowers abound in profusion. It has a rather slow flight, but when disturbed, it moves very rapidly and with apparently little exertion, the wings remaining outspread the whole time. Expanse from 2·2in. to 2·4in.

Papilio, *Linn.*

P. ERITHONIUS, *Cram.* A very generally distributed insect. In Calcutta during the cold months it is the commonest species of the genus. It is fairly plentiful in the hills in the late summer and autumn, occurring everywhere. It has a very strong, swift flight, but luckily for the collector settles frequently where there are flowers. In Calcutta it feeds on the bael tree (Ægle Marmelos), as this tree does not grow in the hills, I imagine this insect must feed on some allied orangeacious tree, probably Xanthoxylum arramaticum, Vernacular name "Taij Bal," which is the food plant of P. Protenor, Polyctor, and Polytes. Expanse from 2·5in. to 3·5in.

P. POLYCTOR, *Boisd.* The commonest of all the genus in the Simla Hills. In July and August I have seen literally hundreds of males sucking up moisture in damp spots on the margins of the Simla river. It is double brooded, the one that comes out in the spring is far less numerous than the summer one, the specimens also are far smaller. Worn specimens are to be met with as late as the middle of November. Expanse from 3·5in. to 4·5in.

P. PROTENOR, *Cram.* Not quite so common as the preceding, but is double brooded also, and makes its appearance at the same time. The male has a patch of white scales on the lower wing where it is over-lapped by the upper, which generally is hidden. I have noticed though that when courting the male and female fly round and round each other, the former opening wide the upper from the lower wings, causing the white patch to be very clearly seen. Expanse from 3·2in. to 4·9in.

P. CLOANTHUS, *Westw.* I have only taken one specimen at Kotgarh, it is a somewhat rare insect throughout the Simla Hills. It apparently hybernates, as I have taken worn specimens very early in the spring, but it is out most commonly in June, and good specimens are again met with in August. I have taken a good many on the top of Tarwa Davi, a hill opposite Simla, flying backwards and forwards over the tops of bushes and low oaks near the summit of the hill, also flying round and round the top of a tall white Poplar tree in a garden on the outskirts of Simla. I climbed to the top of this tree, and by getting my net out beyond the highest branches, I was able with a little patience to secure 3 or 4 specimens in a morning. It is also fond of sitting with closed wings on the margin of streams, sucking up the moisture. Expanse from 3·2in. to 3·5in.

P. MACHAON, *Linn.* Most frequently met with on grassy hill sides, though I have taken many specimens flying along the beds of streams. A small brood comes out in the spring, a much larger one in the summer. I have met with it throughout Cashmere, and a variety? with short almost obsolete tails in Ladakh, where its food plant is the wild carrot, which abounds there. Expanse from 2·3in. to 3·3in.

P. POLYTES, *Linn.* Generally known as P. Pammon. It is a very generally distributed Papilio, occurring very plentifully in the plains, particularly in Calcutta during the cold months, and somewhat sparingly in the hills. I have taken it most frequently near Simla in the beds of streams, though occasionally it occurs in other localities. In Calcutta it feeds on Ægle Marmelos, in the hills on Xanthoxylum arramaticum. Expanse from 2·7in. to 3·8in.

HESPERIDÆ.

Casyapa, *Kirb.*

C. CHAYA, *Moore.* Common both in the hills and on the plains throughout the year. Occurs everywhere. Expanse from 1·1in. to 1·4in.

C. MANGALA, *Moore.* Fairly common in the neighbourhood of Simla near water. Occurs throughout the year. Expanse from 1·3 to 1·6.

Ismeno, *Swains.*

I. EXCLAMATIONIS, *Fabr.* I first took this insect in the Kulu Valley in July, 1879, and a little later on it was very common in Kotgarh, particularly on the flowers of the Zinia. I have never come across it at Simla. Expanse from 1·9in. to 2 3.

Pamphila, *Fabr.*

P. AUGIADES, *Feld.* It is common both in Calcutta and in the hills, occurring in the latter generally near water. A late summer and autumn insect. Expanse from 1·2in. to 1·4.

P. MÆSA, *Moore.* I have taken this insect at Kalka in October, 1877, at Ulwas near Pangi in May, 1879, in the Kulu Valley in July, and at Kotgarh in August. It seems very fond of Thistles, and I have taken most of mine at rest on those flo wers. Expanse from 1in. to 1·2in.

Plesioneura, *Feld.*

P. DAN, *Fabr.* A somewhat rare "Skipper" in the hills. It keeps to one small space generally in the gorge of a mountain stream, up and down which it flies, even returning to the same spot if disturbed. It occurs throughout the summer and autumn. Expanse from 1·3in. to 1·6in.

P. SUMITRA, *Moore.* Commoner than the preceding, but has the same habits. I have taken specimens in several places in Cashmere and in the Chumba State, in May and June, 1879. Expanse from 1·8in. to 1·9in.

Isoteinon, *Feld.*

I. MASURIENSIS, *Moore.* I took 6 specimens of this insect at Kotgarh this August, and have never met with it elsewhere. It frequents thistles and other flowers. Expanse 1·2in.

Thanaos, *Boisd.*

T. STIGMATA, *Moore.* Very common on thistles in Simla after the rains in 1878, and equally so at Kotgarh on the same flowers this year. Expanse 1in.

OFFICIAL PAPERS.

REPORTS UPON ARAKAN HILL TOBACCO,

CURED ON GOVERNMENT EXPERIMENTAL FARM, "MYOUNG."

LONDON, 1st April 1879.

BURMAH tobacco has never been before on this maket, and it is difficult to state if this growth will come in favour with our manufacture. The sample of long leafy tobacco shows a narrow leaf which is too thick and veiny to be fit for cigar purposes. The colors are mixed mostly yellow and grey, and this makes the leaf unfit for wrappers. The quality or the flavor of the tobacco is tolerably good. Value nominal 5½*d.*, to 7½ per lb. The short leafy tobacco is a little sandy, the leaf is, however, thick, and if this tobacco arrives here in a perfectly dry condition, it ought to find a good market here, value nominal 3½*d.*, to 5½ per lb.

It appears that the tobacco has not been *fermented* sufficiently, but that it was *shipped too early.* The general character and the quality of the tobacco are satisfactorily, and if plantation fermenting and packing are carried out in a careful manner, it would probably find a good market in England.

ROTTERDAM, 1st April 1879.

THIS tobacco is unknown here, but it has a certain analogy with the kinds from the "East Indies," "Calcutta," "Singapore," "and "Polah." My opinion of the same is not unfavourable, but it is difficult nevertheless to give any exact value because the tobacco is not known here. I think that this tobacco may be valued for this place from 15 cent. per ½ kl. (3*d*. per pound) more or less provided that the small leaf does not distinctly predominate. I think that the tobacco will find a market here, especially if the packing be well done, and if it is, if possible, cleared of the sand, which exists to a certain extent in the sample. Once well known here, it is very possible that it may have more value.

HAMBURG, 26th April 1879.

SEVERAL of our tobacco brokers, to whom I submitted samples for inspection, are of opinion that its value would range between 8 and 10 p.fg. (1¼*d.*) per lb. A leading broker, however, who has marked my sample, informs me that this tobacco has a certain analogy with that from Kentucky, which finds a ready market here in casks of 800. to 1,000lb., but nevertheless your tobacco should be much lighter (in both senses of the word) and the leaves considerably thinner to meet with anything like a demand.

The same would only be fit for smoking tobacco. This friend tells me further, that here it would only be worth from 20 to 25 p. fg. (3*d.*) per lb., and that he should not advice any great consignment for the present. Should the German Government, however, come to a satisfactory decision with regard to tobooco duty, then he would feel rather more inclined to speak for a small consignment, and he wishes to know whether the tobacco would be shipped in casks or bales.

(True Copy.)
W. G. HUGHES, MAJOR,
Supdt., Hill Tribes, Arakan.

SIR,—We beg to acknowledge the receipt of your letter of the 30th January and 7th instant, and to apologize for the delay in answering the same.

In reply we have to state that we have examined the tobacco forwarded us from the Myonktoung Farm in the Arakan Hill Tracts. We find the leaves to be of large size, good colour, but somewhat indifferent in cure and of an agreeable mild flavour.

This tobacco being unknown here, we propose to send the same to the Austrian Government for report of the Regie Office in Vienna, if permitted by you.

The value of the tobacco is uncertain, we estimate the same at 4 to 5 pence per lb. in bond, if shipped to England.

We, &c.,
(Sd.) ERNSTHAUSEN & OESTERLEY.

(True copy)
W. G. HUGHES, MAJOR,
Supdt., Hill Tribes.

REPORT ON THE ECONOMIC GARDEN AT SALARU,

FOR THE HALF-YEAR ENDING 30TH SEPTEMBER 1879.

HORTICULTURE sustained a severe check here from unprecedentedly severe hailstorms in the beginning of May. Fruit was in consequence a total loss. Besides the damage otherwise done to the trees, many of them were entirely uprooted or broken over a little above the ground. It will be years before the gardens in this vicinity be anything like what they were before the occurrence of those storms. Our wine crop which was estimated, would weigh about 100 maunds, yielded only 7 maunds and 9 seers of grapes, not a single bunch of which was fit to be seen on a dinner table. The plants have not yet got over the effects of the pelting they got just as the fruit had well begun to swell, and the leaves newly expanded, fresh, and in full action. It will be a long time before they fully recover. Pomegranates are the only fruit crop of any value this year in this neighbourhood.

2. EUROPEAN OLIVE.—Our plants continue to grow pretty well, considering the rough weather they had to put up with at the beginning of the season. None of the layers made from them succeeded; white ants destroyed the whole of them.

3. PEACHES and such like fruit trees are far from healthy. A number of them have died since the hailstorms, and still branches continue dying from those yet alive. I do not think any of them will fully recover. Where the bark had been knocked off by the hail; the branches of both peach and apricot are in many cases covered with gum, and show no sign of healing over.

4. DATE PALM.—We have several varieties of this plant, four plants gave fruit last year and were in flower this season, though the fruit did not come to maturity. One is a particularly fine large kind with a small stone, and one is equally good in flavour but of less size, the seed of both was sown and we have a number of young plants, probably each different from the parent. I do not of my own knowledge know that the Date will not grow true from seed, but the plant being diœcious, and the existence of so many varieties of it, tends to make one place very little reliance on this mode of propagating any fine or particular sort. I have been informed by people who have had a pretty lengthy experience in Date culture, that the only way of multiplying a favorite kind is by suckers, not seed of the old plant. We have both under trial here, and may be able to speak more positively on this subject a few years hence. The plant when young, throws up suckers more freely than after it has arrived at its full growth, some of ours have had as many as 8 suckers on them at one time, but this mode of increasing the number of plants is, even under the most favorable circumstances, a very slow process. The date is of slow growth, and takes a number of years care before it makes any adequate return for the outlay incurred in rearing a young plantation, but when once firmly established, it perhaps requires less expenditure of money or labour to keep it healthy, and in bearing order, than any other variety of fruiting plant capable of being grown in so dry a climate as Sind has. It succeeds well at Kotri and Sukkur, and so far seems to do well at Salaru. Its culture deserves to be largely extended.

5. The hail storms in the beginning of May killed all our Coffee plants.

6. INGA DULCIS (*Pithecolobium dulce*).—We have a large number of seedlings from 6 to 18 inches high. This plant makes an excellent live fence or hedge. I have seen some good specimens of it near Sukki, which had been raised by some one connected with the I. V. S. Railway. A few plants only have as yet been distributed, and they have been given to Europeans. Natives do not care to have them, in fact, they do not know the plant yet.

7. MAHOGANY TREE (*Surctenia Mahogani*).—After various futile attempts, we have at last succeeded in getting three young plants from seed received from Mr. Woodraw of the Botanic Gardens, Gunesh Khind; at present they are growing fast, and are quite healthy looking.

8. BAMBOO.—Some of the oldest plants here have this season, thrown up shoots nearly 7 inches girth near the ground, but the internodes are very short, and the *culms* taper so fast, that at 6 feet above the ground the largest specimen measures only 4½ inches girth. The atmosphere here is evidently too dry for successful bamboo growing. The plants I speak of are exposed to the full benefit of the hot south winds, if sheltered by tall forest trees, I make no doubt, but they would do better, but it is quite useless trying the plant in dry exposed situations. We have upwards of 2,000 seedlings of Bambusa Stricta on hand. This is a small variety, the *culm* of which is almost solid, and is according to Dallzell and Gibson, the variety from which boar spear handles are made. None of this sort has yet been distributed, but, if the young plants continue healthy, they will soon be ready to send out.

9. MESQUIT BEAN (*Prosopis Glandulosa*).—The plants of this, put into their permanent places last cold weather, have been yielding pods all through the present hot season, and, at the present time continue flowering, though a good deal damaged in May, the plants have grown fairly well, and are, to all appearance, healthy. So far this plant seems quite hardy and may be propagated by seed or cuttings of the ripe wood, the latter take root freely in February. A considerable number of plants have been distributed, and we have on hand fresh seed or young plants ready for any one who may require them.

10. CERATONIA SITIQUA (*Carob*). The plants are most of them healthy, but growing very slowly.

11. In addition to introducing fruiting plants, trees for shade, &c., we are endeavouring to encourage a taste for growing ornamental varieties as well. The generality of the gardens in Sind which have come under my observation are remarkably deficient in flowering plants of any kind. A good many varieties of flowering shrubs and creeping plants have been distributed during the past two or three years, the native garden owners do not pay much attention to them, for I find them generally in a corner out of the way or along a path already overcrowded with mangoe trees. Some plants fit for trellis work, such as Bougainvillea spectabilis, autegonon leptopus, Quisqualis indica, &c., may be said to grow to perfection here and are much admired, but I do not recollect of any of them having been asked for by natives, except for some of the Amir's gardens near Hyderabad. Flower-growing has not yet come properly into fashion in Sind, the generality of native gardens being little more than mangoe topes.

12. Most of the following economic plants, though properly belonging to the farm, have been kept in the garden as being more under control, both for irrigation and other attendance, the number of plants in each case being few.

13. GUINEA-GRASS.—We have but a small plot of this, but it is almost as well exposed as if it had been sown on the farm, being in an open space outside the garden reserved for vegetable culture. It has, in a manner been unfortunate, having been twice eaten down too near the ground by cattle; at present it is fully 6½ feet high, and beginning to shew signs of flowering. It bears transplanting very well; the area of our original plot has been doubled by this means and by dividing the roots. Should it seed anywise in proportion to its present appearance, the yield will be more than sufficient to sow half an acre next spring.

14. GROUND-NUT.—I have this year confined this plant to the vegetable ground, last seasons experience of it as a field crop, was enough to shew that under present circumstances it could not be grown in the open field. White ants are troublesome to it, otherwise it is growing remarkably well.

15. HULDI (*Curcuma longa*). This is also in the vegetable ground, and is thriving well.

16. CARDAMONA.—The plants are growing well but are protected from the hot winds by nim and other trees. This is a favorite plant with native garden owners.

17. We have several varieties of maize in the garden; seed has been repeatedly given to cultivators in this neighbourhood, but though it grows well with them, they do not try to save any seed of it for future planting, and sow only when we give them the seed.

18. Our chief garden work at present is weeding, transplanting seedlings, and putting down layers of different woody plants. Nearly all our stock of cuttings were destroyed by the hail storms in May, and nearly all our stock of young plants which were not killed, and were fit for destribution, have been disposed of; we have got quit this season of many plants which would have been considered too large for removal, had smaller ones been available; on account of the cost of carriage, people from a distance do not care to take very large plants.

19. I would beg that Government be asked to get us a small quantity of fresh seed of the Doum palm (Hyphœne the baica,) the Ginger-bread tree of Egypt. I believe it would grow with us, and I know of no other way of getting the seed fresh, than by troubling Government to oblige us by getting it.

20. The number of plants distributed during the past six months, were fruiting plants 902, roses 321, flowering of sorts 664, forest and shade-giving trees 195, shrubs 37, and pots of seedling flowering plants 19. Orders for seed are only now beginning to come in, the following number of packets have been sent out up to date, vegetable seed imported 109, ditto acclimatized 121. Flower seed imported 315, ditto acclimatized 199. Both plants and seeds have been given free in most cases. The local funds of Shikarpur and Hyderabad keep up this garden, and the inhabitants of the Collectorates are entitled to plants and seeds from it gratis. During the period under report very few plants or seeds have been distributed in the immediate vicinity of Salaru, most orders met have come from more distant parts of the country, and the cost of carriage in most cases prevents people from taking away so many plants as they otherwise would, of the fruiting plants and roses sent out this year, a camel could not carry over 15 to 20, and I have seen a lot leave, loaded with an average

of 10 plants each camel, so that though people get the plants at the garden for the carrying away, the carriage of them to any great distance, makes them somewhat valuable by the time they reach their destination. With the exception of January, February, and the beginning of March, plants cannot be successfully removed here without keeping a large ball of earth at their roots, even during these months, a Sindi would not run what he would consider the risk of losing the plants by shaking the earth all off their roots, for the sake of being able to carry a great number of them on one animal. We endeavour as far as possible to keep in pots a stock of plants for distribution, but (as as already reported) this year, the young plants intended for this purpose were almost all lost in the beginning of May, and the new stock raised since that time from seed and layers, will not generally be fit to send out much before March next.

21. On account of the fruit having been mostly all destroyed by the hailstorms we had in the beginning of May, the income from the garden will this year be very little. The pomegranates together with what was left of the orange and fig crops, have been sold for Rs. 200, and the sale of grain, &c., grown in the garden during the past six months will bring in about Rs. 100 more. The fruit crop however forms the chief source of our income; seeds and plants (on rearing which the greater portion of expenditure is incurred) are, in most cases, given away *gratis* and being no money return to the garden.

22. During the inundation season two persian wheels (Nars) were kept at work on the farm kurria, day and night, to secure a good supply of water for the garden. The ground round the trees were weeded and stirred up whenever it seemed to require it, so as to give the plants every possible chance of recovering from the effects of the storms in the early part of the season.

23. This season we have another new lot of *purdasee* coolies. They generally stay with us till they become what one might call handy garden laborers, when they leave and put themselves out as gardeners. Some of our late hands are so employed in this district at the present time.

SELECTIONS.

ARTIFICIAL MANURES AND PRODUCTION.

IT became too much the fashion in Ceylon a short time ago to decry artificial manures as more injurious than beneficial to coffee; now apparently the swing of the pendulum is going the other way, and cattle establishments for manuring purposes are being broken up on all sides. We trust planters will refrain from going to either extreme; there is no doubt that a great deal of money has been injudiciously spent over cattle, just as large sums have gone in artificial stuff that probably was not worth the cost of transport. Nevertheless what artificial manures can do for a tropical colony is well shown in the following extract:—

"The small Island of Mauritius, covering only about 700 square miles, spends annually from £200,000 to £250,000, mostly in raw and dissolved Peruvian guano, by the aid of which it is able to produce more than 100,000 tons of sugar, worth from £2,500,000 to £3,000,000, thus about 10 per cent. of the value of the produce is spent for artifiicial manures. British Guiana (Demerara) producing annually about 100,000 hogsheads of sugar worth about £2,000,000 consumes not less than from £100,000 to £120,000 in manure (principally dissolved Peruvian guano) every year, *i.e.*, about 6 per cent. of the value of the produce."—*Ceylon Observer.*

URINE MANURE.

M. RAOUL BRULLE has come forward with a new method of treating the urinous portion of town sewage in preparing it for manure, for which he claims numerous advantages over those hitherto in use. The oldest system is probably the Flemish, which consists in conveying the excreta away from the towns and storing them in large masonry tanks with the addition of water. In Paris the sewage is deposited at La Villette, thence to be directed by machine power through a long conduit to Bondy, where it lies in pools to ferment. In this manner its urea is transformed into carbonate of ammonia, from which the sulphate is obtained by distillation, while the solid matters are compressed and dried, and these sold as "poudrettes." Another system is the direct application of the urine to the irrigation of the soil, as practised on the plain of Gennevilliers. All of these processes are attended with grave inconveniences. 1. The system of fermenting for three or four years to convert the urea into carbonate of ammonia is extremely unprofitable from the length of time it occupies, during which the capital involved is producing no interest. 2. Masonry cisterns and tanks are very costly if made impermeable, as they ought to be. 3. The foul emanations from them are a source of annoyance and disease. 4. The cost of distillation and conversation of the disengaged ammonia into sulphate is considerable. 5. The drawbacks of the direct irrigation system are well known. The inhabitants protest against the nuisance, and the accumulation of putrid emanations infects the soil. From all these disadvantages M. Brulle contends that his system is free. It is based on the one hand, on the property of plaster to absorb, and thus reduce to a solid form large quantities of urine; and, on the other, on the greatly increased quantity of fertilising matter which can be introduced into the medium, by subjecting the plaster to repeated saturations, and driving off the superfluous moisture after each operation by means of hot air. In this way a solid manure can be obtained containing 5 per cent. of nitrogen and 1 to 2 per cent. of phosphoric acid, rich in fertilising elements, easy of transport, and containing not only five times as much nitrogen and phosphoric acid as fresh urine itself, but also all the mineral salts of the urine, which have a certain manurial value. The plaster itself also increases such value. In this system, therefore, interest upon capital is constantly accruing, instead of the latter lying idle for years, for the urine can be treated by it at once and the produce is ready for sale in a very few days. In addition to these economic advantages the process is absolutely free from all objections upon sanitary grounds.—*Home and Colonial Mail.*

ARTIFICIAL MANURES.

THE text of M. Ville's valuable and suggestive work is illustrated by a series of very striking illustrations which add force to his conclusions. As a frontispiece he gives a coloured sheet showing "The power of production of the chief systems of cultivation in their historical order." First we have "the pastoral system" in which a thin strip of "barley crop is added to a large grazing ground for cattle. Next comes "the Irrigation system" by means of which crops of all kinds were and are raised in Egypt. We then have an illustration of "the triennial system" where half the farm is devoted to grass for cattle feeding while the other half shows in succession :—

Wheat.
Fallow.
Wheat.

Then follows the class of "Rotation systems." First "continual rotation; stable manure only used." In this case 60 per cent of the area of the farm is devoted to cattle feeding, 50 per cent. being down in grass and 10 per cent. in clover. Crop, in this case followed each other in the following order :—1 potatoes, 2 wheat, 3 clover, 4 wheat, 5 oats. Next comes the coloured diagram of "continual rotation with manufacturing crops: stable manure only used." Here 70 per cent. of the land is devoted to cattle feeding, *viz* :—

50 per cent. grass.
10 ,, ,, swedes.
10 ,, ,, clover.

The crops in this case run (France, of course being the scene of the cultivation) 1 sugar beet, 2 wheat, 3 clover, 4 wheat, 5 oats.

All the foregoing, except of course the irrigation system, are quoted as most unfavourable and most unprofitable contrasts to the system which, by means of a copious use of artificial manures, M. Ville has inaugurated at Vincennes, the naturally poor soils of which are made to yield large and profitable crops year by year. M. Ville calls his new system "Free and continual rotation: stable manure mixed with chemical manure." The coloured square for this system is, like that devoted to the irrigation system, without any sub-divisions. We have instead the words :—

"Absolute freedom
Meadow or arable.

The crops are double those grown on the other systems."

By the words "meadow of arable," is, of course meant, that by the new system either the whole or part of a farm can be devoted to meadow for the profitable feeding of cattle, the meadow land being heavily manured with suitable substances, and the cattle fattened with substances, other than the grass or clover. But although in such cases the cattle manure may be utilized, its effect being enormously increased by the addition of chemical manures, the object is not to grow grass, &c., to feed cattle *for the sake of their manure.* In converting the whole of the land into arable is deemed the better and more profitable course, byre and stable manure can be entirely dispensed with, and maximum crops obtained by the use of four substances applied according to what is found to be the dominant principle of the particular plant. The four substances required, sometimes the whole of them and sometimes only three or even two, are, as we mentioned in our previous article :—

Nitrogen.
Phosphoric acid.
Potash.
Lime.

Now, judging by the composition of the ashes of the bean, potash ought, we suppose, to be regarded as the dominant principle in coffee. But before

preparing a manure for coffee, M. Ville would inform himself of the composition of the soil to which the manure was to be applied, and he would learn that on young estates, such as those of Dimbula, Dikoya, or Maskeliya generally, there was a considerable store of potash derived from the forest burnt on the ground, in the clay of the soil, and in the gradually decomposing felspar of the rocks. M. Ville, who distinctly recognizes the value of clay as a receptacle of potash, would, we suspect, join Mr. Hughes in stating that for soils like those we have alluded to, the application of potash was not so much needed as t reatment, such as forking and liming, which would render the stored up potash available. We are bound, however, to add, that the French writer makes light of the popular argument in favour of cattle manure as improving the *mechanical* condition of the soil. He contends that much larger crops and more profitable are obtained by means of artificial manures, the mechanical condition of the soil being improved otherwise—by careful culture of course. By the carbonaceous matter contained in cattle manure, M. Ville would, and probably with justice, set little store, seeing that plants derive the large proportion of carbon of which they are composed (nearly 48 per cent. in the case of wheat), from the atmosphere. Indeed, when we add together the constituents which plants derive from air and water, the remaining balance is very slight as a percentage. But even fractions of certain substances, phosphoric acid, for example, are of enormous importance. We can feel as we read this book that it is not so much nitrogen and potash, as phosphoric acid, lime, and culture which *young* coffee estates need, as Mr. Hughes pointed out. In the case of old estates, or young ones after they have borne several heavy crops, however, the dominant principle in the crop removed must certainly be supplied. If we are to judge by the ashes of the coffee beans, the dominant element (50 to even 55 per cent.) is potash. Now let us see what are the combinations which M. Ville advises to be used in the case of plants, the dominant principle of which is potash. For potatoes and flax his normal manure is composed of

	lb. per acre.
Calcic superphosphate	352
Potassic nitrate	224
Calcic sulphate	264
	880

That for vines and fruit trees, would, no doubt be more suitable for coffee, *viz* :—

	lb. per acre.
Calcic superphosphate	528
Potassic nitrate	440
Calcic sulphate	352
	1,320

This is nearly 11 cwt. per acre of substances which (even the gypsum) would be costly on coffee estates. In both the above cases the amount of nitrogen contained in the potassic nitrate is considered sufficient in addition to what is derived from the air and rain. But for vines and fruit trees there is a "Homologous manure," being the same composition as the normal manure, only that the potassic nitrate is replaced by a mixture of potassic chloride and ammonic sulphate, thus :—

	lb. per acre.
Calcic superphosphate	528
Potassic chloride at 80°	440
Ammonic sulphate	308
Calcic sulphate	44
	1,320

Potassic chloride has the advantage of being cheaper than the nitrate. It is composed of potassium 52·41 per cent. and chlorine 47·59, the first named constituent being equal to 63·16 of potash. The price of this substance when M. Ville wrote was 7*s*. 2*d*. to 8*s*. per cwt., against £1 4*s*. for the nitrate. To Ceylon planters it will be important to learn, that "since the discovery of the Stassforth mines, the price of this salt cannot fluctuate much, as the supply exceeds the demand." We believe there have been some importations of this valuable source of potash into Ceylon, by an estate agency house, but we have not heard the result of their experience. Ammonic sulphate is mixed with this substance, no doubt to supply nitrogen. Once again we have for vines and fruit trees a normal h omologous manure where calcic superphosphate is replaced by *precipitated* calcic, thus :—

	lb. per acre.
Precipitated calcic phosphate	220
Potassic nitrate	440
Calcic sulphate	220
	880

The merits of precipitated phosphates are its greater cheapness, its more certain action, superphosphate being rather too soluble for newly-opened lands.

What puts fruit on vines, would, w e should think, put fruit on coffee trees and by his manure M. Ville obtained a heavy crop, while vines left unmanured yielded absolutely nothing. This case is strikingly illustrated by engravings of the contrasted plants. But as our new soils at least are fairly supplied with nitrogen and potash, perha ps we had better look at the composition of the manures which M. Ville recommends for plants in, which the dominant ingredient is supplied by calcic phosphate, such as maize, *sugarcane*, sorgho, and Jerusalem artichoke. The normal manure in this case is composed of :—

	lb. per acre.
Calcic superphosphate	528
Potassic nitrate	440
Calcic sulphate	352
	1,056

And if a normal stimulating manure is required, 58 lb. of ammonic sulphate is substituted for an equal quantity deducted from calcic sulphate. It will be interesting to our readers to hear that M. Ville prefers to apply the lime in his manures in the shape of gypsum. He states :—"Calcic sulphate is nothing more than unburnt plaster of Paris, and is composed of sulphuric acid and lime. It is found in Nature in large quantities in the form of hydrate :—

	per cent.
Sulphuric acid	46·51
Lime	32·56
Water	20·93

Exposed to a temperature of 248° to 266° F., it loses its water and passes into the state of anhydrous sulphate, more commonly known as plaster of Paris. In using calcic sulphate, I prefer it in this state. It is worth about 8½*d*. per cwt. It can also be used in the form of raw gypsum, only in this case the proportion must be increased one-fifth." Of course gypsum is not likely to be obtained in Ceylon for less than many times 8½*d*. per cwt. But we suppose if sulphuric acid were available, the lime from burnt coral cou'd easily be converted from a carbonate into a sulphate? So many things are waiting to be done, when sulphuric acid is locally manufactured and cheaply as well as plentifully supplied. We could then for ourselves convert bones into calcic superphosphate, the most valuable ingredient (though not the most costly) in all manures. M. Ville expresses his intention to write a manual for the instruction of cultivators in this process. Meantime M. Ville is of opinion that the price of calcic phosphates is more likely to fall than to rise ; looking at the fact that they (bones apart) enter into the composition of all eruptive rocks. He alludes to the large deposits in Estremadura in Spain containing 70 to 80 per cent. of calcic phosphate. In Canada, Sweden, and in France, there are also deposits. After noticing the process by which calcic phosphates are converted into superphosphate, preferable generally on account of its superior solubility, M. Ville proceeds to notice exceptions in which bi-and tri-calcic phosphates are more beneficial, *viz*., *newly cleared land* and damp meadows. Our readers will notice that M. Ville does not apply nitrogen in the form of oil cakes, so largely used in Ceylon. He, however, fully recognizes the value of such substances, *if entirely deprived of the oil, which has no man urial value*. If cakes contain any oil he gives directions for extracting it by means of chloroform, or by carbon bisulphide, or the light petroleums or coal oils. He writes :—"These cakes are, in fact, very rich in nitrogen, phosphates and potash. Dissolved in water we can by their aid prepare from them a sort of artificial urine, which if thrown into the manure pit effects the disintegration of the haulm husks, and more especially the straw itself." This may afford a useful hint with reference to the maturing of composts. But we must close this article by giving the very heart of M. Ville's system. "The question then is," he says, "*can we, with chemical manures, cultivate the same soil with uniform success? Yes, we can, but always on two conditions*:—

(1) "Return to the soil by the aid of manure *more* calcic phosphate, potash, and lime than the crops have taken out of it.

(2) "Restore to the soil about 50 per cent. of the nitorgen of the crops. I say about 50 per cent. because there are certain plants which require less, while others, leguminous plants for instance ; seem to be able to do without any nitrogen being returned to the soil. We have already stated that part of the nitrogen required by plants is derived from the air, while some plants draw it more particularly from the soil.

"With respect to the calcic phosphate, potash and lime, the quantity restored must be in excess of that which is lost, because it is exclusively from the soil that plants draw them, and we must not only give compensation for the losses brought about by each harvest, but also fore those which are due to the solvent action of rain."

The bearing of these principles on coffee and other culture is obvious. We have to find out, in the case of coffee what constituents are removed in crop (parchment skin as well as clean beans), and no doubt we must make allowance to some extent for prunings and handlings, and to a large extent we fear for foliage lost by leaf disease. In this connection we must call attention to Mr. Cochran's letter in another column, and we shall recur to the consideration of the subject in a subsequent notice of M. Villes book.—*Ceylon Observer*.

"DRUNK-GRASS."

IT appears that the genuine good name of the Grass family for innocence and sobriety does not extend to all its members. There is a "drunk-grass," so called by the Dutch colonists a' species of Melica, which in some parts of South Africa "intoxicates" cattle to an alarming extent, and the evil is spreading with the increase of sheep-farming ; the sheep, we believe, sorting out the other grasses, while they totally abstain from this.

The account is given by Dr. John Shaw in the *Journal of the Linnean* Society, Vol. 14. In Trimen's *Journal of Botany*, Dr. Hance—a well-known botanist resident in China—describes another grass, a new specie of Stipa from Mongolia, which intoxicates horses. A French Roman Catholic missionary and his party, making an excursion into the Aladian

Mountains, north of the Great Wall, one morning found their horses dreadfully debauched—indeed quite *horse de combat*—through partaking freely of this grass. On appealing to a family of Mongols encamped in the neighbourhood, the missionary was told that the proper antidote was vinegar, followed by a broth made of a goat's head. No vinegar being at hand, the missionary administered sour milk as a substitute, while the goat's head was cooking, the broth completed the cure, and the party returned safe and sober to Pekin, bringing some of the grass which Dr. Hance christened Stipinebrians. The intoxicating and poisoning of cattle, horses, and sheep, in California and Nevada, is said to be caused by some species of the Pulse family, which generally is thought to be as harmless as grass.

AGRICULTURE IN BARODA.

WE have been favoured with the following abstract of a lecture delivered at the Agricultural Show recently held at the Gaekwar's capital :—

Sir,—Not having yet seen in print the lecture delivered at the Agricultural Show held at Baroda the other day, I shall here mention a few of its salient points as they should be brought to the notice of different governments and the agricultural public in general. The lecturer was Mr. Dinshaw Ardeshir, the Municipal Commissioner at Baroda, and he spoke on the present agricultural distress and the practical measures needed to ensure the prosperity of that industry in the future. I quote these points from memory.

Mr. Dinshaw spoke enthusiastically, praising the effective countenance rendered to the show by the Agent to the Governor-General and the Minister of the State and the efforts of Major Nutt, which had brought this novel enterprise into existence at such a place as Baroda. He expressed a hope that the institution may be continued every two or three years, for it was well calculated to stimulate some of the more important agricultural pursuits which brought plenty to the country. Omitting the technical instructions which the lecture contained on the subject of the composition of soils, various products and manures, meteorology, &c., &c., I come to the practical remedies pointed out by Mr. Dinshaw as necessary to ensure the future prosperity of agriculture in India.

He was of opinion that beyond what has been devised in the very humane bill of the Hon'ble Mr. T. C. Hope, not much could be done to sustain any longer the ordinary class of cultivators in India. Excepting certain portions, he said, as a class, they were doomed to extinction in the natural course of things. Those of them who are poverty-stricken, and whose estates have been much reduced, should either be bought up by the better class of landholders or the Government, or the latter should get patels and others to interest themselves in such transfers. This was a question of many important details which, as also the handling of them, would vary according to each set of cases. He said that an improvement would take place in the condition of these miserable classes, when they have been converted into well-paid labourers serving a class of landlords superior to them in all respects, for no capacity is now left them for any independent maintenance and improvement of their landed estates.

He considered that the system of public and private education in India now demanded large modifications. Almost every boy receives such an excess of vague and general education, that he becomes unfit for any definite and practical work when he enters life. After the attainment of elementary knowledge, a boy should at once be practically trained for any business or profession he may be intended for. Confining himself to this one branch of knowledge alone, *e.i.*, agricultural, he said what amount of useful training and learning a student could obtain. He (the lecturer) would have public bodies to introduce into schools, brief and practical treatises containing local information about various soils and products, &c., of each district, the different influences that are being constantly exercised upon each soil or produce, the facilities or difficulties which may exist for carrying on successful agriculture, the means of improving crops or introducing new sorts of crops, the trading and mercantile resources of the district, and so on. He would suggest to the Government, as also to the enlightened and well-to-do landholders to offer prizes to those who would supply useful information, or make practical suggestions on the above points, or who could produce agricultural improvements as a decided improvement on the present ones.

It was indispensably necessary, he said, that every distinct province, whether British or native, should have an extensive farm which could produce all such articles as are required for military, &c., purposes, and which are produced from the soil, these farms being conducted on the most improved methods, and which could furnish practical education in agricultural matters to the students of the district. These farms can be rendered self-paying by the Government indenting on them for the stores they required.

He asked the more enterprising of the landholders to visit England and other parts of Europe themselves, to study the resources applied there to promote fertility of land. He desired that either a Government or some of the landholders should induce intelligent and experienced cultivators themselves to visit Europe, with a view to obtain insight into agricultural matters there. Again, he also would have the rulers and people in India to send for practical men actually engaged in agricultural pursuits from England, &c., and place them in charge of farms side by side with their practical brethren of this country. He said a European practical farmer would have to learn from Indian farms as much as the *khedoos* would learn in England, and if the former were trained and naturalized here, he could command a perfect indigenous knowledge which would produce the best of results that may be needed for agricultural prosperity.

He urged that landholders and others should start an agricultural association for each distinct province, not only to assist Government with the results of their researches, but also to render every practical assistance to farming. He said they very naturally formed one of the principal suppliers of public finances, and it was, therefore, their duty to aid the Government of the country by inducing a better adjustment and also every legitimate augmentation of land revenues, which are absolutely necessary for the progress and protection of the country. He did not think much of the cries raised as regards the incidence of land taxes. Though there are exceptions as adverse to moderate assessments, the real and principal evils which have brought about the present extensive depression in the country, are the natural outcome of the increasing population of the country, and the advancing stages of corruption which cannot but attack a peasantry divided among themselves, and who have been unable either to maintain or augment their original resources with the increasing demands or dissipation of the times. While he deplored the exasperating effects on the youths of the country which the present system of education produced, he hoped that vigorous measures may be employed by both States and peoples to render public education more of an individual and business-like character than it now can be said to be ; and he did not know why, when the difficulties have been met in the pointed and earnest spirit above indicated, the Indian soil could not better sustain the public administration, or produce as great a fertility as it did in old times when the world possessed much less experience than now. In conclusion, he added with much confidence that, under the matchless and benevolent auspices of the British Government, far better days were in store for India both for the maintenance and comfort of its immense population, as also in the interest of its export and import trade, all of which proportionately indicate the well-being of a country.—*Times of India.*

CULTIVATION OF THE AUSTRALIAN BLUE GUM IN CEYLON.

WE fear our correspondent "Eucalyptus" gives us credit for more personal knowledge of the subject he refers to than we possess. Our experience has certainly not been much more favourable, if so much so as that of many of our neighbours. Occasionally every one, nearly, of a set of plants put out will grow, but frequently a very small percentage will live, especially if the plants are allowed to grow big. When they do grow, the trees stand wind better in stiff soil than they do in the loose soil near walks,—that is when exposed to wind. In such positions, there seems nothing for it, but to put *two* large long stakes slanting inwards to each tree from south-west and north-east. The tree seems naturally to have little tap root, but we have seen one from which the earth had been cut away buttress itself by a tap-root rivalling the trunk in size. The seed seems to grow readily, spread over an unsheltered bed and watered when the weather is dry. Tansplanting is the difficult matter, and we should recommend balls of earth and temporary shading. Better go to this expense than lose set after set of plants. But we once published an account of Colonel Beddome's process. It was to cut the bamboo of which estate baskets are made, and which is not more than an inch or two in circumference, into bits about three inches long. Place these pieces end ways close together, in thousands ; cover over with forest mould or fine soil and sow your seed. In this way there will be from one to three or four seedlings in each bit of bamboo. When carried out in the bits of bamboo the best plant can be left, the others being removed and utilised immediately or at a subsequent period. Perhaps planters with more experience will give our readers the benefit of their information. A new interest attaches to the cultivation of the Eucalypti as breakwinds or separately, from the fact that the fine straight timber makes excellent sleepers for railway inclines where hard wood is desiderated. The trees, many of them, are well grown at eight to ten years old.—*Ceylon Observer.*

IRRIGATION.

THE following letter has been addressed to the Editor of *The Argus* :—

Sir,—I wish to place at your disposal the results of some experiments in irrigation, made by me in the course of the past summer. I tried grasses only, of various kinds, but the only one that answered my expectations was prairie grass. My chief objects were to ascertain—1. Whether water applied during the heat of summer would answer. 2. The results to be obtained in the quantity of produce in the shape of hay. 3. The quantity of water necessary per acre, and the intervals at which the water should be applied. I shall only give the general results, premising that the experiments were carried out on too small a scale to enable me to ascertain what the expenses would be per acre if on a larger scale, and that the ground, though a strong soil, was of so stiff a nature that I had to give up attempting growing potatoes or other roots and vegetables in it.

1. I found it perfectly feasible to apply water at any time—day or night, in hot sunshine or on dull days—with advantage, so long as the grass was not submerged. There was no baking of the soil after drying, partly, I think on account of the nature of the grass, which threw its numerous roots near the surface.

2. I cut six crops of hay, the first on November 28, and the five succeeding crops at intervals of about four weeks, the last being on April 19. Prairie grass is a very succulent kind, and appears to contain much saccharine matter, which rendered the saving of the last crop somewhat difficult. These crops averaged 36 cwt. per acre each, or a total of nearly 11 tons per acre. I valued the hay at £3 per ton, or £33 in all. Although I cannot give the cost of the necessary preliminary work, and the wages of workmen, &c., still, if any considerable extent of country could be placed under irrigation, I think some very striking results could be accomplished. My own belief is that £10 per acre profit may be possible. I feel bound to express the opinion, however, that there are very exaggerated views held of the quantity of land available for irrigation, if the water is to be led over it by simple gravitation, without the aid of machinery.

3. I found that about 13,000 gallons of water per acre were necessary every fourth to sixth day, according to the weather. There was little or no waste of water as applied by me, but I applied more than was actually necessary, and I think that in experiments on a larger scale 15,000 gallons per acre, applied every four days, would be abundant, and allow a large margin for loss from various causes.

DACCA AGRICULTURAL SHOW.

THE annual Agricultural Exhibition came off with great *éclat* on the 1st of January last. This being the second year of the institution, we naturally expected that the philanthropic efforts of Nawab Assanoollah, Khan Bahadoor, will be appreciated and sympathised with by the other zemindars of East Bengal, and that they would co-operate in such a grand scheme to improve the natural products of the soil, in which every zemindar ought to be interested. But we were surely grieved to find that almost everything presented in the exhibition, came from the extensive estate of the Nawab, and that the other zemindars had not shown the least interest to promote such a laudable undertaking. But in spite of all these disadvantages, this second exhibition was decidedly an improvement upon the first, and we can commend the efforts and sacrifice of Nawab Assanoolah in such a noble cause in no measured terms.—*East.*

THE SYDAPET AGRICULTURAL SCHOOL.

THE Board of Revenue lately submitted to Government, letters from the Superintendent of Government Farms, reporting the falling off of applications for admission into the School of Agriculture, requested permission to postpone the entertainment of a new class till April 1880, and suggested the advisability of holding out to certificated students some prospect of obtaining Government employ in the Revenue Branch of the service. In their "order thereon," the Government state that they are not prepared to adopt the Board's recommendation for the continuation of the inducements to enter the School of Agriculture hitherto held out to the public. The reduction of the scale has, no doubt, had some influence on the number of applications for admission, and this was anticipated, but other causes have probably been at work. The time allowed for sending in applications was altogether too short, and the establishment of a scheme of agricultural education in the Bombay Presidency will have prevented the entry of students from that part of India, which contributed to the earliest class nearly one-third of its numbers. The Government would have been prepared to admit the applicants to a fresh class, but, as its formation has been postponed with the sanction of the Board, endeavours should be made to induce zemindars throughout the country to send pupils to the class to be entertained in April next. The Government think that pupils might also attend from such of the estates under the management of the Court of Wards as are in a position to pay for their support.—*Madras Times.*

THE FOOD OF PLANTS.

I.

THE following paper by W. Ivison Macadam, F.C.S., &c., Lecturer on Chemistry, was, as we briefly noticed a few weeks ago, read with much approval at a meeting of the Scottish Horticultural Association :—

To the several members of this association no subject can be of greater importance than 'plant food.' It matters not to which branch or section of the great army of 'tillers of the soil' to which each member belongs, for to one and all the subject we this evening consider must have interest.

In the higher section of landscape gardening, the planting or laying down, in fact the head work or thought element necessary for the raising of those beautiful and often costly Edens one finds scattered over our country, no subject can command greater attention than the nature and condition of the soil ; or, if we consider the practical part, the working of the ground, what can be of more use than a knowledge of the composition of the soil, and of the plant most suited to the ground, along with an idea of the ingredients necessary to the life of other plants the gardener may wish to grow, but the food of which his soil does not contain, and which he must therefore add so as to insure success for his crop.

Without further introduction then, let us consider what is necessary for the life of a plant, and also how we can supply these wants.

Take then as the first example, a tree or herb growing in all its Native grandeur, planted where it stands by that ever successful gardner 'Nature.' You find that the plant grows seemingly without effort, it is born, increases in size, and attains a good old age, according to the species to which it belongs, then dies, and falls where it has stood. New plants rise and take its place, to die in their turn. All this has gone on regularly, ceaselessly—and quietly from the first of time, and will go on until man steps in and breaks 'Nature's balance.

Let us suppose that man has now arrived on the scene. He no sooner sees the noble tree or the waiving golden grain, then he commences to remove from the soil her stores, carts off to feed himself and his dependants the grain, and fells the tree to build his house with. Go back to the spot after some years, and you will find that the soil, which on your previous visit yielded its abundance, now gives only a very small crop, and what it bears is thin and poor. How does this come to be?

Look back again to our 'native' tree, and learn what it is built up of. Take a portion of the plant and weigh it, then cautiously and slowly dry it, and reweigh, when you will find that only a portion of what you started with is left behind, that your piece has lost much of its weight. Whatever kind of plant you are working with, much of it has disappeared. The loss in weight consists of *water*, which grains contain from 13 to 14½ per cent. of ; peas, haricot beans, and lentils from 14 to 14½ per cent.; whilst in root crops, the amount runs up in potatoes to 75 per cent.; artichokes, 80 per cent.; and in turnips, to 93 per cent. of the total weight. A large part of plants, then, consist of water.

If the residue after drying be now burned, and the ash left behind weighed, there will be a loss of weight, which is due to the burning off of the *organic constituents* of the plant. The amount of these organic compounds depends much on the class of plants worked with. In grains there is from 83 to 84·5 per cent.; in pease, 82½ per cent.; in potatos, 24 per cent.; in artichokes, 19 per cent.; and in turnips, 6·4 per cent. of the fresh bulb.

The ash left after burning is composed of mineral matter, and amount in grains to from ½ to 2½ per cent. ; in peas to 3 per cent. ; in potatoes to one per cent. ; and in onions, to ½ per cent.

The proportions of these three constituents—water, organic matter, and ash or mineral matter—in some of the more common crops, are contained in the following table :—

	Water.	Organic matter.	Mineral matter.
Wheat	14·5	83·8	1·7
Rice...	14·6	84·9	0·5
Peas	14·3	82·7	3·0
Haricot beans	14·0	83·1	2·9
Potato	75 0	24·0	1·0
Turnip	92·8	6·4	0 8
Carrot	89·0	10·0	1·0
Beetroot	82·2	16·9	0·9
Artichoke	80·0	18·9	1·1
Onion...	91·0	. 8 5	0·5

The water is obtained from rain; the organic constituents part from the soil and part from the atmosphere ; whilst the mineral matter is derived from the soil in which the plant grows.

In its *natural*, or free state, the plant builds these different substances up in its structure, and on dying, returns them once more to the storehouse from whence they were obtained to be again used by succeeding generations.

Man, on the other hand, removes the crops from the ground, and in this way, by slow degrees, impoverishes the soil, each year rendering it more and more unfit to sustain the life of the plant, which is therefore gradually reduced in size and quality until such time as the ground contains so little of the 'plant food' as to render it barren and unproductive. The following table gives the percentage composition of the ash of certain crops :—

Percentage Composition of the Ash of Plants.

	Potash.	Soda	Lime.	Magnesia.	Oxide of Iron.	Phosph. Acid.	Sulph. Acid.	Silica.	Chlorine
Wheat grain ..	23·7	9·1	2·8	12·0	0·7	50·0	0·3	1·2	—
Wheat straw ..	12·5	0·2	6·7	8·9	1·3	8·1	5 8	65·4	1·1
Barley grain ..	13·6	8·1	2·6	7·5	1·5	39·0	0·1	27·3	trace.
Barley straw ..	9·2	0·8	8·5	5·0	1·0	3·1	1·0	67·6	0·6
Oats grain ..	26·2	—	6·0	10·0	0·4	43·8	10·5	2·7	0·3
Oats straw ..	19·1	9·7	8·1	3·8	1·8	2·6	8·3	48·4	3·2
Beans ..	33·6	10·6	5·8	8·0	0 6	38·0	1·0	1·2	0·7
Potatoes ..	55·7	1·9	2·0	5·3	0·5	12·6	13·0	4·2	4·2
Turnips ..	41·9	5·1	13·6	5·3	1·3	7·6	13·6	7·9	3·6
Hay ..	18·1	1·3	23·0	6·8	1·7	6·0	2·7	37·8	2·6
Clover ..	35·5	0·7	32·0	8·4	0·4	8·4	3·3	3·4	7·0

From the above table it will be observed that the principal mineral constituents of plants are nine in number—potash, soda, lime, maugnesia and iron in combination, with phosphoric, sulphuric, and silicic acids, and with chlorine.

Before proceeding further let us consider separately the several mineral constituents of the ash of plants.

Potash contains the metal potassium (K), which is also present in nitre or saltpetre (KNO^3), in muriate of potassium, or chloride of potassium (KCl), and in kainit, as chloride along with the chloride of magnesium.

Soda has as its base the metal sodium (Na), which also forms a part of common salt or chloride of sodium (NaCl), Glauber's salts or sulphate of soda ($Na2SO^4$), and nitrate of soda, or chilé, or cubical saltpetre ($NaNO3$)

Lime is a compound of the metal calcium (Ca), which also enters into the composition of chalk or carbonate of lime ($CaCO3$) and stucco, gypsum, or sulphate of lime ($CaSO4$), and in bone it is found in combination with phosphoric acid as insoluble or bone phosphate ($Ca32PO4$).

Magnesia contains the metal magnesium (Mg), which is also found as the base in Epsom salts or sulphate of magnesium ($Mg SO4$) and as chloride of magnesium ($MgCl2$) in kainit.

Oxide of Iron is a compound of the well-known metal iron with oxygen.

Phosphoric Acid is composed of the element phosphorous (P), in combination with the gas oxygen (O). Its principal state of combination is with lime, as bone phosphate ($Ca32PO_4$) and as soluble phosphate ($Ca3PO3$ or $CaH42PO4$).

Sulphuric Acid is formed of sulphur (S) and oxygen (O). It is found in combination with lime as stucco ($CaSO_4$), and forms the acid portion of Glauber's salt ($Na4SO4$).

Silica is made up of the elements silicon (Si) and oxygen (O). It forms what is known as sand, and with many metals forms silicates.

Chlorine is a yellow-green gas, and is found as a part of common salt (NaCl) muriate of potash (KCl), and chloride of magnesium ($MgCl^2$).

The principal organic constituents of plants are starch, sugar, dextrose, oil, gluten, legumin cellulin, and lignin. The amount in which these occur, will be observed from the following table :—

Table of the Organic Constituents of Plants.

	Wheat.	Barley (cleaned.)	Rice.	Indian Corn.	Peas.	Haricot Beans.	Potatoes.	Turnips.	Beet.	Carrot.
Gluten ..	11·0	6·2	7·5	9·0	—	—	2 3	0·5	0·4	0·5
Legumin ..	—	—	—	—	22·4	23·0	—	—	—	—
Strach ..	69·0	70 0	76·0	64 5	51·3	52·3	18·4	—	—	—
Sugar ..	—	—	—	—	—	—	—	—	10·0	4·5
Dextrose, &c. ..	—	—	—	—	—	—	2 0	4·0	3·4	0 5
Oil ..	1·2	1·3	0 5	5·0	2·5	2·3	0·3	0·1	0·1	0·2
Cellulin } Lignin } ..	2·6	0·8	0·9	5 0	6·5	5·5	1·0	1·8	3·0	4·3
Ash ..	1·7	1·1	0·5	2·0	3·0	2 9	1·0	0·8	0·9	1·0
Water ..	14·5	14 6	14·6	14·5	14·3	14·0	75·0	92·5	82·2	89·0
	100·0	100 0	100·0	100·0	100·0	100·0	100·0	100·0	1 0·0	100·0

Starch ($C6H10O^5$) is a white body which softens in cold water and gives a semi-solution with hot water. The various crops yield starches which do not differ chemically, but the granules of which when seen under the microscope are very different in form and size.

Sugar ($C12H22O11$) is found principally in the stems of plants, chiefly grasses (such as sugarcane), and a few trees (maple and date palm), and also in the tubes of beet and carrot.

Dextrose or *grape sugar* ($C6H12O6$) is a variety of sugar principally obtained from the fruits of plants.

Oil. A very large number of oils are obtained from the vegetable kingdom, such as rape oil from rape seed, castor oil from the castor plant, cocoanut oil from the cocoanut, &c. Each has properties characteristic to itself, and some of them are very complex in structure.

Gluten is a white sticky mass obtained when flour is washed with water in a cloth. It is found in largest quantity in the cereals.

Legumin is obtained chiefly from peas, beans, tares, and other plants of the same order.

Cellulin and *Lignin* form the bones of the plant ; the first being chiefly found composing the walls of the cells, whilst the lignin constitutes the hard matter or woody fibre which is formed inside the cells.

These organic constituents are chiefly built up of the four elements—carbon, hydrogen, oxygen, and nitrogen.

Carbon is largely present in all plants, and can best be seen on charing a piece of wood, when the hydrogen and oxygen are driven off as water, &c., and part of the black carbon remains.

Hydrogen is a gas which has no colour or taste, is combustible, burning with a pale blue flame. It forms one ninth of all water by weight.

Oxygen is a clear, colourness, tasteless gas, which will not burn, but which supports combustion. It forms eight-ninths by weight of water, and one-fifth by volume of the atmosphere.

Nitrogen is a clear colourless, odourless gas, which does not burn, and will not support combustion. It is present in the atmosphere to four-fifths by volume of the whole, and is contained in sulphate of ammonia and nitrate of soda.

From the diagrams given, it will be seen that the greater number of elements necessary to plant life are obtained from the soil. All soils, however, have not the same composition, for all do not bear equally good crops. The soil must therefore vary in composition. Some portions of the earth's crust are barren, and cannot raise any crops whatever. Examples of this are found in rocky places, where the material being hard, insoluble, and compact, does not allow of the plan roots finding their way below the surface and drawing their nourishment from it. Such rock may in time by the agency of frost and rain be disintegrated into very fine and fertile soils, but in the massive state must rank as barren and unfruitful. Other examples of this class are met with in sand and in alkali covered tracts of country, such as are found in Chilé and in some other countries. Fertile soils too are not all equally prolific, for whilst one field may be clothed with grain, another may bear only trees, and a more favoured spot may be so thickly covered as to resemble jungle. No doubt climate has much to do with this but much also depends on the chemical and mechanical condition of the soil. The following diagram will illus'ate the more important classes of soil :—

Composition of Soils.

	Vegetable Mould.	Sandy.	Fertile Clay.	Loam.	Calcareous (Lime).	Marl.
Organic Matter ..	10·08	0·49	3·38	11·24	6·33	10·50
Iron Oxide ..	6·30	3·19	8·82	4·87 }	9·31	11·92
Alumina ..	9 30	2·65	6·67	14·54 }		
Lime ..	1·01	0·24	1·41	0·83	(Carbonate of Lime.) 54·56	19·93
Magnesia ..	0·20	0·70	0·92	1 02	trace.	0·25
Potash } ..	0·01	{ 0·12	1·48	2·80 }	1·01	0·71
Soda } ..		{ 0·02	1·68	1·43 }		
Phosphoric Acid ..	0·13	0·07	1·51	0·24	trace.	0·38
Sulpheric Acid ..	0·17	trace.	trace	0·09	trace.	0 04
Chlorine ..	—	trace.	—	0·25	—	0·76
Clay and Sand ..	72·80	92·52	72·83	63·19	28·77	55 52
Carbonic Acid, &c..	—	—	1 87	—	—	—
	100·00	1 0·00	100·00	100·00	100·00	100·00

Soils then, vary much in composition, and all soils cannot therefore be equally good for growing all crops. A knowledge of the composition of the soil will aid the worker much, for, with a statement of the analysis of the ash of the plant he may desire to grow, he will be able to see in what his soil is deficient, and also which particular crops he can more economically grow with a fair prospect of success. The most necessary foods to be supplied to plants will be seen from the table to be phosphoric acid, lime, and nitrogen. With special crops the amount of each of these must vary.

It will be evident then, that if man removes the crops from the ground it is necessary that he should give to the ground an equivalent. This system of returning to the soil what is taken from it, is termed manuring and the material so applied is called a manure. A good useful manure is one which contains all the saline ingredients necessary for the life of the plant it is desired to grow. Such substances are known by the name of 'general manures,' and leave the ground after the crop is removed in a more fertile condition than before they were applied.

Farmyard Manure.—This was one of the most early applied manures. It consists of the old litter from stables; byres, &c., along with the solid, and part of the liquid excrements of the animals. It varies much in composition, the solids containing most of the earthy matters, whilst the liquid portion has the saline constituents in solution. Much, too, depends on the

care, taken in bringing or heaping the substance, so as to protect it from undue rain or damp, else the salts will be dissolved out, and, passing into the drains, be lost. The composition also depends much on the animal which produces the manure, as, according to Boussingault, you find in *horse urine*, nitrogen equal to 1·55 per cent., whilst in *cow urine* there is only 0·44 per cent. Then the earthy substances in horse dung equal 4·02 per cent., and in cow dung equal 1·18 per cent. It is a waste material, and as such may be used with advantage; but where it requires to be bought is an expensive manure; for, taking the material at 7*s* per ton, the present market price (cartage excluded), and putting 20 tons on the land per acre, the cost would be £7 (cartage excluded), whilst an equivalent amount of dissolved bones—namely 8 cwts.—would cost £3 4*s*, showing a balance of £3 16*s*. in favour of the chemical manure. Then again, as 20 tons will contain all the nitrogen necessary for a six years' rotation of crops, along with three times the amount of salts required, it follows that a lengthened use of this manure will tend to load the soil with saline matters. It is therefore better to employ the farmyard manure together with a certain quantity of some other manure.

(*To be continued.*)

MR. DECLOSETS ON ARTESIAN WELLS.

MR. A. DECLOSETS, C.E., wrote as follows to the Joint-Secretary to Government, Public Works Department, Irrigation Branch, on the 30th October last :—

"I have read in the newspapers your report upon artesian wells and on their application to irrigation or water-supply of towns, &c., and I ask leave to say that your own conclusions were perfectly right; but I will add that, as the data of the Chief Engineer in Pondicherry were established upon a work made by Government Departmentally (*en regie*), the cost per yard you have extracted from Mr. Carriol's report does not represent the true, and real expenditure incurred for boring the Colonial Garden's well; so that if such boring had been executed by a contractor or by private parties, the cost would have been greatly above that stated by Mr. Carriol for the sake of showing economical working. In fact, the cost of the Colonial Garden's well, in supposing the work done by the instrumentality of an Engineer or of a contractor, could be established as follows :—

	Rs.
Wages of workmen for four months	650
Value of eighty metres of piping	972
Transport and fitting charges	264
Shipping and other charges	430
Interest at 5 per cent. on the boring apparatus, the shear legs, and other implements, the value of which has been of Rs. 6,000	124
Superintendence and staff during four months' work	1,600
Total ...	4,040

The total depth of the well being 86 yards, 86 the cost per lineal yard is therefore in reality, say, Rs. 46. The well was bored under very favorable circumstances, as the spot where Pondicherry is built consist of an alluvium of detritic remains from the tertiary formation adjoining, and known as the 'red hills' of Pondicherry, and which is composed of sand, clay more or less indurated, gravels and rolled pebbles of quartz, calcareous nodules, and the like. No stratum of laterite or of conglomerate or sand-stone has been encountered, and it is easy to perceive that the work of boring was easy, and proceeding at the rate of nearly one yard, per diem, the cost was reduced to an average rate. I think that the cost stated for the Colonial Garden's well cannot be taken as a criterion. There are some few examples of cost of wells bored at my knowledge in and near Pondicherry. A well bored in the Savana mills at Pondicherry in the alluvium has cost, exclusive of superintendence and tools about Rs 2,000 for a depth of 56 metres, that is 61 yards, which gives per lineal yard Rs. 32·78. Another well in the same strata, at the "Oupallom mills," where water was tapped at 40 yards deep has been contracted for Rs. 1,500 (not accounting for apparatus and repairs); this gives Rs 37·50 per lineal yard. Another well, three inches in diameter, tried in a garden in the Pondicherry town, was abandoned after reaching 45 yards, for boring another of a larger section and after an expenditure of Rs. 780 about. No superintendence was accounted for, as the works were superintended by the proprietor; the cost of the lineal yard of this well has been Rs. 17·22. I was engaged in the beginning of this year for continuing the boring of an artesian well in the estate of a gentleman of Pondicherry, near the large tank of Oussaudon, 6 miles west of the sea. There the grounds belong to the tertiary formation, and its thickness is estimated at about 200 or 250 feet above the cretaceous formation underlaying, and into which cretaceous strata ascending waters sheets may by found very probably. This tertiary formation dips eastwards at an angle of about 2°, passing under the alluvium of the Pondicherry plain. The work previously done had reached eight yards through a stratum of yellow clay mixed with sand, rolled pebble of quartz, small irregular pieces of carbonate of lime, and had arrived upon a stratum of limestone, or a large boulder of such. This limestone, of yellowish colour and saccharoid was extremely hard to bore; we were at work upon it during two consecutive months, and had attained a depth of 15 yards when the proprietor stopped the work, thinking the cost too high for him. In this case no superintendence was charged, and the total expenditure, exclusive of tools, has been Rs. 334 as follows:—

	Rs.
My travelling expenses	60
Wages	80
Several sundries	60
Repairs and new tools	50
Seven yards of iron piping, 7½ inches	84
Total ...	334

The cost of boring has therefore been per lineal yard, s. 47·78. Lastly, a trial well I had bored in Madras at the then Napier Iron Works, through strata of blue clay and sands alternately reached at 30 yards an ascending water sheet of brackish water, above a stratum of a greenish kind of sandstone. The cost of this well, exclusive of superintendence, of tools, and of piping was about Rs. 100, which will give per lineal yard about Rs. 3·33.

All the above are data from practical operations. You could perceive that the rates differ widely. Now I will add, that I have a party of workmen under a Supervisor engaged in boring a well (artesian) in Madura, and that the rates I have agreed to vary from Rs. 30 to Rs. 50 per yards, according to the depth. The ground in Madura seems to me to consist of an alluvium of the Vigairiver, having filled up a granitic 'basin,' the depth of which I estimate at about 80 or 100 yards. This alluvium I think, must consist of *debris* from primitive rock, clay, sand, and probably strata of carbonate of lime kunker of not ancient formation. I hope to tap some water-sheet percolating the sand beds in the upper portion of the Vigai Valley, and running below above the granitic formation. I hope also that we will be fortunate enough so as not to come in contact with any boulder of gneiss. If this can be of interest for you, I shall be very glad to send you further on some particulars of that boring at Madura. I will, in ending, observe that the cost of boring artesian wells will also depend in great measure on the skill of the person entrusted with the work. It seems to be a general impression that nothing is more easy than to bore a hole into the earth; but this will be found a delusion, as has been the case in Pondicherry, and as experienced by several natives who have undertaken to bore artesian wells, without the proper knowledge and tools, but have ended in a failure detrimental to their customers. An artesian well is an expensive commodity which as you have explained, would not suit the native irrigation, but could be turned into some other mode of water-supply where the prime cost is not of a primary consideration."

The Madras Government have thanked Mr DeClosets for his communication. The Government will be much obliged for any further details of the artesian well which he is engaged in sinking at Madura.—*Madras Mail.*

NOTES ON A NEW FIBROUS PLANT.

AMONG the specimens of raw produce collected in Bombay for the Paris Exhibition were samples of fibre extracted from *Malachra rotundifolia* (so named in the list of Bombay contributions).

Regarding this specimen, the following remarks were made in a memorandum attached to the list of contributions:—

"From this plant, which grows abundantly during the rains in waste places in and near Bombay, Dr. W. Gray, M.B., extracted a fine fibre and sent it to the proprietor of the Bombay Hemp and Jute Mill for examination. It was most favourably reported upon. At the beginning of the last monsoons the proprietor was, at his own request, taken to the Byculla flats in Bombay and the plant was shown to him. He remarked that the usefulness of this plant was not known, and reported that the discovery is a boon to Bombay! He has subsequently taken steps in procuring fibre from this plant, and about forty day labourers were till now kept working by him at Chembud, a village near Coorla. A new industry has been started.

This fibre perhaps deserves special attention.

Struck with these remarks, I asked the officer who was in charge of the Bombay collections for Paris, and who had prepared the list (Mr. F. F. Arbuthnot, C.S., Collector of Bombay), to be good enough to furnish me with some further information on the subject, and samples of the fibre as well as of the plant itself. Mr. Arbuthnot was not able to send me any of the fibre, the whole quantity perpared by the mill-owner referred to above after the monsoon having been already exhausted. He had mixed the fibre with jute and made gunny bags of the mixture. Mr. Arbuthnot sent me samples of the plant, however, and copy of a letter from the mill-owner to Dr. Gray on the subject of the fibre. The letter was to the following effect:—"I have received through your friend, Mr. B., a sample of a nicely cleaned new fibre taken from a jungle plant, and being new it gave me extra pleasure in testing it, and I can safely say that the new fibre is quite as good as jute. If this new fibre can be grown in quantity, it will be a great thing and a boon to this presidency. The fibre is actually not the yarn of jute, nor do I know its true name. It seems like what the natives call sanee bheudee, or jungle bhendee, but even that is doubtful, as bhendee is scarcely so good as this fibre.

"The fibre is in length from eight to nine feet thoroughly cleaned from gummy substance and dirt, has a nice silvery appearance with a peculiar lustre, and is almost as soft as silk. In passing the fibre through the machinery damped with oil and water as is commonly done with Bengal and Konkan jute, yarn was produced strong enough and nearly equal to that made from the second quality Bengal jute. In the opinion of our European spinning master, owing to the almost imperceptible difference between the yarn made from the new substance and Bengal jute, it is very suitable for weft; but if the plant is carefully grown and well looked after, the fibre would then no doubt rank fully equal to Bengal and Bombay jute

Owing to the high prices ruling for jute in Bengal and elsewhere, the new fibre, if carefully prepared, would command a ready sale at Rs. 8-12 to Rs. 4 per Indian maund."

I submitted the specimens of the plant and the papers received from Bombay to Dr. King, Superintendent of the Botanical Gardens, Howrah, who had kindly offered to indentify and name the plant. He says that the plant is *Malachra capitata, not M. rotundifolia,* which is found only in South America, and he adds:—*Malachra capitata*, though probably originally a native of South America also, is now found everywhere within the tropics. It now grows sparingly about Calcutta, but as it is not mentioned by Roxburgh in his *Flora Indica*, it appears probable that it did not occur at all here in his time. Wight and Arnott do not mention it in their *Prodromus Flora peninsula Indiæ Orientalis*, and it is therefore improbable that it was common in Southern India when that book was written. I should not anticipate any difficulty about growing the plant in Bengal, but whether it would yield as good a fibre or be as valuable as jute, I am quite unprepared to offer an opinion. The plant belongs to the natural order *malvaceæ*. It is an erect annual (or occasionally perennial) shrub, covered everywhere with very stiff hairs. The leaves are broadly heart-shaped, almost rounded and are borne on long stalks.

The flower heads are also carried on long cylindrical stalks which rise from the axles of the leaves. The flowers themselves are yellow or white in colour. There are about five or six of them on each head, and they are sorrounded at their origin from the flower-stalk by three or four half-kidney shaped braces. Each flower produces five seeds."

The above is a popular description. Sir J. D. Hooker's description in the flora of British India is to the same effect, though stated in botanical terminology. Sir Joseph Hooker writes of this plant (*M. Capitata*) that it occurs "throughout the hotter parts of India from the North-Western Provinces to the Carnatic, probably introduced." The members of this family are usually found in marshy places within the tropics. It would seem, therefore, that this species would thrive well in Bengal. In fact, it is already common about Calcutta, and Voigt (*Hortus suburbanus Calcuttensis p.* 112) refers to it as domesticated in his time (1841) about Serampore. Mr. Blechyden tells me that Graham, in this Catalogue of Plants in Bombay and its vicinity, alludes to *Malachra rotundifolia* as introduced by Mr. Nimmo about forty years ago.

The preparation of the fibre is the same as that of jute. When Dr. Gray operated on the fibre in Bombay, he steeped the stem in water for a week. It must be steeped when freshly cut, for according to the experiance of the mill-owner who tried the fibre, if the stem is exposed to the sun and allowed to dry, great difficulty is found in getting rid of the external bark, and the fibre obtained is coarse and interior in quality.

The utilisation of this plant would be specially advantageous in the Bombay Presidency, where as yet attempts made to grow jute can hardly be said to have had any success. But the plant seems to merit attention in Bengal too. Growing as it does and flourishing without any attention in marshy soil, of which we have more than enough for all purposes in Lower Bengal, it would seem to offer to spinners and to paper-makers an excellent substitute for an addition to jute. I believe the Bally Paper Mills Company are anxious to find some fibrous product capable of conversion into paper at low cost. Here is one to their hand, and I beg to recommend it to their attention, as well as to that of jute spinners and rope and twine makers.

In Balfour's Class Book of Botany, p. 771, it is said that in Panama the leaves of this plant are used as an anthelmenthic.—*J. E. O'Connor.*

MINERALOGY.

GOLD-MINING IN THE WYNAAD.

WHEN we read of another company, with a capital of £100,000, being formed in London for working the quartz reefs in the Wynaad, there seems no fear of the mineral resources of this district being any longer neglected. Mr. Brough Smyth's visit to this presidency has certainly had the effect of calling public attention to a possible source of wealth in India which had hitherto been singularly neglected. It has been objected to Mr. Smyth's reports that they were not definite enough in their assurances of the existence of gold in payable quantities, but we feel bound to say that we think those objections hardly reasonable. After all Mr. Smyth could do no more than test the quartz found in certain localities, and form his estimate of the general character of the reefs from the samples he had examined. With the staff at his disposal, it would be impossible for him to make a detailed examination of the country over which gold-bearing rocks have been proved to exist. The important fact remains that, so far as Mr. Smyth's examination has gone, it has proved that gold does exist in certain parts of the Wynaad in quantities that would be considered highly encouraging to mining enterprise in Australia. It is a well-known fact than in the colony of Victoria the average yield of quartz gold is something under seven dwts to the ton; while Mr. Smyth has found quartz in Mysore and the Wynaad yielding at the rate of several ounces of gold to the ton. "Ah, but these are only samples," say the sceptics. This is quite true, but it is fair to assume that the samples give a good idea of the general character of the reefs from which they have been taken. Judged by this standard, it is undeniable that the quartz reefs which have already been explored offer a fair prospect of being profitably worked. Much however will depend on the constitution and management of the Mining Companies, whether they will be financially successful or otherwise. We should say it would be absolutely essential that native labour should be employed. European or Australian labour would be too expensive, except for purposes of direction and supervision. The success with which the coal mines are being worked in Bengal and the Central Provinces, would suggest that there should be no insuperable difficulty in obtaining the necessary native labour for quartz mining, which is no more laborious or dangerous work than coal-mining. The necessity of having trustworthy European managers in charge of the mines and mining plant is obvious enough. In fact, a very great deal will depend on having honest and efficient supervision on the spot. The Government, too, will have their work to perform in connection with these gold mining enterprises, and must be careful to do it in a way that will not fetter or discourage the Companies.

Of the Company referred to in the telegram we know nothing as yet, but it is supposed to be patronised by some wealthy London firms who have taken over Messrs. Smith, Fleming & Co.'s interests in certain proprities in the Wynaad. The Alpha Gold Mining Company has now entered on a new lease of existence, in connection with a Company in London that is to raise a capital of £50,000 for working the reefs that belong to the former Company. A third Company has been formed in Madras for working certain reefs that have been explored in Mysore, and which are said to promise a yield of gold equal to that found by Mr. Smyth in the Wynaad. There is now, therefore, a good prospect of gold-mining in India having a fair trial. Should these Companies succeed, they will have plenty of followers, and a very important step will have been gained in the direction of righting our exchanges with Europe. Should they fail, they will but share the lot of many other adventures of a like character. They will have proved, at all events, that India must still look to other countries, for her supply of precious metals.—*Madras Mail*

GOLD MINING IN SOUTH INDIA.

ADVANTAGE has been taken of the revival of enterprise in the London market to introduce the South Indian Gold Mining Company to the notice of investors. The capital is £100,000 in shares of £1 each, of which £33,000 is taken by the vendors. The concern is formed for the purpose of purchasing and working mining rights on 1,200 acres in the Wynaad, comprising "numerous reefs of oriferous quartz of great extent." Mr. C. J. Harvey, late manager of the Clunes Works of the Port Philip Mining Company, pronounces them to be "most valuable properties." It is remarked that the statements made during the last few years, and the very considerable interest excited in the minds of scientific men in respect of the gold deposits in the Wynaad, prompted the Government of India to institute an official inquiry into the subject, the result being to confirm the fact of the existence in this district of abundant deposits of the precious metal. It is well known that for years past, the character of gold mining has completely changed from what it was in the early days of California and Australia. What was then fairly looked upon as a speculation, has now become, by the introduction of machinery, a steady and legitimate industry, yielding regular and remunerative dividends. To effect this result, what is now looked for by experts is, not so much rich pockets of ore, as a plentiful supply of auriferous quartz, which will permit of continuous crushing, and give a fair return for all work done or money expended. This company expects to earn £30,000 per annum net, or 30 per cent. on the capital. A powerful company has been formed in Glasgow for the purpose of working extensive mining rights of a similar nature in the same district, and arrangements are contemplated for the co-operation of the two companies in the erection of works on a convenient site as regards water-supply, thus affording mutual support and economising expenses. Engineers, accompanied by one of the directors, have recently been commissioned to examine the properties of the Glasgow Company, and advantage was taken to obtain the examination by them of the properties now to be acquired by this company. It is in consequence of the report of these gentlemen that the Glasgow Company have decided to commence their operations on the adjoining estate, and it is on the report and information thus obtained from disinterested parties, that it has been decided to place the present enterprise before the public.—*London Commercial Correspondent of Times of India.*

FORESTRY.

TREES IN TOWNS.

AT the Social Science Congress, Manchester, Dr. Phene read a paper "On the Sanitary Results of planting trees in towns." He said that, during repeated visits to the Continent, he had directed his attention to the apparent difference of health of urban populations, in those parts where trees grew, and where they did not, and had always found those persons living in the vicinity of trees looking more healthy than their neighbours. He had closely observed what trees grew best in such confined spaces, and began his experiments in England as far back as 1850, by planting

several streets in the style of the French boulevards, in a neighbourhood which, though at a low level, was shown originally to have been quite healthy, but in which a number of small houses had for a long time back been erected, and in which houses fever and diseases of various kinds were frequent. The streets were in different positions, *i.e.*, from north to south and east to west. The result of his experience was, that quite independently on the condition of ill-health which often prevailed in some of the neighbouring districts, from which the occupant of these planted streets were free, the same thing applied to periods of opido—when the large and wealthy neighbourhoods around, but further removed, were also seriously affected. He did not of course attribute the whole of the difference to the trees. He had exerted care in drainage and other sanitary improvements with of course, beneficial results, but, on the one hand, the levels, subsoil, and exact position were shared by a large number of inhabitants other than those on the estate in question, and all the sanitary appliances and advantages were enjoyed by the wealthier neighbourhoods, and yet during thirty years he had not been able to trace a single case of fever or small-pox in any of the streets so planted, even when the epidemics were most serious around him, including the districts occupied by the wealthy classes. Dr. Phene then described the latest scientific experiments on the oxygenating property of trees from which most beneficial results were manifest, and from which it was evident that the presence of fresh green foliage was a prime condition in the health of a dense urban population. The following is a list of the trees which, from experiments extending over thirty years, he has found grow in London, some of the most beautiful being those which grow with great rapidity and little attention. Acer psudoplatanus; Ailanthus glandulosa; Catalpa syringifolia; Fraximus Europea; Gleditschia; Populus alba; Populus nigra; Populus Caudensis; Quercus cerris; Rhus typhiuum; Robinia; pseud-acacia; Tilia; Ulmus campestris; also the common ash, oak, elm, pink chestnut, copper beech, (a fine specimen of which is in the rectory gardens, Chelsea), mulberry, thorn,—white and red; common and oriental planes; and of shrubs, Ilex ovata, and other hollies, lilac, common and Persian, Euonymus, various, almond and wild plum, privet, aucuba, &c.

THE GARDEN.

A PLEA FOR THE SUNFLOWER.

THE value of the sunflower, from an agricultural point of view, has frequently been pleaded of late, but nowhere do its merits appear to be so thoroughly appreciated as in Lithuania. According to M. Grunert, of Landeshut, who has recently published a paper on the subject, on his return from a journey to the province, the sunflower is there universally cultivated in fields, gardens, and borders, and every conceivable part of the plant is turned to some practical account. A centner of the seeds yields as much as 40lb. of oil, scarcely inferior to Provence oil, and the pressed residue forms a good wholesome food for cattle, as also do the leaves and the green stalks, cut up small, all alike being eagerly eaten. The fresh flowers themselves, when a little short of full bloom, furnish a dish for the table which bears favourable comparison with the artichoke. They contain a remarkably large quantity of honey, and so prove a great attraction to bees. The seeds are a valuable food for poultry, or supply fine groals of a delicate almond flavour; ground into flour a very light pastry and cakes can be made from them; roasted, they supply a kind of chocolate by no means to be despised, and boiled in alum and water they yield a beautiful sky-blue colouring matter. The carefully dried leaf is much used locally as tobacco. The seed receptacles are made into blotting-paper, and the inner part of the stalk into a fine writing paper in the manufactories of the province; the more woody portions are consumed as fuel, and from the resulting ash much valuable potash is obtained. Experience has shown that large plantations of them in swampy places are a great protection against intermittent fever; further, that they will grow anywhere, and in any soil with little or no attention. The best seed is obtained from the Crimea. Plants grown from this, if partially deprived of leaf and robbed of their side shoots, will furnish flowers with a least 400 seeds apiece.

TEA.

THE 1879 tea season may now be said to be wound up; with few exceptions, the bulk of the tea has gone forward, and the outlook for dividends is not a very bright one we fear. The chief cause of this has been the low prices which the teas realised in London and here, prices which in many cases did not suffice to meet manufacturing and other charges. As we cannot now expect much improvement in these prices, with the steadily increasing production, shareholders must turn their attention to cheaper modes of manufacturing. Where labour is scarce and expensive, recourse must be had to a more extended use of machinery, and united action on the part of all concerned should be brought to bear on the Government, with a view to abolish, or materially modify those almost penal regulations regarding labour. We do not use the word "penal" in connection with the "cooly." It is applied here in regard to the treatment of the employer, who is apparently and in advance, adjudged as a particularly hard and unjust master, and crushing legislation is in consequence prepared for him. It is high time that the tea industry should be taken out of these legislative swaddling-clothes; it being now of age, and perfectly able to take care of itself.

THE total quantity of tea exported from this to Great Britain last year was, according to Messrs. Thos. Watson & Co., 38,126,447lb., as against 33,458,071lb. exported in 1878.

INDIAN TEA FOR AUSTRALIA.

THE following important information is transmitted by Major M. Clementi, Bengal Staff Corps, Commissioner for India to the Sydney International Exhibition to the Officiating Secretary to the Government of India, Home, Revenue, and Agricultural Department:—

I have found that the firm of Messrs. Clifford, Love & Co., of 862, George-street, Sydney, are especially interested in the matter of Indian teas. During the past year they have imported into this colony of New South Wales 170 chests of tea purchased through an agent at Calcutta. They have also a tea business in connection with the colony of Queensland. They are now exhibiting a number of samples of Assam teas in the Indian court of the Sydney International Exhibition.

2. I find that the consumption of tea in this colony is at the yearly rate of ten pounds per head of the population, as against three pounds* in England. And although the population of this colony is only 700,000, yet this gives a total consumption of seven million pounds of tea per annum.

3. It is reasonable to presume that the inhabitants of the neighbouring colonies are equally large tea-consumers; and as the total population of Australia is about one and-a-half million souls, it will be seen that the tea trade with these colonies is worth having. Beyond these, there are colonies of New Zealand and Tasmania, where the trade could be pushed with possibly profitable results.

4. The chief difficulty to overcome is the prejudice entertained by the grocers who were imposed upon some time ago by having a large consignment of very inferior Japan tea sold to them as Indian. The grocers here, too, are behind those of England in the knowledge of teas and the best trade uses to put them. In London all large grocers have mixing machines, I believe, and use them for mixing, for instance, the broken and possibly expensive; but to the uninitiated eye inferior-looking teas, with the more handsome-looking, unbroken, but inexpensive ones, having little flavour. I am informed that there is not a single mixing machine in Sydney; and it is, therefore, very necessary that the Indian teas thrown into this market should present a handsome appearance.

5. Messrs. Clifford, Love & Co., have a considerable business in teas with China as well as that they have with India; and, as far as I can discover, Mr. Love is the only professional tea-taster in Sydney.

6. Mr Love assures me that with judicious management, 500 to 1,000 chests of Indian tea might be disposed of, in Sydney alone, next year, and he would undertake the disposal of them. Within seven years he feels convinced that the India teas would command the Australian markets, provided their introduction was systematically taken in hand in a business like manner.

7. At present about two million pounds of adulterated or, as it is commercially termed, "lie" tea are exported from China. This must find a market somewhere; and as there is no law here, similar to the English one, to prevent its being imported into these colonies, no doubt but that a large quantity of it finds its way into the Australian markets, and is saleable by reason of its very low price, and because the leaf has good appearance, and liquors with a dark colour, which is mistaken for a proof of excellence of quality.

8. The Indian Pekoe Souchong is the best adapted to this market but should be fired more than it now is, that is, the tea should be a *little over* roasted so as to destroy the slightly earthy flavour common to it as it is now prepared.

9. Messrs. Clifford Love & Co., showed me their last invoices, and I find that they paid at the rate of ten annas and nine pie a pound for the tea in Calcutta, the exchange being then one shilling eight and five-eighth pence the rupee; to this had to be added high agency charges, freight, and insurance. But I suppose that if the tea could be bought directly from the gardens, a better class of tea could be sold here to the public for the money they now asked for a more inferior sort.

10. The tea for this market should be laid down here at a cost of a shilling to one shilling and five-pence a pound, which admits of its wholesale purchase at from one shilling and eight-pence to two shillings: and then the grocers can, as they require to do here, retail it at two shillings and six-pence to three shillings the pound.

* This is wrong, the consumption in England is 4-6lb.—ED., *I. A.*

JOTTINGS FROM MINCING-LANE.

THE following facts are doubtless known to many planters, but they may prove interesting to those who have not had some practical experience of the "Lane."

Brokers are divided into two branches, the selling broker and the buying broker. No less than 28 firms of brokers issued catalogues of Indian teas during the year, representing nearly half-a-million packages. There are about 12 buying brokers, who support the auctions in three ways: 1st, by buying "over" what they consider to be cheap; 2nd by executing the orders received from principals; 3rd by forcing some buyers to pay long prices. If trade is at all brisk, the leading buying brokers can buy over and place ½ per cent. brokerage fully 500 chests per day. With all their acuteness, they sometimes buy dearly, and have then to resell their purchases at a discount or give a fresh prompt. The buying brokers drop their money occasionally by dear buying, and the selling broker sometimes loses the market for his merchant by holding firmly for valuations until compelled to accept the best price he can get. It does not require the gift of prophecy to foresee however, that the time is not far distant when all Indian tea will be sold with reserve, as at the China tea sales. The course is seldom adopted just now, and there is undoubtedly some risk, but on the whole, better prices are obtained when the teas are printed for sale without reserve.

Dealers.—There are probably about 30 dealers on the London market, who do a trade of more than 5,000 chests per annum. The largest houses have from 20 to 30 agents scattered throughout the kingdom.

Warehouses.—About 14 warehouses have a share in the Indian trade, but the greatest quantity is stored by the London and St. Katherine Dock Company, whose principal warehouse is in Cutler-street, and the East and West India Dock Company. These warehouses allow 30 per cent. discount off their published tariffs, but some of the private warehouses give 40 per cent., a difference of about 6*d.* per chest. The warehouse charges are the heaviest items of the account, and sales vary from 4*s.* on chests weighing from 80 to 128lb. gross, to 4*s.* 6*d.* on chests weighing from 130 to 159lb. gross, after deducting 30 per cent. discount.

Invoices—Generally show a better result when the tea is sold by auction on arrival. If offered privately, they never receive the same amount of publicity or competition as at the public offerings. Holding teas for a better market is not a remunerative operation as the quality too often deteriorates. The probable absence of Cape shipments which used to supply our market towards the end of the season will necessitate some holding back either here or in India, and it may be mentioned that the cost of doing so here may be put down at ½*d.* per lb. per three months,

Exports.—A fair supply of Kangra Valley, Debra Doon, and Darjeeling teas chiefly Souchongs and Pekoe Souchongs, is sent from this port to the continent, and it appears the Australian Colonies have taken this season, direct from Calcutta up to 30th October, no less than 1,300 chests. This demand may be expected to increase yearly.

Consumption.—The average *daily* deliveries for the past 6 years is as follows:—

	1874	1875	1876	1877	1878
Chests	660	860	990	1,040	1,360

but the statistics for the present year show a falling off on 1878. Various districts have their particular tastes in tea. For instance, Darjeelings are largely consumed in the north of Ireland and in Scotland, while broken Pekoes of the finest kinds are drunk pure by the lower classes in Ireland. Strong and rather burnt liquoring Assam teas are also popular in Ireland. Pale pungent teas are in great request in the midland counties of England, and in other districts, where the public taste had been accustomed to the China scented caper tea.

GREEN TEA.

IF the "deficiency" in supply be not made, it will not be for wont of efforts which the public should duly recognise. Last week upwards of 2,000 packages of green tea were sold, which were imported as long ago as 1870. The best friends of the "deal" admit that "some" of this leaf was, "no doubt, very highly coloured and objectionable" and an unprejudiced examiner describes a sample as "leaf *debris* coated with a greenish paint"—this treatment having unfortunately become necessary owing to the last having been sunk in a Thames barge some years ago. Of course, the Adulteration Act will grievously interfere with the retail of this leaf; but sellers and buyers are perfectly aware that it can be got off by judicious mixing. The public have been invited, however, to believe, that these parcels are "merely a few that still remain" of what was a few years ago "a considerable article of trade," and that these "teas" will be "chiefly shipped abroad as they are completely out of favour for the home trade." I should mention that a firm which have tasted a number of the samples, including the lot that had been soaked in the Thames, they generously say that 'though a little peculiar in flavour" the same samples are quite sound and wholesome "and much less objectionable than much so called genuine tea."—*Times of India.*

THE PREPARATION OF TEA IN CHINA.

IN continuation of this subject in which the Chinese are defended to some extent against the charges of adulteration, the *Grocer* says:—We now come to the use of spent tea-leaves for the adulteration of tea. In this as well as in the other cases of alleged adulteration, the commercial evidence should be examined. Let us begin at home, and ask whether there is any such evidence to indicate that any notable proportion of the 200,000,000 pounds of tea sold in this country is largely mixed with, or as some have affirmed, entirely composed of spent tea-leaves.

Where must the spent leaves come from if such is the case? Who collects them, and where do the collectors find a market for what they have collected? It is clear that a large trade of this kind could not be carried on without making itself evident. We know that rags and bones are collected; the collectors of these are visible enough—sufficiently so to become, in some cases, a domestic nuisance. We can easily learn what becomes of kitchen stuff and candle-ends, but we fail to discover any house-to-house visitation for the collection of spent tea-leaves, or any shop-keepers to whom the cook can sell such unconsidered trifles. Neither have we been able to learn that hotel-keepers and coffee-house proprietors are able to find a market for the considerable quantities of spent tea-leaves they might save if such a market existed. It would be rash to affirm no such transactions have ever occurred, but we may safely assume that no regular business of any magnitude is carried on by means of which adulterators or sophisticators of tea could obtain supplies of raw material in the shape of spent or exhausted tea-leaves.

Eder states that out of five samples of tea bought at small shops in the suburbs of Vienna, three had been admixed with exhausted leaves. We are not able to apply the commercial test to Austria, and therefore cannot tell whether, supposing Eder's method of detecting this adulteration to be reliable, the exhausted leaves were added there or brought from China. Our limited knowledge—or rather complete ignorance—of the commercial operations of Chinese rag-and-bone men render us unable to apply the commercial test to that country; but from what is known of the very economical habits of the people, the vast quantities of tea they consume, and their aptitude in sophistication generally, it is not at all improbable that the collection of exhausted leaves may there be a regular branch, provided the labour of such collection costs less than the growing of the tea shrub and the picking of its fresh leaves. This, however, is questionable; and if some of our resident tea merchants would study this subject, they might contribute information that would be very interesting and of some practical value to the trade. Even in China an extensive traffic of this kind could not be carried on invisibly.

Eder's method of analysis for the detection of this adulteration, which he admits to be very difficult, is to first analyse a given sample of tea, then infuse a similar sample and analyse the exhausted leaves. The constituents that he determines in these analyses for this purpose are, first, the *tannin*, or that astringent principle which tea-leaves contain in common with oak, bark, catechu, divi divi, &c., and which if added to gelatine converts it into the basis of leather; secondly, the "*extract*" or mixture of peculiar gummy matters that are soluble in water; thirdly, the total ash, or all that remains when the leaves are completely burned; fourthly, that portion of this ash which is soluble in water.

The results of such comparative analyses are shown in the following table:—

PERCENTAGE.

Kind of Tea Leaf.		Original Leaves.			
		Tannin.	Extract. soluble in water.	Total ash.	Ash soluble in water.
Black Congou	... No. 1	11 20	40·30	5·43	2·83
,,	... No. 2	10·10	39·40	6·21	1·55
,,	... No. 3	8 36	37·60	6 05	2·32
Moning	...	11 32	39·90	5 03	3·03
Souchong	... No. 1	8 16	34·40	5 27	2·90
Assam Souchong	...	10 95	44·30	5·22	3 09
Green Hyson	...	12·44	43 20	4·89	2·77
Yellow Japan Tea	...	13 07	39 50	5·81	2·73

PERCENTAGE.

Kind of Tea Leaf.		Leaves once Infused.			
		Tannin.	Extract soluble in water.	Total Ash	Ash solube in water.
Black Congou	... No. 1	4·14	10 20	3·92	0·94
"	... No. 2	5·65	15·30	4·80	0·46
"	... No. 3	3·31	8·50	4·27	0 39
Moning	...	3 73	12 90	3 88	1·27
Souchong	... No. 1	2·51	12·40	...	...
Assam Souchong	...	5·07	19·70	4·96	1·05
Green Haysan	...	5·36	13·20	3·41	0·74
Yellow Japan Tea	...	2·62	12·00	3·40	0·47

This shows us what is taken out by the infusion, and proves that the difference between fresh and exhausted tea-leaves is very considerable. We suspect that, however, in spite of all the skill and learning of the German chemist, if several samples of fresh and exhausted tea were submitted for examination to him, and the same to an acute English laundress, the laundress would detect the difference as unerringly as the chemist. She knows well enough the difference between the first cups of tea from the pot, and those poured out after a second watering. The professional tea-taster can detect such adulteration still more efficiently, unless some very skilful disguise is perpetrated.

Is such a disguise possible? The analyses of Eder above given (and they nearly correspond with those of other chemists) afford some data for answering this question. Let us first consider the tannin. The table above shows that the percentage of this component is reduced to less than one-half by infusion. Can this be replaced so as to disguise the effect of its loss by infusion? There is no doubt that it may be. A chemist could name a multitude of vegetable substances that contain a far larger proportion of tannin than any sample of fresh tea-leaves; he could add a small quantity of these, or he can make solutions containing so much tannin, that if exhausted and dried tea-leaves were soaked in them they would take up as much tannin as they lost by their previous infusion. Logwood, oak, bark, catechu, divi divi, &c., might be used for this purpose. These would not only supply the tannin answering to the tests of the chemists, but also the rough astringent flavour and the dark colour of the infusion which the tea-drinker demands. Eder accordingly looked for such adulterants, especially for catechu and logwood. His tests for these are as follows. We state them for the benefit of our chemical readers. Non-chemists may skip them, as novel-readers skip the author's moral reflections to follow the story :—

Test for Catechu.—Make a decoction of a weighed quantity (one gramme) of good tea, and the same of the suspected sample; boil each with an excess of sugar of lead, and filter. To the filtrates (which should be colourless) add a solution of nitrate of silver. If the tea contain catechu it will produce a copious flaky precipitate of a yellow-brown colour; if not, only a slight greyish-yellow turbidity will be produced.

Test for Logwood.—Steep the tea in cold water. If logwood is present, the blackish solution which results is changed to a bright green by the addition of a little sulphuric acid. Another delicate test for logwood is the addition of a solution of yellow chromate of potash to the cold, aqueous infusion of tea; if it contain logwood, a blackish-blue colour will be produced; if the tea be pure, the chromate will have no such effect.

The next constituent—*viz.*, "extract soluble in water"—is rather a complex one. All leaves yield such an extract composed of gummy, saccharine, albuminous, and other matters, some of which are special and characteristic of the particular plant, giving it any special flavour, and any medicinal or other property it may possess. The special alkaloid the "theine," upon which the physiological properties of the tea plant mainly depends, would be here; also the special flavouring matter, such as the aromatic tea-oil, which a delicate taste detects, and which is rather disguised than otherwise by the coarser astringent flavour of the tannin. It is pretty certain that this cannot be supplied by any artificial means, and as the purity and character of this special flavour give to the better class of teas their high value, there is little risk of such teas being adulterated with exhaustive leaves by the Chinese, seeing that the adulterant would bring down the price of the sample even to a greater extent than it would increase its weight.

The coarsest and cheapest of teas contain so little of this choice flavouring extract that it is masked by the astringency of the tannin, and the drinkers of such coarse teas judge the quality mainly by this tannin flavour and the dark colour of the infusion. Therefore, we may commercially infer that the use of spent leaves as an adulterant would be limited to the coarser qualities of tea, and that some source of additional tannin would probably be added when this adulterant is used. Eder's analyses, which we shall give in our next, confirm this. The ash or mineral matter—whether soluble or insoluble—could be easily added if demanded commercially; the soluble or that which is removed by infusion, being chiefly such common salts or carbonates and oxalates of soda and potash. The following abstract of Eder's statements of the results of his full analysis of the composition of genuine teas may interest our chemical readers. Those who are not interested in such details may skip as before, and await our next, which will deal with the more commercial results :—

Average Composition of Tea.—Forty per cent. of the whole weight of the tea is soluble in water. Of this 38·3 parts are organic matters and 1·7 mineral matters. The organic matters consist of 10 per cent. of hygroscopic water; 10 per cent. of tannin; 0·2 per cent. of gallic acid, oxalic acid, and quercetin; 0·1 per cent. of boheic acid; 2 per cent. of theine; 0·6 per cent. of tea-oil; 12 per cent. of albuminous bodies, probably legumin; and 3 to 4 per cent. of gummy substances with dextrine and sugar. The 1·7 per cent. of soluble mineral matters is composed of 0·938 of potash, 0·014 of soda, 0·036 of lime, 0·0351 of magnesia, 0·024 of sesquioxide of iron, a trace of manganese, 0·133 of phosphoric acid, a trace of sulphuric acid, 0·021 of silicic acid, 0·430 of carbonic acid, and a trace of chlorine. The remaining 60 per cent. of the tea is insoluble in water; 12·7 of this is organic matter consisting of albuminous bodies. *The etherial extractive* contains 1·8 to 2·2 per cent. of chlorophyll, 3 per cent. of resin, 1·8 per cent. of colouring matter, 16 per cent. of colouring matter, 16 per cent. of extractive matter (for the most part soluble in nitric acid), and 20 per cent. of cellulose. *The 4·0 per cent. of mineral matters insoluble in water* contains 0·290 per cent. of potash, 0 052 of soda, 0·515 of lime, 0·592 of magnesia, 0·045 per cent. of sesquioxide of iron, 0 019 per cent. of oxide of manganese, 1·031 per cent. of phosphoric acid, 0·046 per cent. of sulphuric acid, 0·680 of silicic acid, 0 744 of carbonic acid, and a trace of chlorine.

COFFEE.

LOCAL *versus* LONDON COFFEE SALES.

OUR morning contemporary has some forcible remarks and figures on this subject, the gist of which is as follows:—"What would be said of the merchant who always bought in the dear market, and sold in the cheap one? Who shipped produce to a foreign port in the face of a heavy loss which might be avoided by a sale on the spot? Would anyone expect him to prosper? Yet this is practically what we see done the season round, year after year. Take an instance; to-day a fair sample of plantation would very likely not be obtainable under Rs.49 f.o.b. per cwt. equivalent at 1s.8½d. exchange to 82s. 8d. sterling—or, including freight, insurance, and all London charges, equal to 93s. The present price of middling plantation is 87s., so that anyone unable to sell in Colombo, is facing a positive loss of six shillings sterling per cwt. But if it were ten shillings instead of six, most of the coffee we grow must still be shipped on planters' account, and for one reason only as far as we can see—to enable the English capitalist to make a show of doing a large business. It will be said that it is impossible to sell the whole of our coffee crop in the island, and to a certain extent this is true, but all the finer coffees would command a ready sale here were they "free." The difficulty at present is to get suitable quality in sufficient quantity for direct foreign customers—and they are consequently driven to supply themselves in London where by waiting their time they are able to buy on better term than they can do here, thanks to the present plan of swamping that market with our crop as fast as it can be pushed forward through the canal by steamers. We could name a large number of crops, which, if sold in the island, would realize much better prices than they do at home. There is, however, no help for it; they *must* be shipped—that is in the bond from which there is no appeal. Some years ago, extensive orders used to be recieved from France, Belgium, Russia, and the United States, but of late the direct trade with these countries has dwindled down to the most insignificant proportions. A strange fact apparently, when we consider the extension of cheap steam communication since the opening of the Canal, but in no way surprising if we look at the cause. Taking the price of plantation to be Rs. 49 f. o. b., and exchange at 1s. 8d. the sterling, the equivalent is 81s. 9d. to which must be added, say 11s. for freight, insurance, and usual home charges, thus making the cost 92s. 9d. and showing a loss of 5s. 9d. per cwt. on a quotation of 87s. It is therfore clear that if a Frenchman is willing to pay the equivalent of 81s. 9d. sterling to the seller direct, in Colombo, the latter will realize 5s. 9d. per cwt. more than he could expect to do in London. But this is not all. The foreigner if buying there at 87s., would have to add say 3s. to this price for expenses of transport and other charges, so that actually he is saying 90s. for an article which, if it had been bought on the spot, would have left the grower 83s. 6d. net sterling against 76s. net sterling from a sale in London. A difference of 7s. 6d., or less (say 2s. 6d. the merchant's selling commission), of 5s. net gain by a sale in the island. This will be seen more clearly from the following calculation :—

	s.	d.
London price	87	0
Freight and transport from London	3	0
Actual cost at Wharf in Marseilles	90	0
Deduct freight and charges from Colombo to Marseilles ...	6	6
Leaving	83	6

as the net sterling price that could be paid in Colombo for an order on French account. In this instance, we have taken the Marseilles market, but the same facts apply equally to other continental ports. If coffee proprietors here be in a position to have their interests sacrificed in this way to the whims of home firms, well and good, but if they are not, then it might be as well, whilst seeking to economise in estate management, if they wer at the same time to seek relief as far as possible from a cruel incubus, which is becoming a more intolerable burden every day."

We do not suppose their is anything new in all this to our planting community. It has been a well-known fact for some years back, more especially since the advent in our midst of the representatives of German and French coffee-buying houses and the establishment of a coffee market in Colombo, that it is more advantageous for the planter as a rule to sell locally than to ship to London. We suppose very few independent planters, at liberty to sell or ship as they choose, have adopted the latter alternative for some years back. The cause of so large a proportion of our produce being shipped to

London is familiar to us all, and it seems particularly cruel of our contemporary, at the very time when a large number of our planters are realizing more keenly than ever their dependence on English capital to turn round and say "Why don't you sell your produce in the local market—why ship your coffee to London." He might as well ask, "why go and borrow money at ten per cent. from a mercantile firm here or at seven per cent. from a London house; why not employ local brokers to get the money for you?" Was there ever a more unseasonable moment to go and open the old sore of local *versus* London coffee sales than at present, when so many of our planters are pressing both Colombo and London houses to take up their accounts—when money to carry on with is scarcely to be had on almost any reasonable terms, and when it is of particular importance to try and induce English merchants to increase their investment of capital in the business of this island? This is how it strikes us while fully alive to the hardship imposed on the producer by the present mercantile stipulation that coffee must be shipped and sold at home. It is simply the old old story:—"The rich ruleth over the poor and the borrower is servant to the lender." If the London merchant advances his money only on condition that it brings him besides the stated amount of interest, so much business in the shape of produce to sell in Mincing-lane, who is to say him 'Nay'—at any rate at the present moment? He cannot and does not force his money on the producer. The latter is quit at liberty if he care to get his capital independently, and if he so manages, to sell when and where he please. But until this financial crisis has passed away, we cannot help suspecting that the number of grumblers against the system which binds them to ship, will not be so great as the number who are anxious to get accounts taken up and the wherewithal to carry on even if they have to ship every bean at the disadvantage our contemporary points out. It may be asked, however, if our German and French local houses are so anxious to obtain fine plantation coffee for direct shipment to the Continent, so undoubtedly saving extra freight, charges and commission, why do they not enter into advance business—why not invest some of their capital in helping the producers at this crisis to carry on—why not take a little of the risk appertaining to estate accounts? From the point of view of the London merchants and their Colombo agents, the remarks of our contemporary will, in fact, appear eminently one-sided and unfair. Their answer will be:—"You want us no doubt to continue the investment of our capital in the accounts on our books, but to allow our constituents to sell their coffee to French and German rival mercantile houses on the spot, in order that the planter and the purchaser may divide a profit which now comes to us and our supporters as part of the return we reckon on against the risk of occasional bad accounts and heavy losses." It may seem somewhat strange for the *Observer* to be thus standing up for London capitalists and agency houses in a business practice undoubtedly prejudicial to the producers; but we cannot help remembering that at this moment the most urgent requirement of the producers is an additional supply of money which only the said capitalists appear to be able to afford. What at this time, would be the value of liberty to sell crops in the local market if the wherewithal to weed the plantation, to buy rice and gather in the crop is withheld? Is it not a fact that some of our planters would be right glad to get their accounts taken up on condition of shipping produce to London; while there are others who for weeks and months have been waiting in the hope of advances on any more independent terms. So scarce is money that we have heard of cases of men with clean title-deeds (for young properties) being unable to raise a moderate loan on primary mortgage (at good interest, but without other conditions), to carry on. At such a time then, we fear that while to the independent planter the news will be trite enough of the advantages of selling his coffee locally rather than in London, to the rest of the planting community the convincing figures adduced to shew how 6s. a cwt, may be saved, will seem like a mockery of them and their dependence. If continental buyers really desire to promote direct sales and shipments, they ought certainly through their own locally experienced agents to make advances against crops, to undertake business somewhat similar to that of the "Cash Credit System," which carefully managed ought to be free of any special risk.—*Ceylon Observer.*

COFFEE TWO CENTURIES AGO.

In the book entitled "Isagoge Phytologica," published in 1690, to which we recently made reference, the following appears relative to coffee:—

"Coffee.—*Cophy.*—It groweth on little trees, only in the deserts of Arabia. The time is not observed. As for the variety of names, authors have as yet writ little. Coffee is of an exsiccant quality. It dryeth up the crudities of the stomach, comforteth the braine, it benefits consumptions, lethargies, rickets, swounings of women, it fortifyeth the sight with its steem, and prevents dropsies, gouts, and the scurvie, together with the spleen and hypocondriacall winds; all of which it doth without distemper. Hereof may be made an eletuary, thus. Take of butter and sallet oile equal parts, mixed, and melt them with thrice so much hony and Turkish coffee, a sufficient quantity of rumsey; the quantity (the size of) a nutmeg taken, opens the body, and helpeth the stone and gout. The *grains* and *berries* called coffee are brought from Arabia, and drunk generally throughout all the Grand Seigniour's dominions, and about halfe a pint is to be drunk fasting, an houre before, and not eating an houre after, as hot as may be endured, it not fetching the skin of the mouth, or raising blisters by its heat. The Turks drink it to help their crudities, drinking water and eating much fruit, which cause it. This drink is cold and dry, and when hot or in flames more than hot posset. It closeth the mouth of the stomach and helps digestion, and so may be taken at 3 of the clock in the afternoon or 4, as well as in the morning. It much quickens the spirits, and makes the heart lightsome; the steem helpeth sore eyes; its good against a cough and cold; suppresseth fumes, and so helpeth the headache; stops defluxions, and prevents the cough of the lungs. It's better than any other drying drinks for old people, and children having running humours as the king's evill, &c. It prevents abortion and drousiness, hindring sleep for 3 or 4 houres, taken after supper. It helps the stone, whitens the skin, and is not laxative or binding.

CINCHONA.

The Superintendent of an estate in Dimbula sent the proprietor a specimen with the following note:—"Enclosed is a bit of renewed cinchona bark with roots growing out of it. I was looking at a tree to see how the bark was renewing and on taking the moss off found these roots growing out of the new bark. Rather curious is it not, for it was some 5 or 6 feet above the ground." The specimen and note were referred to Dr. Thwaites, who wrote:—"With reference to your's of the 27th, enclosing a specimen from a cinchona stem with young roots being developed, this phenomenon has arisen from the bark having been cut too deep and into the true wood, when of course roots are produced under a covering of damp moss; under similar circumstances we get what are called Chinese grafts for propagation of many of our trees, such as mangoes, oranges, &c."

THE MADRAS CINCHONA PLANTATIONS.

The following order of Government has been issued on the report of the Commissioner of the Neilgherries:—

"The report of the Commissioner shows that satisfactory efforts, were made to maintain the condition of the Government Cinchona Plantations during the year 1878-79. The seasons were favorable to the growth of the trees, but the rainfall was too limited and infrequent to allow of the bark "rising" freely and continuously. Labor was still scarce at Neddivattum and Pykara, but out of the allotment of Rs. 24,125 for the general up-keep and conservancy of the plantation, Rs. 23,530 were utilized. Manuring was also carried out more extensively than usual, except at Pykara where there is always a difficulty in procuring manure. This defect demands prompt attention and the Commissioner's promised proposals on the matter should be subimitted at a very early date. The yield of the year was 114,320 of dry bark, and the Commissioner has appended to his report a statement of the plot, and number of trees in each, from which bark was taken. The trees it appears are barked, not by plots but according to their growth and individual capacity to yield. Under the "mossing" system of barking, therefore, the yield is necessarily calculated per tree, and the results for each plantation are shown in the following abstract statement prepared from that above referred to, and the figures given in paragraph 6 of the report:—

Trees Barked.		Weight of Bark.		Average Yield per Tree.	
Kind.	Number.	Wet.	Dry.	Wet.	Dry.
		lb.	lb.	lb. oz.	lb. oz.
Crown* ...	33,331	65,755	27,062	1 15	0 12
Crown† ...	28,056	53,948	26,602	1 10	0 15
Red† ...	17,715	93,690	43,543	4 6	2 7
Crown‡ ...	18,985	30,649	5 475	1 9	0 4
Red‡ ...	12,799	38,399	11,888	3 0	0 14
Total ...	1,10,889	2,82,341	1,14,120	2 8	1 0

*Dodabetta Plantation. †Neddivattum, Plantation. ‡Pykara Plantation.

These results are very satisfactory, especially for the Neddivattum and Dodabetta Plantations. Dr. Bidie, in the notes on the Pykara Plantations which he visited while this crop was being taken, remarked that the bark would be very light when dried, and his prediction is fully borne out by the figures given above, which make it evident that very careful treatment and cultivation are imperatively demanded to maintain the trees on this plantation. From the year's crop dry bark, 108,514lb, were sent to England, and being there sold at prices which showed an advance on those of the previous year—realised £26,159:

but as only a portion was sold before the end of the year, this amount doesnot appear in its assets. The receipts of the year as returned by the Commissioner, Rs. 406,217-85, are made up of the sum obtained in England for the bark of 1877-78, and the value of so much of the 1878-79 crop as was supplied to departments, &c., in this country *plus* gain by exchange at 1*s.* 9*d.* the rupee. It is presumed that in adopting this rate, the Commissioner, as directed in the order, ascertained that it was fixed for the adjustment of transactions between England and India in the year under report. The valuation of the bark departmentally supplied seems fair, but the Government do not consider that credit should be taken for the gain by exchange that would have accrued if the bark had been sold in England, as, though a debit allowance for carriage and freight is made, the broker's charges and other expenses incidental to the English sales cannot be accurately estimated. Moreover no credit should be taken for the bark that was the subject of the experiments recorded in G. O., 9th May 1879; No 1022, as it has been sent to England for sale and the proceeds will appear in the receipts of the present year. After these deductions are made, the receipts of 1878-79 will stand at Rs. 400,354-33. The public demand for seed and plants was abnormally large, but appears to have been fully met. The sales of 1877-78, *viz.*, plants 187,850, seeds 326 lb. were in excess anything previously known, but were far below those of 1878-79 :—

Plants	604,855
Seeds	1,822 lb.

showing the rapid progress recently made in Cinchona cultivation in this Presidency and Ceylon: The Government regret to learn that so large a number of the young plants raised at Neddivattum from the *Calisayo Ledgeriana* seed received from Java have died. The larger measure of success obtained at Dodabetta would indicate that the nurture of this delicate variety is there better understood or is conducted under more favourable conditions. It would be well therefore that a larger proportion of any further supply of this seed should be shown in its propagating houses. The second parcel of seed which has only recently arrived, contains a far smaller consignment than that which was stated to be required for Government purposes and distribution in the Wynaad, and under these circumstances it is not understood why a portion of it has been sent to planters in Travancore. The erection of new drying houses must await the report from England as to the comparative chemical and commercial value of the samples of bark sent home under G. O., 9th May, 1879, No. 1022."

SILK.

IN consequence of the general failure of the silk trade, there are at present in Calcutta a number of continental gentlemen, who have especially come to India to inquire into the silk produce of the country. One of these, Signor Papayanni, has, in the course of his travels fallen upon a district on the confines of Burmah and China, the inhabitants of which are in the habit of using the worm *Bombyx attacus yarna mahi*, as food, when it is about to spin, or technically speaking when it is in its sixth stage. He states that the people regard it as a great delicacy. The chrysalis also is used as an article of food, being previously stripped of the cocoon, which is thrown away. The explorer, Signor Papayanni, we are informed, sent to Marseilles, in November last, a box containing a quantity of these cast off cocoons, which he picked up on the road side, and which realised the handsome sum of Rs. 300. This enterprising gentleman, we learn, will shortly make a second trip.

SILKWORM "CROSSING."

AT the International Congress of Geography, at Brussels, Mr. Rogers, late Bombay Civil Service, called attention to a communication made by him last year at the Paris Congress respecting the indigenous Indian worm that spins the Tusser silk, a product resembling that spun by the Japanese oak silkworm *Yama. Mai.* The Indian worm can be advantageously crossed with that of Japan, and the crossed breed, not being dependent exclusively on the mulberry tree for food will flourish on the leaves of common trees, especially those of the fig tribe. Silk, the produce of the indigenous worm, can be produced in any quantity in India, and a further recommendation of the species is its hardiness. It is also said to be probably free from the maladies to which worms that feed on the mulberry tree are subject.

DEVELOPMENT OF SILK INDUSTRY.

(*Abridged from the 'Mainichi Shimbun.'*)

WE have consistently advocated the establishment of fresh industrial undertakings. We consider that it is only by increasing the wealth and importance of the country that we shall advance in the scale of civilization and obtain all the rights and privileges of an independent nation and the only way to accomplish these objects is to encourage and foster those industrial undertakings which lay the foundations of a prosperous commerce.

Although many writers on the subject agree generally with our views, yet there are some who are very anxious to see Japan develop her resources immediately and therefore advocate the introduction of foreign capital, while others again, considering that the attempt to make Japan a great manufacturing country must inevitably prove successful, actually suggest the reduction of the price of produce and a consequent diminution in the specie of the nation. If either of these recommendations are adopted how can the wealth of the country be increased ? No doubt industries cannot be easily made successful in the face of the rivalry which exists, nor can a nation acquire great wealth and power in a day, but those who feel despondent should reflect upon the past state of many countries in Europe, and compare it with the prosperity they now enjoy. These countries were not always so wealthy and powerful as at present, indeed, not so very many years since, some of them were in a more backward state than we are. Under these circumstances we should not despair of achieving the same success in the course of time.

Many people allege that the industrial resources of Japan are not developing, and yet we find on examination, that numerous industries have been established since 1877. Prominent amongst these are the silk-reeling establishment at Tomioka, the *Shindzuisha* (match factory) of Tokio, the ship-building yards of Messrs. Kawasaki, Hirano, Shiramine, and tens of others, the cotton mills of Sakai, Hiroshima, and Kanasawa, the black tea factories in Kishiwada, Matsuyma, and many other industries, all of which have been but lately established.

Far beyond all others has been a remarkable increase in the development of the silk trade, and we will here furnish our readers with a list of the different filatures, the localities where they are situated, the number of work-people employed in each, and the annual production of the different establishments. (*Here follows the table.*)

It will be seen that this industry has been commenced in 27 different prefectures and that 702 filatures have been established, employing no less that 11,135 work people. About one or two per cent. of these filatures have closed for the present or are not yet finally completed, and although the first started began operations in 1865, and the latest this year ; the majority were established in 1876-7-8. The motive power in these factories is supplied by steam, water-power, and manual labour, eighty or ninety per cent. of the filatures being worked by water-power and only three by steam.

Our readers will now perceive that industrial undertakings are steadily increasing year by year in this country. Silk being the principal product of Japan, it is only natural that this particular branch should experience the most rapid development, but even then it is remarkable to find no less than over 700 different filatures established in a very little over ten years, the vast majority being within the last three or four years. Silk affords the best example of what may be done in other branches of business and who, in the face of the examples we have quoted, can assert that industrial undertakings will not flourish in Japan ?

We trust that our countrymen will ponder over what we have brought forward and strive to increase the national wealth and power by the establishment of industries, and thus in course time, bring Japan on a level with the countries of Europe and America.

TOBACCO.

WE understand that Mr. J. H. V. Cureswell, late of the Government tobacco farm, has entered into an engagement with an extensive land-owner and planter of Rohilkhund and Tirhoot, with a view to opening a plantation for the cultivation and manufacture of tobacco. Mr. Cureswell has lately been curing tobacco in Calcutta.

TOBACCO IN ARAKAN.

WE have been favoured with the following reports from Major Hughes, which are sufficiently interesting in themselves, and do not require any notice from us. At the same time we may be permitted to congratulate the authorities concerned, in the success of their efforts to push on this great industry, for it only requires a little more development to make it a great industry. This tobacco was worth say 4½*d.* per lb. in London, that is to say Rs. 15 per maund, or, at the present exchange of 1-8¾*d.* to Rs. 16-8 per maund. As this was the first consignment, the result must be considered very satisfactory, as the curer will by a little more experience get over the difficulties appertaining to climate, which have always stood in the way, but which can doubtless be reduced to a minimum by care and skill. This should open up a new industry almost, and if thoroughly successful, will have the advantages over tea and coffee of speedy returns. There is an almost unlimited demand for the article, and as no difficulties exist on the growing; we are pleased to see that the curing difficulty is being grappled with successfully.*

* The reports will be found among other official papers in another column.—Ed., *I. A.*

A GOOD deal of useful information is contained in Mr. Buck's report on tobacco operations in the N.-W. Provinces for 1878-79. As might have been expected from the practical bent of Mr. Buck's mind, we find that attention was given largely to the curing, which has hitherto been the weak point in all our experiments. Five practical curers were at work, and four methods were tried to find which suited best the Indian grown leaf and the Indian climate. The four systems tried were drying by sun heat, air, wood-fire, and flue heat, the latter having been found to give the best results. Outside furnaces with internal flues have been constructed at the factories. On hot clear days sun-drying was found very effective, but it has its drawbacks, the exposure to the air during the hot months making the tobacco liable to get spoiled from dust, and during the rains, when there is no dust, the periods of sunshine are intermittent, and this interferes with the continuous process.

The quantity cured was 1,650lb., and the machinery now at work, while turning out 500lb. a day, is capable of manufacturing 3,500lb. daily. The prices obtained in the London market, for the crop of 1876-77, were such as to warrant the conclusion that the experiment should become financially successful. Some of it sold as high as 7*d*. per lb., while the greater part sold from 5*d*. and over, and this was when the market was acknowledged to be about 25 per cent. below *par* as regards prices. The price at the same time of the corresponding qualities from America ranged from 5*d*. to 6*d*., while the higher bright leaf from Virginia realised from 7*d*. to 13*d*. per lb.—a success towards which our curers are no doubt working. Cigar-making has not been tried, all efforts having been concentrated on manufacturing cake and smoking mixture, and the success which has attended this is shown by the sales, which now average 1,000lb. per month and are steadily increasing; and orders are now coming in from Australia and New Zealand, which is a hopeful feature in connection with the industry. The manufacture of smoking tobacco, either in the form of cake or mixture, has another advantage over cigar-making, in that it uses up scraps, which, although quite as good as whole leaf, are unsaleable in the home market. We should not need to fear competition with America, as our cheaper labour enables us to grow and cultivate the article more cheaply than can be done in the United States.

A selling price of 4½*d*. per lb. in England will make the venture a commercial success, and a higher average rate than this has been obtained already, so that with the experience gained from the earlier working, success from a financial point of view may be assumed. Every penny per pound obtained over 4½*d*., will give a profit of Rs. 50 per acre. The Government has leased the farms and factories to a commercial firm, who have better opportunities of getting sale for the produce, and Mr. Buck tells us that the Government will continue to render such assistance in the prosecution of the undertaking as they might reasonably be expected to give.

INDIAN TOBACCO.

THE time seems to be approaching when Indian tobacco will really be placed in competition with American. The progress in the North-West last year was very encouraging, and as an official report just issued shows the enterprise is now conducted on a rather extensive scale. Five Europeans, or Americans, were engaged on the operations connected with experiments at Ghazipur and Pusa; the area cultivated being 239 acres, and the estimated outturn of cured leaf 165,000lb. During the latter portion of the year natives were instructed in the various and complicated details for manufacturing, and at the present time every class of manufactured tobacco is being turned out. It is said that there is no kind of tobacco, smoking mixture or cake, which cannot be manufactured of a quality equal to that of the same class of American, while for this country the Indian brands are likely to prove superior to the American, since it is well-known that America does not ship her best qualities to the Indian market. Orders have come from Australia, and arrangements have been made to send consignments to New Zealand of the manufactured smoking tobaccos; while a new market is not unlikely to open in France, for the French Government have already asked for and received samples, which they have pronounced to be better than any they have had from India before, and they have shown their practical appreciation of its quality by asking for a larger consignment for trial, to the extent of 1,000 or 1,500lb. No mention has yet been made of cigars, but these, it is suggested, will come in time, now that the more serious attempt to meet the most important composition in the field has been made. The machinery at Ghazipur is capable of turning out 3,500lb. a day as soon as a sufficient number of hands have been probably trained; and when it is understood that it takes twelve months to train a factory hand in America, the progress which is being made must be considered highly satisfactory.—*Times of India.*

THE POSITION OF TOBACCO CULTURE IN INDIA.

SORTING.—Tobacco intended for smoking should be carefully sorted when stripped. There should be four sorts, *viz*., 1st, large, equally good coloured untorn leaves; 2nd, leaves of good size and colour but torn; 3rd, leaves of inferior colour and bottom leaves; and 4th, the refuse containing shrivelled up leaves, &c., to which may be added the suckers. Leaves under No. 1 when thin, elastic and of good species are mostly valued as wrappers (outside covers) for cigars. No. 2 may also be used as wrappers but are less valued than No. 1; they are adapted for fillers and cut tobacco. The different sorts should be kept separate. The best plan is to let the most intelligent man strip the leaves from the stem and at once separate them according to quality. The leaves should then be made into hands, that is 10 to 20 leaves should be tied together by twisting a leaf round the end of the stalks; each sort should be attended by a special man to avoid mixing. The leaves of the first sort being large, 10 to 15 leaves will be sufficient for a hand. To make up a hand more leaves are required from the other sorts. When making the hands of the two first sorts, the man should take each leaf separately, smooth the same on a flat board, leave it there and take another leaf treating it in the same way, and continue thus until a sufficient number is ready to make a hand. When the hand is ready it should be laid aside, and a weight placed upon it to keep the leaves smooth.

Bulking.—Bulking means placing the tobacco leaves in heaps, for the purpose of heating it, in order to attain colour and flavour; this is carried out in various ways, nearly all of which involving great labour and risk, as in most instances tobacco loses more or less in value during the process called curing. It must here be mentioned that the more care is taken in raising the crop, the less attention the tobacco requires in the shed. With a good species of tobacco grown on light friable soil, treated as laid down in this paper, and the leaves dried as mentioned above, little care will be needed, after the leaves are dried and stripped. By the drying process described the leaves will have undergone a slow fermentation, which makes it unnecessary to watch or guide a regular fermentation afterwards, hence bulking and fermenting as generally understood are not required.

The tobacco after being made into hands should be put into heaps (bulked) before it again dries. Every evening the tobacco that has been stripped during the day should be bulked, but if the weather be very dry the tobacco must be bulked as soon as a certain number of hands is ready. The heaps should be made from 4 to 8 feet square and from 4 to 8 feet high; all the stalks should be outside, and the whole covered by mats, &c., to check evaporation. The drier the tobacco, the larger must the heaps be made to encourage a slight fermentation. The extent of the fermentation can be easily controlled. If the colour of the leaves is not uniform, or if it is desired to give them a browner colour then the heaps must be made large, and a somewhat moist atmosphere is required in the storing-room. This will cause fermentation to set in after a short time, and the heat to rise after some days so much that rebulking is required, which is done by putting the top leaves of the old heap at the bottom of the new one. Under such circumstances the heap must be frequently examined during the first few weeks to prevent overheating. It is advisable to rebulk the tobacco also, even when not much heated after the first fourteen days, and again a month later to ascertain the exact state in which it is. Sometimes the tobacco becomes mouldy; this may occur especially with tobacco which has been manured with chlorides, which cause the tobacco to become more hycroscopic than when manured otherwise. If this occur, the mould must be brushed off, and, if necessary, the tobacco dried. The tobacco may now remain heaped in the store-room until there is a chance for sale. It must be remembered, however, that the best time for sale varies very much. Some tobacco is fit for smoking a few weeks after drying, whereas others burn very badly at that time, but nevertheless sometimes become a good burning article after being stored for several months.

It is sometimes the custom to subject the tobacco leaves to some sort of improvement. There is no doubt that by proper application of ingredient the value of tobacco may be much enhanced. The most costly tobacco often commands a high price not so much on account of its inherent flavour as on account of that given to it artificially. In most instances the best course to be adopted is to leave the improvement of the leaves to the manufactures. Many ingredients are employed to improve smoking tobacco. They tend—

1. To make the tobacco more elastic and flexible.
2. To remove the coarse flavour.
3. To add a particular flavour.
4. To improve the burning quality.
5. To improve the colour.

To make the tobacco more flexible and pliant the leaves are macerated in or sprinkled with, a solution of sugar. In hot countries this is often necessary to give tobacco such an elasticity as to become fit for handling, especially when intended, for wrappers, and may be done by an intelligent cultivator.

To remove the coarse flavour, tobacco is often macerated in water or in a solution of hydrochloric acid. To 100lb. of tobacco 4 to 8 ounces of hydrochloric acid diluted with 25 to 30 measures of water is applied in Holland; the more coarse the flavour of the tobacco, the stronger is the solution used. The time of maceration varies between half-an-hour and an hour. Sometimes tobacco is steeped in a mixture of sugar solution and

diluted hydrochloric acid. To extract the fatty matter tobacco is macerated in alcohol or spirit of wine.

To give tobacco a fine flavour nume rous substances are employed, some of which are kept secret. In the macerat ion of tobacco for the purpose of influencing the flavour, the following ingredie nts are mostly in use :—water muscattee, cognac, vanilla, sugar, rose-wood, nelo-wood, cassia, clove, benzoin, citoro oil, rose-wood oil, amber thyme, la ven ier, raisins, sassafras wood, saltpetre, orange, and many others. The burning quality is improved by macerating tobacco in or sprinkling it with a solution of carbonate of potash, acetate of potash, acetate of lime, saltpetre, &c. Badly burning cigars inserted for a moment in such solutions are much improved. Tobacco treated with acetate of lime yielded a very white ash.

The colour of tobacco is sometimes improved by fumigating the leaves with sulphur and by the application of ochre and curcuma.

Although it may be said that fine tobaccos g enerally do not require any impregnation with foreign matter for the sake of flavour, yet the manufacturer resorts frequently to it to give the leaf a particular aroma. An inferior tobacco, however, which often would not find a market is so much improved by artificial means as to compete successfully with the genuine fine article.* A special preparation of tobacco for snuff is seldom attempted by the cultivator. With reference to the preparation of tobacco for export, the sorting of the leaf is of the utmost importance. Only first and second sorts should be exported. It would be well to remove the mid-ribs, whereby the cost of transport and customs duty would be greatly reduced.

Finally, it must be mentioned that the value of a cigar depends not only on the intrinsic value of the leaf, but to a great extent on the mode of manufacturing the article. Thus the raw material may be of good quality, but if the maker does not classify the leaves properly, or if he rolls his cigars too hard, which must vary according to the qualities of the leaves, the cigar will burn badly. The best burning leaves must always be used for wrappers. If this should be neglected the inside of the cigar burns faster than the covering, the air has no access to the burning parts, and the empyreumatical substances are votalized without being decomposed. Such cigars therefore make much smoke and smell badly.—*K. Schiffmayer, Asst. Supt., Government Farms.*

* It is said that in Germany, indigenous tobacco is often so much improved that the cigars made from it after being covered with a fine tobacco leaf are sold as genuine Havanas.

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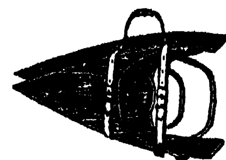


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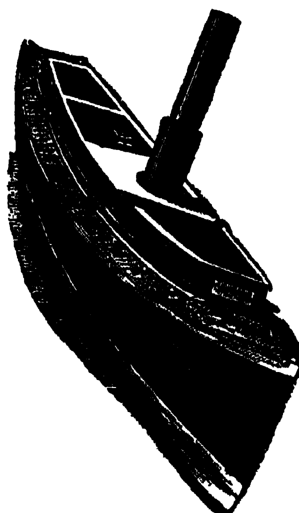
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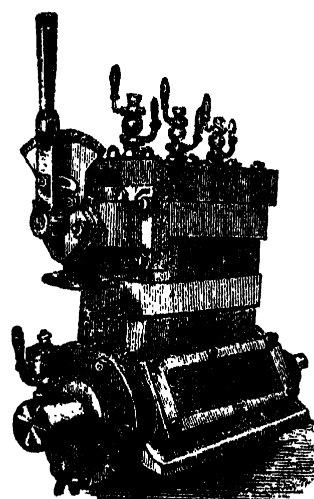


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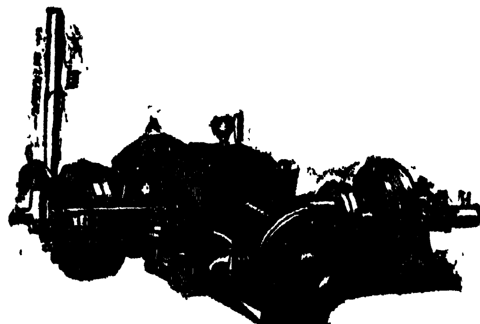


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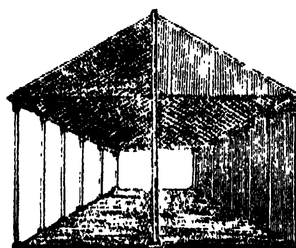
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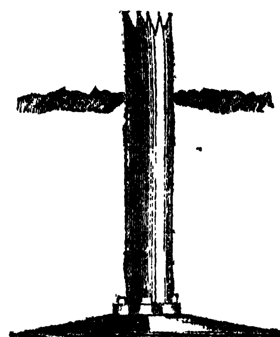
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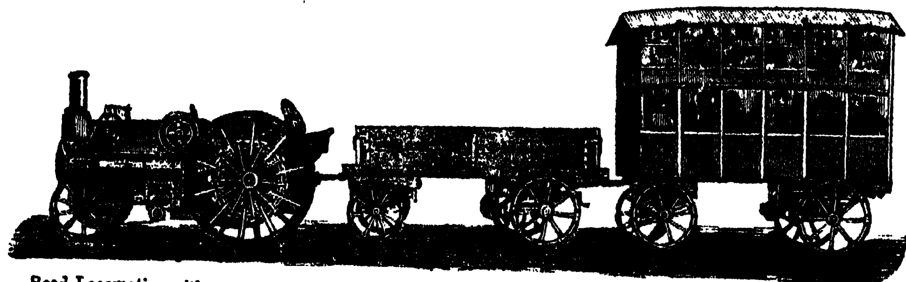
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INDIAN AGRICULTURIST.

A MONTHLY

JOURNAL OF INDIAN AGRICULTURE, MINERALOGY, AND STATISTICS.

VOL. V.] CALCUTTA: MONDAY, 1st MARCH 1880. [No. 3.

NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.

Calcutta, 1st Feb. 1876.

CONTENTS.

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.

CORRESPONDENCE.

TEA DRYING MACHINES.

TO THE EDITOR.

SIR,—The assertion made in a home (English) paper by an expert to which attention was drawn in the *Englishman* of the 6th instant, to the effect that Indian teas rapidly deteriorate in flavour and will not keep, is supported by continental opinion, a similar assertion having been made some ten months ago in the *Journal der Physik und Chemie.* The majority of scientists who have investigated the subject agree that placed under similar influences, Indian tea will lose flavour and decompose more rapidly than Chinese teas. Whether this is due to insufficient drying or to the use of machinery in the rolling process, is an important question to solve for those most interested.

What I desire to draw attention to, is that the tea industry of India runs, in my opinion, a great danger of increasing this defect. The danger I refer to, is the yearly increasing quantity of tea dried by heated air. Charcoal, it may be well to remind tea planters, is not pure carbon, but retains always some volatile ingredients, possessing important antiseptic qualities.

Tea dried by direct contact with the fumes and products of combustion of charcoal, will, it may therefore be fairly assumed, less easily deteriorate than that dried by heated air not containing any antiseptic qualities. As I believe most patentees of tea drying machines to be sincerely interested in the true development of this industry, I do not hesitate to recommend them to obtain evidence that the danger above referred to does not exist.

EUGENE C. SCHROTTKY.

Calcutta, February 10th, 1880.

CASCARILLA AND CINCHONA BARKS.

To the Editors of the Ceylon Observer.

DEAR SIR,—Perhaps the following remarks on the subject may be useful in answer to the question put by "Quinine" in your valuable paper on the 30th ultimo:—

In the first place, the barks known in England as cascarilla and cinchona are two totally different drugs, having perfectly distinct botanical origins. The word cascarilla is Spanish for "little bark" (as shown by yourself in your foot-note), and was the name given by the Peruvians to the cinchona barks, the collectors themselves being called "Cascarileros" or "Cascadores," and when the cinchona barks first found their way to Europe, this name came with them.* This, according to Sir G. Baker, was (in the case of England) about the year 1655. About the same time, or shortly afterwards, the bark of one or more species of Croton was brought to Europe *from the Bahamas*, under the name of Eleuthera bark, and was prescribed by a German physician as a febrifuge, and very soon afterwards it began to be *confounded with cinchona barks*, and to be used in place of that, then rare, medicine; hence the name cascarilla which was erroneously applied to the Bahamas bark, until at last it quite superseded the original and more correct appellation of Eleuthera. In the Bahamas, the name cascarilla is still hardly known, the bark being there called Eleuthera bark, or Sweet Wood Bark. It is used as a medicine, is the essential ingredient in most fumigating pastilles, and is frequently smoked *with* tobacco for the sake of its corrective odour. It is shipped from Nassau. New Providence (Bahamas), and is usually packed in sacks. The quantity imported into the United Kingdom in 1870 was 613 tons, valued at £16,482 (Flückiger and Hanbury's Pharmacographia, Macmillan & Co., London 1874).

The barks, therefore, stand thus:—

Cascarilla bark, bot. origin, Croton Eluteria, nat. order Euphorbiaceæ, known in England as Cascarilla, and in the Bahamas as Eleuthera bark.

Cinchona bark, bot. origin, various species of the genus—cinchona, nat. order Rubiaceæ, now known in England as cinchona, and in S. America as Cascarilla or Cinchona bark.—Yours faithfully,

J. P. T.

Kandy.

THE JACK FRUIT TREE.

TO THE EDITOR.

SIR,—INQUIRER in your issue of the 2nd instant asks for some information about the jack fruit tree. It is not true that a plant, reared in the nursery and transplanted will yield bad fruit or fruit sparsly. This probably has originated in the native mind from the fact, which I have experienced and borne out by friends in the planting line, that a plant from a seed sown where the tree is to grow, springs, up more vigorous and comes into bearing sooner than a transplanted seed.

In my farm about five miles from Bangalore, I have nearly a thousand seedlings of different ages and growths, and I have found that it is better to place the seed in the ground—a seed sown this way will in twelve months be nearly double the height of a seed of the same age grown in and transplanted from a nursery. In the nurseries about this part the jack seeds are put in pots to allow of easy removal, this induces the tap root—which in the jack is strong, vigorous, and very sensitive of opposition—to curl as soon as it touches the bottom of the pot, and it takes some time after it is transplanted to *coax* it to continue its downward path. Herein lies the secret of the growth of the ground sown seed over its nursery brother ; the former striking down at once continues without any interruption to penetrate the subsoil, and is more capable of yielding that nourishment which is conducive to speedy growth and vigor.

Though INQUIRER may have been successful in transplanting jack plants, as a rule it ought to be avoided ; let him try the experiment of sowing a seed in the ground. Dig a hole say one-and-half foot square and two feet deep, fill with a mixture of good manure and sand, sow the seed about two inches below surface and water once a day ; if his *maloe* does not rob the seed to eat it (the natives being very fond of it boiled or roasted) in about 12 months he ought to have a good healthy tree about 2½ feet high. Jacks bear in their sixth year.

In the coffee district of Nuringabad the jack is a fine tree, and the fruit of it there is much appreciated. Major-General Otly, a well-known coffee planter, planted out a dâk road with an avenue of jacks, the seeds were all ground-sown in the spots they were intended trees should grow ; and this avenue is one of the sights of the locality—the general never potted a jack seed, and since I have known him, I have followed his example with benefit to myself.

There is one description of jack to be found in Bangalore, which produces fruit on the root below the surface of the ground—this is highly prized, whether it is a freak of Nature or not, I cannot say, but from the very paucity of such trees, I am inclined to think it is not a distinct species.

Natives hereabouts will tell you that the following is the most correct way to grow a jack tree. Dig a large hole about 5 or 6 feet square, take a *full* fruit quite ripe, and without cutting it, place it in the hole, filling up with manure and sand, the fruit should be about three feet below the surface. In about two months *one strong* plant shoots up, and this will be an extraordinary good plant as far as the quality and quantity of the fruit goes. It looks absurd on the face of it, but nevertheless a friend of mine was induced to try it, and I need not say it was a complete failure.

THOS. T. LEONARD.

Bangalore, 13th February 1880.

DOD ROGA.

TO THE EDITOR.

SIR,—Can you, or any of your readers, tell me the best remedy, and how to be administered, for "Dod Roga" which is now somewhat prevalent in the district, introduced from Mysore by the cartmen thence coming to carry down coffee. The natives say that the disease is incurable and do not attempt a cure but leave the sick animal at once.

INQUIRER.

Mercara, Coorg, 16th February 1880.

IRRIGATION.

To the Editor Hindoo Patriot.

SIR,—I shall feel obliged by your inserting the following remarks on an article which will be found in your paper of the 26th ultitmo, headed "*State wells in the North-Western Provinces.*"

First as to irrigation from wells which is usual in the North-Western Provinces.

In their vicinity, especially in the neighbourhood of those constructed of masonry may be seen broad tracts of splendid crops which would do credit to any country. But to raise sufficient water where it is from the surface entails great labor both for man and beast, and the machinery used in raising the precious fluid is costly and perishable.

When the rainfall is short, the water recedes in the wells and the ryots are frequently unable to lift it at all. At such time fodder is scarce, and the bullocks required for raising the water are, from want of proper food, weak and unequal to their task. To remedy these defects, some years ago I recommended pumps to the notice of the Court of Directors, and my suggestion was opposed by the Company's Engineers. But these gentlemen had probably not witnessed as I had done the mortality among the bullocks, thousands of them dying from sheer starvation. I am still of opinion that my suggestion would be a great improvement upon the present mode of raising the water, indeed in many places it cannot be done by any other means owing to the great depth at which it lies. I have said that the machinery used in lifting the water by bullocks is costly and perishable, this fact will be easily understood when I state that the *pool* is always made of leather, and in many instances the well rope is also of the same material, which from being alternately wet and dry soon wears out. A simple iron pump would cost but a small sum and when any trifling repair was necessary it could be done by the village blacksmith. Some long time since a Brahmin zemindar put one over one of his wells, and the people from the neighbouring villages flocked to see the "*kul*" at work much to their admiration and astonishment.

With regard to canals—if they convey water suitable for irrigation, and their construction does not interfere with the drainage of the country, such works in my opinion must always be preferable to any other. In them the cultivator has water without labour to himself or his cattle, and cultivation can be carried out on a much larger scale, because the ryot has only to lead the water in the direction required. No person acquainted with Indian agriculture will accuse the ryots of stupidity. They and the zemindars have their prejudices and so have English farmers. But once let the ryots be convinced that you take a real interest in their good, and that you are capable of giving sound advice, and they will not be slow in following friendly suggestions, for I have frequently found them willing to do so. When it is considered that almost the entire population of India is engaged in agriculture, it is marvellous how little has been done by Government for the improvement of the art. With a proper system of irrigation according to the requirements of the various parts of India, and with improved means of cultivating the soil, we should hear no more of famines. We might take a lesson from a neighbouring power, for no sooner had France determined to colonise Algeria, than a Committee of Senators was assembled to ascertain what products could be profitably grown in that country, and for one of the gentlemen of the Committee I drew up a paper detailing the mode of growing indigo and of preparing that valuable staple for the market of Europe and America.

I am Sir,
Yours obediently,
RALPH MOORE.

ESSENTIAL OILS.

TO THE EDITOR OF THE MADRAS MAIL.

SIR,—Can you or any of your readers give me any information on this subject?

(*a*) What is an *essential oil?*

(*b.*) Can fatty or resinous matter extracted from the leaves, petal, or bark of any tree, be correctly to called an essential oil?

(*c.*) Would it be equally correct to call the oil extracted from the seeds of, the same tree, an essential oil?

e. g. If an oil can be prepared from the rind, leaves, flowers, or seeds of any tree, which of these would be called or deserve to be called an *essential oil?*

Yours, &c.,

14th February. B. M.

☞ Our correspondent will find the most complete account of the essential oils in a paper read, in December 1868, by Dr. Gladstone before the Chemical Society. We subjoin the following extract from Chambers's Encyclopædia :—"The *volatile* or *essential oils* exist in most instances, ready formed in plants, and are believed to constitute their odorous principles. They resemble the fixed oils in their inflam-

mability in their solubility in the same fluids and in their communicating a greasy stain to paper or any other fabric; but the stain in this case soon disappears, and they further differ in communicating a rough and harsh rather than an unctuous feeling to the skin. Their boiling points are in almost all cases far higher than that of water, but when heated with water, they pass off with the steam—a property on which one of the chief modes of obtaining them depends. The oils have characteristic penetrating odours, which are seldom so pleasant as those of the plants from which they are obtained, and their taste is hot and irritating. They vary in their specific gravity, but most of them are lighter than water, and retract light strongly. Most of them are nearly colourless when fresh but darken on exposure to light and air; but a few are green, and two or three of a blue colour. By prolonged exposure they absorb oxygen and become converted into resins. By far the greater number of them are products of the vital activity of plants, in which most of them exist ready formed being enclosed in minute cavities which are often visible to the naked eye. Although diffused through almost every part of a plant the oil is especially abundant in particular organs of certain families of plants. In the *Umbelliferæ*, it is most abundant in the seeds; in the *Rosaceæ*, in the petals of the flowers; in the *Myrtaceæ* and *Labiatæ* in the leaves; in the *Aurantiaceæ* in the rind of the fruit. The members of this group which is an extremely numerous one (more than 140 essential oils being noticed in the article on that subject in *The English Cyclopædia*) admit of arrangement under four heads. 1. Pure Hydrocarbons; 2. Oxygenous Essential Oils, 3. Sulphurous Essential Oils; 4 Essential Oil obtained by Fermentation, Dry Distillations, &c."

The Indian Agriculturist.

CALCUTTA, MARCH 1st, 1880.

THE PLOUGH OF THE FUTURE.

AMONG the many suggestions which are being constantly made with a view to the improvement of agricultural operations in India, none we apprehend, are of more importance than those relating to the plough, and that this opinion is shared by the general public is evidenced by the fact that so many efforts are being made from time to time by various parties having the improvement of the plough in view. Besides the many private or semi-private attempts at improvement which have lately been made, notably those by Mr. Buck in the North-Western Provinces, and by General Angelo at the Hissar Farm, both of which we understand have attained a certain amount of success; there are at the present moment a few inventors before the public with ploughs which they have patented or are now patenting, and to those and their capabilities we propose devoting a few remarks. Before doing so, we would refer for a moment to the attempts being made in Southern India to introduce light English and American ploughs, which attempts also have gained success. We do not apprehend any permanent results of a beneficial nature to follow the introduction of those foreign ploughs, for many reasons, the principal of which are the following. They are two heavy from a drought point of view for the cattle of the country. The manipulation of the two-handed plough is found to be difficult of introduction, and the cost is too high. However good the ploughs may be intrinsically, the price places them beyond the reach of the mass of the people, and it is for them that the plough of the future must be adopted. We will enumerate what we consider ought to characterise this plough, and then see how far these requirements have been met by the ploughs at this moment before the public. The new plough thus must first (1) have the advantage of presenting to the rayat, as slight a difference in appearance as possible to the common country plough, which he and his forefathers have used for centuries. We hear a great deal of the conservative nature of the native of India, and while he is not perhaps so idiotic as to permit this feeling to stand between him and profit, it must be confessed that he does attach a deal of importance to change. He will not change until he is thoroughly convinced that the change is a beneficial one. All the American and English ploughs fail in presenting too great a change, and so do those adaptations of them which have been made in this country. The rayat has always been accustomed to guide the ploughs with one hand, and keep the other for the purpose of guiding the bullocks after his own primitive fashion, and he cannot be brought to use a plough which requires both his hands for the purpose of guiding, and thus compels him to provide a boy to drive the cattle. (2). It must be easily pulled. In most parts of India the cattle are miserably weak, and a plough to be at all successful must be well within the powers of those small cattle. The rayat is not yet sensible of the advantage on many considerations of improving the breed of his cattle, and although the Government are doing a little in this way, it is so little that centuries must elapse, before the Indian bullock is what it ought to be. We must then adapt the plough to the power available.

(3). It must be light in weight. The rayat has his superstitions on the subject of division of labour, and it does seem a little inconsistent that after a hard day's work from his bullocks, he sees no harm in making them drag the plough home to his steading, while nothing will induce him to impose this duty on his cattle in the morning. Hence we observe in the early morning, the rayat driving his cattle to the fields where ploughing is to be done, himself carrying the plough on his shoulder. For this reason the plough must be light, we have weighed Mr. Jones's plough and find it 14½ seers. Mr. Chick advertises his as weighing 17 seers, while Mr. Martin informs us that his plough will not exceed 11 seers. The specimen we saw and reported on briefly in our last issue was made, it appears, under certain disadvantages, and in a hurry, and moreover, wood not thoroughly dry was used, hence its abnormal weight of 18¾ seers. All of these seem to come within the limit of a man's carrying capacity.

(4). The ploughman ought to be able to reach the bullocks' tails, we need not waste words here dilating on the percentage of Indian bullocks which have got broken tails, nor as the heinousness of the cruelty which has brought about this excessive amount of caudal fracture, but must take things as we find them, and this we must take for granted, that the Indian rayat *will* twist his bullocks' tails, and if we can make a plough which admits of his doing this without any undue effort on his part, it may after all tell us the bullock in the form of a less aggravated manipulation, Jones's plough and Martin's also can pass muster on this score. We have not yet seen Chick's, but doubt not that the inventor's experience has told him this important requirement.

(5). It must be so simple in construction that any ordinary village *mistree* may be able to repair it. The importance of this will be at once apparent to any one who has lived in the mofussil, and has seen the work performed by a village carpenter or blacksmith. The latter are usually very ingenious artificers and manage to turn out a fair job with the most primitive tools, but the former is a most clumsy workman, whose head does not seem capable of entertaining a new idea. It is then incumbent on us, if we would make the plough really popular, to have it so little foreign to the village *mistree's* ideas of what a plough is, that he will have no difficulty in repairing the implements from time to time, and even in making entirely new portions such as share, mould-board, or coulter. Mr. Chick affirms that his plough will stand this test, as we know the other two will.

(6). It must be durable. The rayat is poor, and it never occurs to him to have two ploughs, unless he has two sets of oxen at work. He never has a spare plough to put to work when an accident takes place, consequently if his plough gets broken, he must wait until it is repaired. The plough then must be durable and strong, and must be such, that having paid for a new one, he will not be called on to repeat the purchase for a considerable time. This is a qualification which cannot well be judged by a mere glance at a new plough, unless we may be allowed to predicate durability, from the absence in the plough of those elements likely to lead to premature decline in this connection, such as inferior workmanship, or the use of cast iron, which latter is frequently liable to give way should a sudden strain be put on it, such a sudden wrench as would be communicated to the framework by its suddenly coming on a large rock or a stubborn root. Mr. Jones's plough will we imagine stand this test, as certainly will Mr. Martin's, as it contains nothing but the finest wrought iron and steel. We observe that Mr. Chick's has some cast iron used in its construction. We have no desire, however, to speak dogmatically on this point, as we have said, we have not seen the implement. In a general way we deprecate the use of cast iron in an implement of this sort.

(7). It must do more and better work, than the common country plough. This is a truism, a new invention must be an improvement in its capability for work, else why introduce it. How then will those new ploughs stand, when tested by this. The only plough we have actually tried is Mr. Martin's, and as to its power to do more and better work, there is no possible room for doubt. The ordinary method of ploughing with the common country implement is to go once over the field, scratching the ground to the depth of an inch or so, then repeat the process going half an inch deeper, and this deepening process has to be repeated four or five times, so that the amount of work a plough can do in a day, is reduced to one-fifth by the work having to be done over and over again. Mr. Martin's plough on the other hand does its work quite as quickly, with no more strain on the cattle, and to such a depth that one ploughing is enough. Hence time and labour are economised. We cannot speak of the other two from personal experience. Mr. Jones says his plough is becoming popular on this very account. It gives no trouble, and does its work thoroughly, and Mr. Chick affirms the ability of his plough to do thirty per cent. more work on the same expenditure of labour and money.

(8). It must be cheap. This is perhaps the most important feature in the plough of the future, and is the reason why so many inventions fail to satisfy the want. They all err on the side of cost. Those three of which we have been speaking are much cheaper than many that have been presented to the public. Mr. Chick's we see advertised at Rs. 10 complete. We are just afraid this will be found too expensive, we do not mean relatively, as it may be well worth the money, but we fear the amount is more than a native will give for a plough, however good. Mr. Jones's plough sell at Rs. 5-8 at Cawnpore where it is made. This is more within the reach of the rayat, and we are therefore not surprised to learn that this plough is selling well. Mr. Martin proposes selling his at Rs. 3, in the Upper Provinces, or say Rs. 4, in Calcutta. He anticipates a good sale, as soon as he is in a position to place it on the market, but this he cannot do till he secures it by patent, and, like many other legal details in this country, the taking out of a patent is rather a tedious process. These gentlemen will deserve well of India if they succeed as they anticipate, as they will have solved the problem of making two blades of grass grow, where only one grew before.

SOME OF THE PRINCIPLES UNDERLYING THE ROTATION OF CROPS.

ON a former occasion we said that there are three methods at present in practice for the purpose of maintaining and improving the fertility of the soil—these are fallowing, rotation, and manuring. The last, we have considered shortly, and we now purpose briefly noticing the principles underlying rotation.

By rotation is meant the succession or recurrence of cert crops, spread over a longer or shorter period of time, in such a way that crops of the same kind may be separated from each other as far as the length of the course will allow. The principle underlying every rotation, every course of cropping, is this—different crops require different foods, and those which withdraw from the soil the same mineral constituents should recur at as long an interval as possible, in order that the special plant-foods required by each may have time to gather in the soil, by the natural processes of disintegration and decay.

When different plants are grown on the same land several years in succession, the first of which leaves behind in the soil plant food which the second may require, and the second, that which the third may use up, then all other conditions being present, the three different crops are likely to be profitable ones without unduly taxing the natural resources of the land and we have what is called a rotation of crops.

A thorough acquaintance with the ash constituents of plants lies at the root of all rational rotation. There are certain mineral constituents such as iron, manganese, &c., which occur in such small quantities, that for all practical purposes they may be disregarded in any estimate of ash constituents. There are others which though not present in great abundance, are nevertheless essentially necessary for the building up of special plants. Here's an example of this: Grasses, indeed all the *cereals*, are notable for the large quantities (comparatively speaking) of silica they contain; and where the amount of soluble silica is small in a soil, the exhaustive effects of crops of this kind soon make themselves apparent. The continued repetition of crops of this kind would render their profitable cultivation impossible, even while at the same time other substances might be present in sufficient abundance to produce highly profitable crops of other plants, which do not require that substance in such abundance. Beans, pease, turnips, hay (especially the latter) require large quantities of alkalies such as potash, and may be grown with an infinitely small quantity of silica. If the straws of cereals are returned to the soil, cereals are probably by far the least exhaustive of all cultivated crops. This is no doubt the reason why straw should as far as possible be consumed on the farm on which it is raised. Liebig has estimated that oats contain 83·42 per cent. of phosphoric acid, barley 22·74 per cent., wheat 19·38 per cent. If in a rotation oats were taken first and the other two followed, probably the last crop would be less than an average one, because of the exhaustive drain on the phosphoric acid contained in the soil. Some plants have deeper roots than others, and so can bring up from greater depths the special plant-foods they require. Others have roots which ramify through a larger area of soil, and are in the soil a longer period than others (autumn sown wheat in England). Some again have a much larger leaf surface than others, and are thus able to draw a large store of food from the air. It is highly probable, that near the sea or on land over which winds from the sea pass, plants obtain small quantities of soda, potash, common salt, and other compounds. In this we have probably one of the reasons (the chief being of course the

difference in plant-food) why root crops follow grain crops, the roots and foliage of each crop penetrating the soil and spreading themselves in the air in a fashion characteristic of each.

Some plants are cultivated for their seeds; others for their roots, or for their folliage, or for the coloring matters they contain or the fibre derived from the stalk of their seed pods. Crops of roots folliage and seeds may thus naturally be supposed to alternate with each other to the best advantage.

In Sweden, when pine forests are cut down, a growth, not of pines but of birch follows. The difference of the ash constitutents is said not to be sufficient to explain this, if not, then the difference of the root ramifications may in part account for this change of vegetation ; taken of course along with the fact, common among plants as among animals, that there is always going on a struggle for existence in which that plant or animal which finds the greater number of conditions suitable for its growth and propagation, drives out all the others from the same area or *habitat* more or less completely. After the great fire in London, 1066, large quantities of *Erysimum latifolium* grew up on spots left bare by the fire. The houses of that period were chiefly composed of wood, and no doubt the ash constitutents washed into the soil by rain furnished large quantities of potash available as plant food ; and thus provided one of the conditions for the growth and spread of plants which on account of their former rarity escaped notice. At Copenhagen the *Blitum capitatum* appeared in the same way after a fire ; and at Nassau the *Senecio viscosus*. In America when pine forests are burned down, poplars grow up. In most fields in Britain which have been long in pasture or *lee*, a species of *Senecio* with the characteristic yellow flowers clustered close together, makes its appearance in such quantities as at a distance to give a yellow colour to the greater part of the field, these are probably due to the slow gathering in the soil of potash. There can we think be no doubt, that the presence of certain indigenous plants on land, point to the existence of certain constitutents in the soil, as well as to the physical properties of the land where they abound ; and it is only necessary to change these conditions by drainage, deep-ploughing, and burning ; and the liberation and removal of potash by liming and appropriate crops, to change materially the indigenous plants of some districts, at all events in cultivated land. The whole question of the relation of indigenous vegetation to land and how faithfully it may indicate the existence of certain plant-foods and mineral constitutents, as well as physical properties in the soil has as yet scarcely obtained the attention of trained observers which its importance demands. We think there is here a very wide and interesting field of study in which the botanist, the chemist, and the agriculturist may each gather useful facts.

The following we believe may be taken as established.

1st. The absolute quantity of inorganic substances removed by plants varies, not only, with the crops grown, but also with the part of the plant.

100 lb. of wheat seed after burning leaves	... ...	2 lb.
" " " dried clover hay	... ...	7 "
" " " turnip bulb...	... ...	7 "
" " " leaves of cabbage	... ...	26 "

2nd. Different crops, though requiring for their full growth all the mineral substances found in fertile soils take these into their tissues in different proportions. Root crops require large quantities of potash. Clover uses lime in considerable quantities ; and grain, especially wheat requires phosphorous in considerable abundance.

3rd. Different parts of the same plant take from the soil different quantities of inorganic substances.

	Potash.	Phosphoric Acid.
Wheat grain	30·02	46·79
" Straw	17·98	2 75
" Chaff	9·14	4·31
Oats Grain	20·68	50·54
" Straw	19 46	5·07
" Chaff	6·83	1·04
Turnip seed	21·91	40·17
" Bulb	23·70	9·81
" Leaves	11·56	4 85
Mangold root	42·73	12·31
" Leaves	8·34	5·89
Potato tuber	48·8	8·61
" Stem	39·63	6·68
" Leaves	17·27	13 60
Kohl rabi bulb	36·27	13·45
" " Leaves	9·31	9 43
Cabbage head	40·86	12 53
" Stalk	40·93	19 57
Tumothy grass	31·09	11·29
Rye grass	28·99	10·07
Cock's foot	29·52	8·60
Alopecurus	37·03	6·25
Red clover	25·60	4·09
Cow grass clover	22·78	4 94
Yellow clover	27·48	—
Rib grass	33·26	7·08

Anderson.

From a consideration of the ash constituents of different parts of the same plant, such as that given above, it is quite apparent, that a crop may at one period of its growth thrive vigorously, then fall away. Wheat may have a magnificient straw, but the grain may be much below the average weight ; because there is abundance of silica, and phosphoric acid may be deficient ; or again, this may be reversed. The straw may be poor and very weak, stunted in short, and yet produce plump full grain of more than average weight. We may also learn from this, why one soil or one district of country yields better crops of certain plants than of others. The necessary plant-foods may be in abundance or deficient.

4th. Plants of the same class, that is crops that withdraw plant-foods of a like kind from the soil should be repeated as seldom as possible ; and when it is necessary to return to them in the course of rotation, a different member of the class should be sown ; that is instead of repeating wheat, oats or barley should be preferred ; and turnips should be replaced by mangolds or some other root. There are crops which have a much higher commercial value than others, these it is the interest of the agriculturist to grow as frequently as he can ; this, however, can only be done within certain limits and with considerable caution.

BARODA AGRICULTURAL AND CATTLE SHOW.

(Communicated.)

THOUGH two months have now elapsed since the Agricultural and Cattle Show attracted the admiration of the multitudinous visitors at Baroda, it may not yet be too late to give some account of the event. Several casual notices of it appeared at the time in the local journals, but they were fugitive and fragmentary. It is desirable, therefore, that a consecutive narrative of it should find a place in a magazine conducted expressly in the interests of husbandry in all its branches. The Baroda show deserves to be duly chronicled not only on account of the benefits which such exhibitions confer on agriculturists generally, but because it was the beginning of a new phase in the administration of an important Native State, and the first of its kind ever held in the fruitful territory of H. H. the Gaekwar, and it is to be earnestly hoped that it will not be the last. It is the duty of all who are interested in the agricultural prosperity of India, to carefully study the results of such exhibitions, and if proved to be beneficial, to give them wide publicity for the encouragement of others.

The Baroda show was but one item of a long series of festive arrangements in connection with the marriages of H. H. the Gaekwar and his sister. This contributed to the number of visitors, but here the advantage ended. The distractions created by the other more popular events greatly lessened the concentration of attention and study which the show, had it stood alone, would

assuredly have received. This is greatly to be regretted. A thing of this sort, to yield its legitimate fruit, must be made a study by those who visit it, its objects carefully examined and compared, and all thought over on the spot. In the present instance there was too much hurry and restlessness, and too much desire to see everything everywhere. Had the show been the only object of attraction, it would have secured for itself more careful attention and fastened itself more firmly and more productively on the memories of its visitors. Still all disadvantages notwithstanding, the attendance was good, and the show of cattle and produce very fair. Taking the order of the prospectus we come first to.

HORSES.—There were 85 exhibited, and among these were some —in particular one—of the handsomest Katty horses ever exhibited in any horse show in Western India. This particular one is Reddo. He is a Katty Stallion, is a veteran at exhibitions and horse shows, and has gained the first medal or prize wherever he went. His great width of shoulder, finely formed legs, beautiful head, and above all, the strength of bone and muscle displayed, effectively dispose of all the recent cant about the inadaptability of Katty horses for heavy work. His scions, which were also exhibited, all more or less shewed some of his best points, but they are as yet too young to enable a judge to say whether they will develop into such animals as their magnificent sire.

Amongst Arabs the Stallion Anstey, the property of the Thakoor of Palitana, carried off the first prize, while General Graves, the veteran horse racer, came in for the second with his W. A. H. Pearl. Galloways and ponies were but sparely exhibited. The wedding festivities prevented a better show by local owners, their animals being largely employed in conveying them from one scene to another.

Before quitting the horses it must be added that one object which the Committee had in view in holding the show was undoubtedly attained. That object was to prove that horses of indigenous breed, if only cared for, are the proper horses for India, and that admixture of breeds generally ends in degeneration. Reddo, the Katty Stallion, was the admiration of all, and the much vaunted Arab, though worthy of all the praise he has received, rather sunk in estimation in his presence.

CATTLE.—What the horse is to the Arab Bedouin, the bullock is to the Gujerat cultivator. Mr. Kinlock Forbes, the author of Arnals of Gujerat, remarks that "the *Kunbi* and his bullocks are inseparable, in speaking of the one it is difficult to dissociate the other." The show of bullocks accordingly, in the heart of Gujerat, was necessarily good, but it was a matter of much regret that the bullocks of Dhrangadhra, near Abu, were not exhibited. These animals are really magnificent creatures. Their huge well-proportioned heads of curving horns, with large soft melting eyes, give them an appearance of the utmost imaginable good nature, while their immense bodies bespeak extraordinary strength and endurance. Handsome and strong, however, though these Dhrangadhra bullocks are, the Petlad district of the Gaekwar's territory can boast of nearly as handsome, and certainly quite as useful for all farming purposes. Several pairs from Petlad commanded high admiration. Of the 120 pairs exhibited, those of Petlad carried the first prize, and the only gold medal of the show, which was presented by H. H. the Gaekwar.

COWS.—Did not make a good appearance; of the 47 shown, there were but two poor and inferior representatives of the famous Ghir breed, which are so much valued in Gujerat. These cows have been known to give as much as ten seers of milk at one milking.

BUFFALOES.—The place set apart for these animals was the centre of unusual interest. The attraction lay in the massive bison-headed buffaloes exhibited by H. H. the Thakoor of Bhawnagar. In body they somewhat resemble the rhinoceroses, but the formation of their heads needs to be seen to be understood. These wonderfully constructed creatures seem to be *sui generis*, and so far the breed does not appear to have got into Gujerat. Their milking qualities are quite as remarkable as their bodily construction, for at a single milking they will give no less than 22 seers. These animals, of course, easily took first prize.

Male buffaloes made a good show. It was but natural that they should do so, for numbers of them are kept at the Baroda Court, well cared for and trained for fighting, which sufficiently accounted for the good condition in which they appeared.

Camels, asses, and goats, which were by no means well represented, must be passed over, and a word or two said specially about sheep. Bhawnagar, one of the most enterprising and go-ahead Native States in Western India, exhibited a pair of rams of the Liecester strain, which were only recently imported to improve the indigenous breed in Kattiawar. The appearance of these foreigners caused much merriment to native spectators, who had never seen the like before and were almost sceptical about their being sheep at all. They looked like a pair of huge pillows propped up on four little white sticks, so round, and puffy and soft were they. The wool was nearly a foot long, and did not grow below the knee. It is to be hoped that they will become acclimatised and add to the value of Indian wool in the future.

POULTRY.—This department of the show was, to a considerable extent, shared in by the European residents of Baroda. Cocks shows of curious rare breeds, geese from Venice, ducks from Suez, and turkeys from unknown regions formed a distinct and lively colony in the grounds of the show. Pigeons of all kinds and of all manner of plumage greatly contributed to the ornamentation of this interesting feathered settlement. The crops were expressly designed by Major Nutt. They surrounded a group of umbrageous trees, a series of concentric circles extending to the utmost limit of the shade, and, barring the little incidents of dispute and tyranny which at times occur even in more refined society, looked altogether a very happy community.

VEGETABLES AND FRUITS.—The products of numerous gardens in and about Baroda contributed largely to the vegetable show, while very fine samples of fruit came in from outlying districts, even as far as from Bhavanagar across the Gulf of Cambay. The oranges from Bhavanagar, which were equal to the best of their kind produced in any part of India, carried the first prize, pomgranates and guavas claimed much attention, while the enormous bunches of plantains which loaded the stalls caused wonder and amazement. Some of these gigantic branches bore each a weighty mass of 150 fruits. Fruits of various other descriptions were fairly well represented, and in the general opinion of the judges the show in these products was quite a success.

GRAINS AND SEEDS.—This branch of the show was the best; grains of all kinds and from nearly every part of India were exhibited. As this is probably the most important department of any agricultural show, a somewhat fuller account of it will readily be pardoned, though it is not necessary to note every kind of grain that was shown. The maize or India corn came in from Kattiwar and Gujerat, and from the greater distances of the Punjab and Cawnpore. The Punjab shocks carried the first prize. They were grown from American seed, and the India growth was as good as its Western parent. Each grain was fully three-fourths of an inch long and broad in proportion, while the colour was exceedingly white and glossy.

Of wheat there were 30 exhibits. Cawnpore took the first prize for a very fine, white, and well shaped description, and Petlad, in Baroda Territory, took the second for an article of almost equal value. In 33 exhibits of grain, Dr. Macdonald stood first an enterprising land-owner of Nariad in the British district of Kaira, stood second. *Jowari* had 43 representations, but neither Kattiawar nor Gujerat was able to compete with Khandesh a farmer from which locality taking both the prizes offered.

The prizes in *bajari* were taken by Petlad and Bhavanagar from 37 competitors. Rice was exhibited by 94 persons. Petlad was awarded the first prize, and the other two to Bombay and Karri, in Baroda Territory. Paddy or rice in husk, was shown in numberless varieties, some 25 samples being put forward by a single farmer from the sea coast near Bombay.

The prospectus, however, unfortunately did not provide any prizes for this article.

In oil seeds Baroda stood unrivalled and carried off most of the prizes, while it failed in *Til* and *Nachni*, two products of some importance. Petlad carried the palm in respect of grains, and was very properly awarded the silver medal. Nariad in British Territory, and Dr. Macdonald, of the Bombay Gardens, were the next in general merit.

Tobacco is very largely cultivated in the Petland district of Baroda State, as it is also in the neighbouring British district of Nariad, and the competition, therefore, was very keen. To the discomfiture of all other competitors, however, Major Nutt

carried off the first prize by his splendid growth from Kentucky seed. The size and appearance of the leaves of this foreign plant filled the local tobacco planters with wonder and delight, and the great demand that ensued for the same kind of seed was one of the evident fruits of the show. It is surely matter of regret that such fine tobacco bearing soil as lies in abundance in Gujrat should not produce an article far superior to what is now grown in the locality. To show the interest taken in tobacco growing, it is only necessary to say that there are no less than 193 exhibits, green and crued together. The other prizes offered were shared between the two districts already named.

COTTON.—This article caused much excitement, which was engendered not merely by the high value of the prizes in the prospectus, but also by the feeling that the credit of each exhibiting district was more or less at stake. Ginned and cleaned together, there were 124 samples shown. Bhavanagar, Baroda, and Khandesh took the chief prizes. Bhavanagar took also the first prize for cotton seeds and for growing plants. The staple of some of the Bhavanagar cotton was all that could be desired in length and strength.

In sugarcane there was a contest between Bhavanagar and Baroda, which ended in a draw, the former getting the first prize for indigenous and the latter for the Mauritius article.

Fibres, though not generously treated in the Prospectus, made nevertheless an excellent show.

There is a sample here at present, taken from the Malachra plant, which for length, gloss, and fineness is unequalled. The Government of Bombay are endeavouring to make the growth and manufacture of this article as popular as possible, and should they succeed, a vast trade in Malachra may confidently be prophesied. Manufacturers in Europe, if made acquainted with this article, would doubtless turn it to good account. The fibre has only recently been discovered by Dr. Grey, of Bombay and is not yet very generally known.

The show closed with what ought to have been a most interesting event, namely a ploughing match. Fifty ploughs were placed in position, and at a given signal all started and worked for 40 minutes. The large crowd of natives who had assembled to witness the work showed how deep was the interest taken in this department of the show. Unfortunately, however, the ground selected was not at all suited for the exhibition, which was one of the many instances in which Major Nutt's untimely accident proved a serious drawback. The greater part of the soil was so hard that ordinary ploughs could not enter it, and one or two were broken in attempting it. In several plots the native implement made no more impression than a walking stick would have done, the marks on the surface being scarcely discernible. Even the lately introduced light English ploughs were powerless in breaking the crust. In some plots which had been watered the day before the work was fair enough. The only plough which, in the unwatered plots, went into the soil and honestly turned it over, was a large heavy one of English make. The defect in this instrument was its great weight, requiring two pairs of bullocks to drag it along. But notwithstanding its handicapping by the extra pair of bullocks and extra men, it gained the first prize, as from the thorough nature of the work it performed it well deserved to do. The great fault of the native plough is that, the share being only a narrow rib of iron and there being no mould board at all, it takes at least three ploughings to break up all the soil, while the English instrument, when properly handled, turns over the whole soil once for all.

Among the ploughs which competed there were four from Europe, manufactured by Messrs. Ransomes Sims, and Head, and there were two from Benares, manufactured by Dr. MacGregor of the Central prison there ; there was one also from Cawnpore, sent by Mr. Crawbey, but none of these, though pronounced by competent judges to be first class articles, were fit to cope with the hardness of the soil. In ordinary ploughable land they would have done well, but in this instance their performance was little better than that of their native rivals. The winner of the first prize was made by Cooke, and has been in use for some years on an enterprising Parsee's farm in the neighbourhood of Baroda.

To say that Agricultural shows are beneficial in improving the art of husbandry and developing the resources of the soil, is a truism, and nowhere more than in India is such improvement needed. In the course of this paper, mention has been made of Bhavanagar and Kattiwar as having taken away many of the prizes. This fact is a proof of the advantages of shows within our own observation. Major Nutt, who spent some years in Kattiwar, inaugurated, seven or eight years ago, agricultural shows in that province, and the people from witnessing them have learned to improve their stock and produce, and to give greater attention to cultivation and manures. Hence their superiority in almost every department of the show at Baroda, and who shall say what seeds of improvement this show may not have sown in the heart of Gujarat ? The inquisitive curiosity displayed by numerous cultivators is itself a sign that new ideas had already been started in their minds, and among an uneducated and simple peasantry, the birth of a new agricultural idea should be viewed by the administration as of at least equal importance with the birth of an heir to the throne.

It is deeply to be regretted that Major Nutt, the enthusiastic agriculturist and the author of this and several other shows elsewhere, was confined to his couch all the time of the exhibition. His organising powers are well known, and though by his foresight and general arrangements there was no appreciable hiatus in any part of the plans, yet his absence was felt everywhere as if some thing was wanting that ought to have been present. Indeed the details of the work could not have been carried out with anything like success, had it not been for the great energy and indefatigable exertion of Mr. J. A. Raitt, the Honorary Secretary, who gave himself heart and soul to the complicated business, and made the show a memorable and fruitful event in the history of Baroda.

R.

EDITORIAL NOTES.

THE subject of well irrigation has lately been taken up by the Government, and it acquires a degree of importance when we attempt to compare the cost of irrigation by well with the same operation by canal. From calculations based upon the estimates made by parties well able to deal with the subject, it was found that irrigation from wells would entail an annual charge of 9 annas 8 pies per acre, *plus* the actual expense to the cultivator of raising the water. As he has his bullocks on the spot, and does not place a high value on his time, we might safely reckon a charge of Rs. 2 per acre as an ample one to allow. From the report on irrigation in the North-Western Provinces and Oudh for the year 1879-80 (kharif crop only), it appears that the assessment on account of water-rate was at the average rate of Rs. 3-2-3 per acre, and this, be it remembered, was for the kharif crop only, the extent watered by the canal having only been 555,641 acres, or the merest fraction of the cultivated area. That the high rate charged for this canal water acts as a deterrent, is shown by the fact that the income realised by the department depends largely on the rainfall for any given year, and as it is of the utmost importance that a judicious use should be made of this water, it is thought that the canal water should be supplied not only to those who choose to use it, but that all whose fields are within the reach of the water should be taxed for it. The cultivator will not spend one rupee in the hope of saving ten, he will only make the outlay against a certainty; hence the advisability of making the canal tax a compulsing one, payable by all who have water within their reach. When a district neglects to use it, and a partial or total failure follows, the Government have to step in with help, and it is better that the Government should interfere to prevent than to relieve.

THE Calcutta correspondent of the *Indian Herald* makes the following remarks on Mr. Martin's plough :—

Agricultural Exhibitions in India go a greater way in developing the productive resources of the country and in lending an impetus to the extension of trade, than even the spread of railways and other means of locomotion. While the latter facilitate the distribution of the produce of land over a large area, the former conduce to improve both its quality and quantity. Those who have watched

the conservative spirit that pervades the lives of Bengalis will not fail to remark how slow they are in adopting any deviation from established usage. The rude implements of agriculture used by their ancestors centuries ago, in tilling the land or threshing out corn, are retained to this day with the same results—*viz.*, great waste of power and produce. But it is to be hoped a revolution will shortly be effected in that way; thanks to the enterprise and energy of an English gentleman who hails from Etawah. Mr. W. Martin, planter and talookdar of that place, exhibited an improved plough at the Agricultural Snow held at Krishnaghar on the 14th instant. Although it is a compromise between the ordinary country and the English plough, its combined advantages are admirably suited to the requirements of the peasant, who can easily work it with the cattle commonly employed in these parts. The judges who awarded the prize, report that it makes a deeper furrow, and consequently turns over the soil better than the country plough. It is pronounced to be more effectual and just as cheap as the other. In point of efficiency, cheapness, and simplicity (for a village blacksmith can mend it) Mr. Martin's invention ought to recommend itself to the notice of the Bengal zemindars.

THE annual ploughing match at the Sydapet Farm took place on the 19th December 1879. The competitors were divided into two classes, one consisting of the students in the School of Agriculture only, the other open to any one. In awarding prizes the following values were placed on the character of the work :—

Depth	30
General Finish	30
Straightness	25
Speed	15
Total	100 points.

In the class open to all, twenty-six competitors entered, and as a proof of the general excellence of the work done, the first prize was gained by a ryot working with an English pattern plough, and he scored no fewer then 95 points, a good second scoring 84 points with a Swedish pattern plough, followed by 81 points made with an American pattern plough.

Nine competitors entered for the school prize, although the points scored were not so good as in the other class, the highest score being 85. We are not informed what particular plough was used.

These matches are valuable as putting to the test the alleged merits of certain ploughs, and certain methods of working. At the present time agricultural subjects are engrossing a considerable amount of attention, and we think the Government are badly advised when they attempt to throw obstacles in the way of new experiments and inventions, having for their aim, the improvement generally of our agriculture. We hear, for instance, complaints made by inventors, that they have the greatest difficulty in getting their inventions secured by patents; that they have to dance attendance for months at sundry Government offices, and thereby lose valuable time, and that the whole proceeding seems to go on the assumption that they are soliciting a great favour instead of asking a right which they are willing to pay for. These things disgust men, and lead them in many instances to imagine that the Government really do not want to encourage invention and improvement.

THE report on the working of the Lucknow Horticultural Gardens for the year ending 31st March 1879, has just been issued, and it is, as usual, accompanied by a short order from the Government, N.-W. Provinces and Oudh, which is a model of what such an order should be. It is short, but sufficiently long to touch on all important topics, and we observe with much satisfaction, that this order embodied in a letter from the Secretary to Government, N.-W. Provinces and Oudh, to Mr. E. C. Buck, disclaims all idea of interfering with details. This is exactly the duty of the Government. The whole subject being in the hands of responsible officers, who are *primâ facie* supposed to be well up in the subjects under discussion, it is wise of the Government, whose information cannot be expected to be special, to leave the carrying out of details to those best qualified. This, we must confess, is unusual, and we therefore have the greater pleasure in commending it. Mr. Ridley is highly spoken of in the order, and this commendation is all the more creditable to him when it is remembered that he succeeded such an expert as Dr. Bonavia, whose mantle seems to have fallen on the shoulders of his successor. We are also pleased to see that the financial returns are considered satisfactory, although the expenditure is nearly Rs. 1,900 over the income. This is a second fault often committed by Government in connection with these institutions, the measure of success which attends them is supposed to be gauged by the balance at credit at the close of any given year.

A most important series of experiment was initiated with the view of ultimately improving the indigenous or acclimatised kinds of fruit. This is a step in the right direction. Our efforts are too often wasted in trying to introduce exotics when the country produces in abundance a large variety of fruits which are well adapted to the climate, and which only require some intelligence in the way of cultivation to improve them and make them a source of wealth to the country. The same plan has been followed with respect to vegetables and flowers. In the former, a considerable amount of success was attained, which speaks well for the future vegetable supply of Oudh. Nor was arboriculture forgotten, several attempts having been made with the different varieties of the *Eucalypti*. We look forward to valuable results of the operations at this institution, which is evidently under careful and intelligent management.

"AN expert in Indian teas states in a home paper that the chief drawback to their extended consumption in England, is the fact that they speedily deteriorate and will not keep. This is attributed to the insufficient drying of the leaf, or the use of machinery in the rolling process." So says the *Pioneer*. It is undoubtedly true that Indian tea, as now made, will not keep, and this is quite a new defect in Indian tea. Time was when tea was not considered good until it was a few months old; some brokers even insisted on one year's keeping as necessary to mature its flavour. When the Suez Canal was opened, many planters imagined they would not get full value for their tea, on account of its being placed on the market, too soon after manufacture. About the middle of last year, a few chests of tea were found in a godown in Darjeeling where they had lain for several years, and had been quite over-looked. They were opened under the suspicion that the tea would have gone bad from old age. The result, however, was quite different; the tea was found to be so mellowed as to be simply delicious, and it was readily sold on the spot at fancy prices. Now such a thing could not possibly happen under existing circumstances. At home, a buyer finding the market favourable, lays in a good stock for future requirements, and finds it getting worse and worse as time advances. He imagines, like the expert above referred to that it must have been insufficiently dried, or that the machinery has got something to do with it. He forgets, or perhaps, like our expert does not know that had the tea been insufficiently dried, it would not have kept a month. Within that time it would have become quite mouldy, and he ought to have known also that the rolling by machinery could only affect the shape of the tea, but could have no influence on its chemical condition. Its influence could only have been mechanical. The true cause of this deterioration we believe to be the present ruinous method of manufacture. For the purpose of making the tea of this country suitable for mixing purposes, and of giving it the necessary pungency to make up for the want of flavour in the China tea with which it is mixed, the process of manufacture is not carried out in its entirety. At a certain stage of fermentation, this process is checked. And more, the good old method of panning is almost entirely abandoned, entirely so, in fact where the brokers' influence is felt. The panning was resorted to in order to tone down the bitter flavour natural to the tea, and the checking of fermentation which to a certain extent assimilates the manufacture of black tea to that of green, has the effect of producing a thick malty liquor, with a hoppy flavour. On a sample being "tasted" the liquor is found too strong and pungent, but the "outturn," the technical name given to the leaves after infusion, is found to be of a more or less greenish tint, instead of the almond colour, so much approved by those who love a cup of really delicately flavoured tea. This is the result of tasting, the after-result being that, after a time, this tea shows symptoms of decay because it is at best *cutcha* and imperfectly cured.

A question arose at the Bombay High Court last week as to the comparative effects of the datura plant and *bhang* (*carmalis moicus*) when administered internally. The Government Analyser was present as a witness, and expressed the opinion that the symptoms produced by both of these drugs in whatever form administered, were very similar, but could be readily distinguished by a qualified man. Two other points raised were, first, whether datura is daily taken by native women voluntarily as a remedy against sterility; and secondly, whether *bhang* is or is not taken in the form of a liquid. Strange to say no one in the court seems able to answer either of these questions, nor was any reference made to authorities upon the subject. The facts are, however, known to every native, the datura plant being prized for the virtues of the kind alluded to which its seeds are supposed to contain, and it is in frequent, if not common, use for this purpose. *bhang*, again, every native knows is taken as a liquid, being known by different names when used as a dry powder, or in other forms, of which there are several.

We should like those who are interested in the improvement of native agriculture to see, as we have had the pleasure of doing, the "Patent Economic Plough" which has lately been invented and patented by Mr. W. Chick, 24, Chowringhee-road We have not yet seen the plough in actual operation, but a mere inspection of it seems to leave no doubt that it only requires to be made widely known to secure its universal adoption by native cultivators. We understand that it has been tried with striking success. The plough, while strong and durable and capable of deep ploughing, is so portable that the weakest plough boy could easily carry it to and from the field. It can be driven by one man, and may be drawn by a pair of small bullocks, such as are commonly used by the ryots. It is so constructed that while it ploughs deeper than the native plough, and with good bullocks will go to a depth of seven inches, it actually requires less exertion on the part of the ploughman than the native plough. He has to exert no downward pressure, but simply to guide the plough with one hand, while he drives the bullocks with the other. Such casual repairs as may be necessary may be executed by any village workman, and the plough is so simple that the ryot can work it at once without previous instruction. The price is only Rs. 11-8, and though a little dearer than the native plough, is surely within the reach of very many ryots, who, we are assured, would secure from its use a large profit from increased production. We are told that experiment has shown that, other things being equal, an improvement of 30 per cent. or more in production may be obtained. For the practical purposes of native agriculture this plough promises to be all that is required, while it is free from the objections which are fatal to the introduction of the English plough in this country.—*S. & F. of I.*

There are many directions in which the expenses of working English farms might be reduced, such, for instance, as placing the homestead in a central position, improving the arrangement of farm buildings, improving the roads upon a farm, increasing the size of fields, and so on. How often do we see the homestead of a farm placed without any regard to the situation of the land to which it belongs. Probably, the site was selected years ago, and for no reason that now possesses any weight. Of course the removal of a homestead to a new site is not an undertaking to be entered on lightly; it could be done only under unusual conditions. When the demands of modern farming call for extensive modifications in a homestead, it may well be taken into consideration whether, instead of incurring expenses in alterations, it would not be wiser to pull down such of the buildings as cannot be utilised, and to erect a new homestead in a more suitable position. In some instances, from the low position of the homestead, the farmer may be under the necessity of spending annually from 15 to 20 per cent. more on hand labour than would have been necessary had the homestead been placed where it ought to have been; and it is possible that the amount, if saved by the provision of a new homestead, would go a long way towards paying any extra charge that might be created in connection with the improvement. We all know how much more costly is the tillage of distant fields, than that of those conveniently near the homestead; the time of the horses and labourers is wasted on the road to and from the fields, while the cost of carting manure out, and the field produce home, is frequently very great. It is not always possible, nor indeed always desirable, that the exact centre of the farm should be the site of the homestead; but in the majority of instances it should be. It is very much the fashion now to construct imposing homesteads, and to group together the various buildings needed on the farm; and this is certainly an arrangement that enables the operations conducted at the homestead to be carried on with the least expenditure of labour, and under the most perfect supervision; but when the area of the farm is large, the cartages are lengthy, and therefore costly, if the manure must all be conveyed from one place, and the whole of the produce be carted there. On some farms out-lying stock-yards, with cattle-sheds attached, greatly facilitate the working of the farm in lessening the horse labour.

The farm buildings are also often very inconveniently arranged. The homestead is the manufactory where the produce is worked up into a saleable form, and the various processes there carried on cannot be performed in an economical manner when the buildings are grouped together without any regard to the uses of each. The substitution of covered yards for open yards will effect much good, in enabling the work done at the homestead to be performed in the most economical way. Landowners who will carry out this improvement, and judiciously re-arrange the buildings when necessary, will do a great deal more for the good of their tenants at this unfortunate period, than by returning 10 or 15 per cent. of the annual rent, or even in some cases in reducing permanently the rent to this extent.

Farm roads, again, are seldom kept in the condition in which they should be, and the expense of cartage over them is usually considerably greater than on public roads. Of course the internal roads of a farm cannot be maintained in the condition in which public roads are kept, but there is no good reason why they should generally be in their present wretched state. The farmer who tests with a dynamometer the draught of his loaded carts on a public road, with that of his carts, similarly loaded when drawn over the ordinary roads of his farm, especially in a busy season and in showery weather, will have his eyes opened in regard to his losses from bad roads. We have found a cart loaded with a load of 1,000 pounds—a sufficiently hard task—on a farm road for a horse that could, in the same cart, draw with ease over a public road a load of 2,000 pounds. Of course, good roads will not help us when the carting has to be done over ploughed land, as in the case of the distribution of manure; however much of our farm carting is performed along prescribed tracks, which, though not in all cases recognised as roads, are used year after year for the purpose. Good internal roads would, on most farms, greatly reduce the expense of cartage. Not only should the roads be in a good state, but they should be so laid out as to reach the various portions of the farm by the most convenient and direct route. Some road-tracks on farms follow most tortuous courses, frequently following tracks originally made by stock in passing from one place to another. On many farms it would be the wisest course to abandon the present tracks altogether, and to strike out a few lines of roads where such roads are absolutely required, and to have them well made—that is, adapted to meet the needs of the farm. The construction of such roads, as well as their up-keep, would fairly fall to the share of the landowner, he getting his return for the outlay in the increased letting value of the farm.

There are many improvements that might be suggested to save expenses, but most of them require a considerable initiatory expenditure which the farmer, under the present system, cannot be expected to lay out, while the landlords will not. Yet a continuance of the depression that has forced so many of the latter to concede reductions of rent, would soon show that such expenditure would be real economy. Without it British agriculture cannot hope to compete with America.—*Statesman*

Though the depressed state of British agriculture has engaged so much attention of late, there is much diversity.

of opinion as to the causes to which it must be attributed. That a succession of bad seasons contributed, in no small measure, to bring about the result deplored is evident. It is equally clear that it was the vast importations of cheap food from abroad—the United States chiefly—that kept down the price of agricultural produce in England, and that prevented our farmers from obtaining that recompense for short crops that, in former bad years, high prices afforded. But making every allowance for these influences, we do not think they could alone have brought about the almost entire collapse of British agriculture witnessed during the past few months, had it been established on a sound footing. Generally the remedies applied for the bad results of our husbandry are presents to the tenants from their landlords of sums representing 10 to 20 per cent. of the annual rent which the tenants have stipulated to pay. While we recognise fully the generosity which has influenced so many landowners in thus sharing with their tenants the losses of the past season, we cannot but deplore the fact that such an important interest as British agriculture, should have become so reduced as to depend for maintenance on the "generosity" of any body of men. But our faith in the capabilities of our country has not sunk so low as to admit of our believing that her agriculture need be bolstered up by such means. We are convinced that if our farmers had but fair play, their general practice would become so much improved that they would have no need to make any demand on the generosity of their landlords, and might defy all foreign competitors in supplying much of the produce of agriculture required by the people of this country. We do not admire the arrangement under which the land is generally owned by one class of persons and cultivated by another. We do not think it possible to draw up any lease or agreement that will protect the interests of the owner of a farm, and, at the same time, afford the tenant the protection he needs to justify him in working the farm to the best advantage, as long as farms generally are in the condition the majority of them are now in. We do not lose sight of the fact that, under the varied conditions under which agriculture is practised in England, bad farming is the rule. Landowners have but in a few instances performed the duty of putting their farms into a state thoroughly fitted for economical working, and, as long as this continues to be the case, it will be the best policy of the farmer to keep to the antiquated practice, and to incur as few risks as possible. High and modern farming demands a large outlay, but then the returns are proportionately increased; but the outlay required could not be safely laid out unless the farmer had his farm put in a thorough working state by the owner, or unless the farmer was himself the owner of the land, and carried out the improvements needed.—*Statesman.*

OFFICIAL PAPERS.

THE WYNAAD GOLD FIELDS.

FROM R. BROUGH SMYTH, Esq., Mining Engineer, to J. H. Garstin Esq., C.S.I., Acting Secretary to Government, Revenue Department, dated Ootacamund, 6th December 1879.

I HAVE the honor to submit the following report of my proceeding, during the month of November for the consideration of his Grace the Governor in Council.

2. From the 1st to the 6th of November inclusive I was employed in completing my general report and maps and, as already reported, these were forwarded to the Government on the 7th November. Subsequently my time was occupied in testing specimens of quartz and minerals, in treating amalgams, and in compiling a schedule of the yields of gold per ton of quartz from reefs and veins in South-East Wynaad and the Gardoor Ghât.

3. On Wednesday, the 19th, and on Saturday, the 22nd, I visited Nanjanad Valley.

4. On Tuesday, the 25th, I proceeded to Avalanche, and during the succeeding nine days examined that country and that at Sispara.

5. A map of these areas, now nearly ready, will be forwarded to you as soon as possible.

6. I am at present engaged in correcting the proofs of my general report.

7. I beg reference to the accompanying report on the country around Nanjanad, Avalanche, and Sispara.

ENCLOSURE No. 1.

REPORT on the country around Nanjanad, Avalanche, and Sispara.

Nanjanad.—It is not easy to indicate the areas which have been worked for gold, presumably by the natives, in the Nanjanad Valley. The quartz workings are extensive, and as they are found principally on land used for grazing, it may be supposed that they remain now very much in the same state as the miners left them. It is different with what may be called the alluvial workings in the old stream bed.

Though numerous evidences of the work done in former times are to be seen, they have been obliterated by the Burgher cultivators over an area whose limits cannot now be discovered. On my last visit the Burghers were engaged in levelling ground which had been sluiced for gold. The uneven surface was being made smooth and in course of preparation for sowing grain; and how many acres may have been thus treated cannot now be ascertained. Here in Southern India as in Australia the cultivator follows the miner; and a gold field that at one time afforded employment to thousands of persons becomes in a short time unrecognisable by its former inhabitants. The bright green crops of grain and the removal of the trees and scrub completely alter the character of the landscape and render it as unlike a gold field as any tract can well be.

It is certain that much work was done at one time by gold miners along the course of the stream which rises near the Belmont Tea Estate and flows thence through the Nanjanad Valley.

About one mile north-eastward from the Nanjanad Chuttram, there are outcrops of quartz which have been worked to some extent.

Prospecting operations have been carried on here during the last four months, but no quartz shewing gold visible to the eye has been found, and the results of experiments have been unsatisfactory.

Mr. Thomas Laing has washed several dishes of earth taken from the slopes of the hills in this area, and several have shown gold; and quartz pounded by him and washed has in some cases given a few particles of the metal.

In testing the stone by amalgamation several samples showed no gold, others yielded minute grains, but no weighable button was obtained.

The reefs are thick, some strike nearly N. 70° W., and all along the outcrops westward of the stream know as Buk-kan-halla there are old workings to be seen. The quartz is ferruginous, but the proportion of undecomposed iron pyrites is usually very small. Near the veins there are seams and nests of black oxyde of manganese intersecting the country rock and coating the quartz.

Strong "leaders" are thrown off towards the north, and these have generally a low dip.

Nearly one mile and-a-half west from the stream where these outcrops occur there are numerous heaps of quartz broken into very small pieces, and the excavations are large and deep. One sample of quartz from this locality yielded at the rate of 6 dwt. 13·47 grs. per ton, and another between 5 dwts. and 6 dwts. (a portion of the amalgam was lost).

These old workings are near what is said to be a perennial stream, and the quartz could be economically mined by adits. The locality is one which might be prospected with some certainty that the results would fairly exhibit the character of the reefs of the Nanjanad Valley.

The quartz is in most places white, but there is a proportion of brassy yellow pyrites, and much of the stone resembles that found at the Skull Reef near Devala.

Two dishes of earth were washed here and gold was obtained in both.

Avalanche.—After crossing the range about one mile south of the Nanjanad Chuttram, up to which point the country rock is intersected by well-marked large veins of quartz, there is a change in the character of the strata. Numerous very thin veins of quartz, nearly everywhere following the direction of the foliation of the rocks, present themselves, and not a reef is to be seen.

At Avalanche and near Kudiaked the strike of the rocks is N. 60° E.—S. 60° W., varying but a few degrees. They are quartzose, and a little magnetic iron is seen in places, but hornblende is rare. In the beds of the rivers rounded water-worn blocks were found very similar in composition to a basaltic rock; and here quartzose gneiss was got with minute foliated particles of graphite.

These were not traced to the rocks *in situ.*

In this locality also thin veins of quartz were observed running in the direction of the strike of the rocks, and there were intercolated masses of garnetiferous rock.

Though it was easy to collect specimens of pure quartz, no really persistent reef was seen; and it was soon evident that this was not a locality which would reward the prospector.

Mr. Thomas Laing made a cutting in the banks of a stream where there was a good "wash" and tested several dishes of the earth overlying the bed-rock, but no trace of gold was found; and many dishes of earth washed in other places gave the same unfavorable results. Quartz also was crushed and washed at various points, and not a speck of gold was discovered.

Sispara.—Careful attention was given to every feature in travelling from Avalanche to Sispara in the neighbourhood of Sispara, and thence down the ghât for some distance, but nothing was seen which would encourage the miner to search for gold; and though many dishes of earth were washed in the most likely places, no gold was seen anywhere.

About two miles and-a-half north-east from the mud-hut at Sispara the rock is composed of quartz and felspar in coarse grains, and closely resembles a binary granite; but where a weathered surface is observed, the lines of foliation shown by slightly projecting indurated veins composed mainly of quartz indicate a gneissoid structure. Again, down the ghât and elsewhere thick bands of ternary granite consisting of quartz, felspar, and black mica form the mass of the country rock; but these again are only intensely metamorphosed strata coinciding in direction with the ordinary foliated gneiss, and not true granite.

Where these bands occur, the detritus is exactly like that derived from granite, and where the rock has decomposed pieces can be picked up having a small specific gravity; they consist of a skeleton of silica (quartz), the more perishable associated minerals (chiefly felspar) having become kaolin or having dissolved out altogether.

On the edge of the plateau and in the jungle down the ghât several slabshaped pieces of white and crystalline quartz were dug out of the soil not resembling the quartz in the country-rock, but in these pyrites and oxyde of iron were absent, and no gold was seen in them.

Several dishes of earth were washed at and near Sispara, but not a trace of gold was found.

I returned from Sispara on the 4th instant, and I have not yet had opportunity to examine all the minerals and rocks collected during the journey; but there is no reason to believe that the tract lying between the southern part of the Nanjanad Valley and Sispara is likely to yield gold in quantities sufficient to remunerate the miner either from the masses of quartz (nearly everywhere granitic) or from the soils.

It may be mentioned here that some samples of quartz collected by direction of his Grace the Governor when his Grace visited Sispara yielded minute particles of gold by amalgamation. The locality as pointed out to me will be shown on the map.

(Signed) R. BROUGH SMYTH,
Mining Engineer.

OOTACAMUND,
6th December 1879.

SYDNEY EXHIBITION.

Dated Elizabeth-street, No. 717, Sydney N.S. Wales, *viâ* Galle, the 23rd December 1879.

From—Major M. Clementi, Bengal Staff Crops,

To—The Offg. Secretary to the Government of India, Home, Revenue, and Agriculture Department.

I HAVE the honor to acknowledge the receipt of your letter marginally noted, with copy of telegram of the 17th October.

No. 267, dated Simla, the 24th October 1879.

2. In the face of considerable difficulties which I need not now more refer to, I have managed to display all the exhibits with the exception of one large carpet.

3. I have been careful in the matter of expenditure, which has been less than I estimated. As requested by you, I will furnish a detailed account of the expenditure at the close of the Exhibition.

4. I gather from the newspapers that the Government of India purpose participating in the forthcoming Melbourne Exhibition. Melbourne, I may say, is very far in advance of Sydney in civilization, and I would therefore suggest that the art manufactures for that Exhibition should be selected with care.

5. I would suggest for selection the following:—

Castor and other oils; Indian pottery; a small quantity of Bombay blackwood furniture and sandalwood goods; Lucknow, Sind, and Cashmere silverware, *surahis*, and so on; *chaddars*; shawls; *choghas*; *malida*, and similar cloths, silks, muslins, cottons, prints, chikan works, carpets; a small and light Swiss cottage tent complete, with iron pegs, and a small sleeping pal; native jewellery; Benares, Moradabad, and Gujrat metal wares; Agra mosaic and inlaid stone-work; Jaipur figures in marble; photographs; papier-mache; ivory work; medicinal barks and roots; dyes; tea; coffee; spices; tobacco; rice; sugar; shell-lac, rough and prepared; gunny cloth and bags and woolpacks.

6. It would be a saving of expense, labour and material being so much dearer in these colonies than in India, if the show-cases could be sent down with the exhibits; they should be of teak, or some other strong wood, and the larger ones should be packed in pieces, the glazing and polishing being left to be done at Melbourne.

7. The show-cases sent down from Madras are not suitable for the protection of the exhibits from persons, or from the atmosphere and dust; and as they were sent glazed, there was loss from breakage. Moreover, the style of the cases do not admit of good arrangement, or for the most advantageous display of the exhibits.

8. Some of the teas from the Bengal side were sent down in stopper bottles; but the packing was so bad, that a large number of the bottles were on arrival, found to be broken. The treatment packages receive in transit to this, is so rough as to necessitate strong cases and the most careful packing. In some instances the bottles were smashed to atoms I had better mention also that the indigo from Madras came through the wrappers, and discoloured some of the grain exhibits; and some of the coffee bags (which are not of very strong material) burst, and the contents got mixed.

9. The labels for the exhibits from either Presidency were not very securely fastened on, and many came off.

10. I think that stopper bottles are as good and inexpensive a way as there is for exhibiting teas, coffee, spices, grain, manufactured tobacco, oils, sugar, dyes, roots, &c., &c.; for cinchona barks tobacco leaf, and other long exhibits, bottles are unsuitable. The labels might be placed at the bottom part of the bottle, and be of such size as to leave the contents of the upper part open to view. In addition to other descriptive matter, the labels had better give the prices. This is the more important, as prices are not allowed in the official catalogue. This suggestion as to marking the prices applies to all exhibits, and not only to those in bottle.

11. The bottles might be packed in strongly made cases, with the tops screwed, not nailed down, each bottle being in a seperate partition and these cases should not be too large. This method of packing may be dearer than that commonly adopted, but it will I venture to say prove to be cheaper in the end.

12. There would seem to be no occasion to send more than fair samples, and a 40 ounce bottle will as a rule hold quite sufficient tea, both for exhibition and for tasting. If it be considered advisable to send larger quantities, then the bulk might be packed separately; but the samples in bottle should I think, be sent for to open tea and keep it exposed for any time is to cause it to deteriorate in favour and exposure to the air is not necessary until the time for judging. Large and nicely printed cards givings names and addresses of respective exhibitors, and their local agents, together with any description necessary or advisable (descriptive matter not being permitted in the official catalogue), might well accompany the different collections of exhibits.

13. I found that the catalogue sent from Madras was not in accord with the official classification and rules promulgated by the Sydney Commission. But, as I had to make a general catalogue for the entire Indian section, this did not much matter; and I distributed the Madras catalogue as an unofficial one. Copies of the Indian catalogue will reach you, I trust by the Torres Straits mail leaving this on the 27th instant. The descriptive and unofficial part preceding the catalogue, headed "Statistics," I compiled from the Madras catalogue and other sources. Had there been time, I should have reffered to your department for this part, and I would suggest that the statistical and descriptive portion of the Melbourne catalogue be supplied from India.

14. The prices marked on the metal wares and on the shawls, do not tally with those given in the lists I received from your department. I am disposing of those articles at the prices marked on them, although these are somewhat lower than the prices given in the list.

15. May I ask you to do me the favour to correct the statement officially made in India that I am a retired officer? I have the honour to be, sir, your most obedient servant.

(Sd.) M. CLEMENTI, MAJOR,
Bengal Staff Corps.

No. 2 of 1880.

GOVERNMENT EXPERIMENTAL FARM, KHANDESH.

BHADGAON, 10TH JANUARY 1880.

Progress Report of the Superintendent of the Khândesh Farm for the half-year ending 30th December 1879.

THE monsoon although measuring only 34 inches in all, dragged itself out to an unusual length, and being, especially towards the end, accompanied by extreme cold, country-people generally suffered severely from a peculiar fever called *Hewa*, the symptoms of which are not unlike those of ordinary *Dengue*. At times as many as half the entire rural population were laid up with this fever, and field work, of course suffered accordingly. Especially was this the case during the cotton weeding season, and many fields remained unattended to. In spite of this, however, the crop is everywhere turning out remarkably well. Statistics of the farm crops have not yet been obtained, but, with the exception perhaps of jowari, they will certainly compare favourably with the best of any previous year.

New Implements.

2. The new cotton plough and scraper mentioned in last report, have fully maintained their reputation during the season, and are now being much asked for by the cultivators.

Selected Cotton Seed.

3. Great attention has this year been paid to the selection of good seed for distribution, and as many large growers who were last year supplied with pure seed have also kept their stock for sale at sowing season, the demands on the farm store will this year probably be lighter.

Malachra Capitata.

4. This fibre plant (Ran Bhendi) a sowing of which was made under Government Resolution No. 1983 of 15th April 1879, has done very badly, not more than five per cent. of the seeds germinated, this is a very common result of any first attempt to put a wild plant—under the ordinary conditions of cultivation. In such cases the seeds usually come up the second year.

5. Although the sowing of the plant is so far unsatisfactory, it is otherwise with the experiment as a whole, a sufficient quantity has been found growing spontaneously in the fields to produce if not a ton of fibre, at least as much as will afford a thoroughly practical test as to the suitability of the article for spinning and weaving.

Cow Tree (Brosimum Galactodurdron.)

6. Several new trees have lately been introduced, the principal of which is the cow tree of South America, which is said to yield abundance of milk (from incisions made in the bark) equal in quantity to that of the cow. It is therefore a tree of immense

importance, and its successful introduction into India would be a valuable achievement.

7. So far, the seeds planted here have not germinated, neither however, have they rotted, so that there is still ground for hope that they may not have lost their vitality.

Cane Mills.

8. The only new machine received on the farm during the half-year, is a sugarcane crushing mill, the invention it would appear of Messrs. Thomson and Mylne of Beheea. The advantages claimed for this invention over the native mills of that locality are :—

1st.—Economy in working.
2nd.—Cheapness of up-keep.
3rd.—Portability.

For very small canes the machine may be all that it is represented to be, but it is evidently far too fragile to crush the large ligneous canes commonly grown in this part of the country. A series of carefully calculated trials will be conducted and the results duly reported.

9. The five heavy iron mills sent out by Mc.Onie, and others, are by far the best ever made. Of the five belonging to the farm, only one remains to crush the cane crop, the others are all out in the district on hire.

Silk Factory.

10. During the past rains, attention has been mainly directed to the rearing of the tusser worm in the open air. Two crops were obtained, the first was eminently successful, the second, owing to the protracted cold rains mentioned in para. 1 was a partial failure. Plantations of different kinds of food plants are now being made, when it is expected that more uniform results will be secured.

11. The Mulberry silk experiment continues to show a fair amount of success, the quality of the silk has not so far been critically examined, but its value will now be satisfactorily determined, as a bale of the raw material has been sent to Major Coussmaker who will dispose of it in the open market.

Stud Horses.

12. A few magnificent Arab pony stallions have just been added to the Stock Department, which is now becoming the most important section of the farm, nothing but the very best results can be expected from this new scheme. The Khandesh ponies sent forward for baggage purposes have proved themselves marvels of endurance, wanting only in symetry. This latter defect will readily be remedied by the Arab sires, specially seeing that so few native ponies are left to interfere with the progress of improvement.

13. The ponies of the Scotch Hebredies own their faultless forms and wonderful constitutions to Scandanavian blood introduced by the *Norwegians* and *Danes* many centuries ago. Similarly a few superior stallions which escaped from one of the vessels of the *Armada* wrecked of the coast Galloway, gave rise to a breed of horses (galloways) which even to this day are worth 25 per cent. more in the market (size for size) than any other breeds of horse.

There seems no reason why the scheme now being started for the improvement of our long neglected native ponies should not be equally far reaching in its results.

A. STORMONT,
Superintendent.

NAGPUR FARM—HALF-YEAR ENDING 31ST DECEMBER 1879.

Extracts.

I HAVE the honor to submit the following report on the working of the Nagpur Farm during the past half-year.

From the marginal statement it will be seen that the total rainfall registered during the prevalence of the south-west monsoon was 45 inches ; this total includes 7 inches of the heavy fall of 31st May and 1st June, and as there has been no fall registered since the 9th October, the rainy season may be said to have lasted 131 days.

		Inches.
1—15th June	...	7·82
16—30th „	...	6·14
1—15th July	...	1·87
16—31st „	...	7·11
1—15th August	...	7·90
16—31st „	...	5·60
1—15th September	...	[illegible]
16—30th „	...	3·29
1—15th October	...	3·65
		45·63

Jowari.

Jowari was sown as a primary crop in five fields, and as a complementary crop in the cotton and thur. The fields chosen were Nos 1, 5, 8, 16, and 40, of which No. 8 alone is completely black soil, the others being partly black only, "murand" cropping up occasionally, especially it Nos. 16 and 40. With the exception of No. 1, these fields are all situated on a more or less inclined slope, and from their position, Nos. 5, 16, and 40 are more than usually cut up with water-courses. Manure had been applied to No. 1 field in the hot weather of 1875 in the form of town sweepings and also to No. 5 in 1876, but the other fields have not been manured by us.

The preparation of the soil was restricted to "bakhuring" before sowing, but in the case of Nos. 1 and 16 alternate strips were ploughed as an experiment. Sowing was carried out at the end of June and the beginning of July, and germination was complete.

The heavy rain which fell continuously damaged the crop in the low lands of the black soil as well as on the poorer mixed soils, where the constant moisture caused some plants to be washed away, others to rot, and the rest to remain stunted and weak.

In the higher lands and on the richer level soils the crops withstood the impoverishing effect of the heavy rain, although everywhere by the month of August jowari presented an unfavourable appearance. Outside the farm it may be noted that jowari on the whole remained healthy ; but in the immediate vicinity of Nagpur, on the western side of the city, this crop is generally grown on stony ground as a field crop or on very rich soils as a garden crop. In the former case an evenly distributed heavy monsoon is favourable, and tends to induce the production of a uniformly good stalk wherever the ground is only fairly drained ; on the other hand breaks of ordinary duration would, in many cases, prove fatal to jowari grown under such circumstances.

Our cultivation of jowari on the farm may be more rationally compared with the garden growth, in which case, as with us, the production of grain is the great *desideratum.* The appearance of the garden grown jowari is familiar, and its more prominent feature of excessively tall growth was very marked during the past season, yet when the time of flowering and fruiting came, the "bhootas" where only small and unhealthy, as if the vigour of the plant had been absorbed in the production of the stalk. Nor was the consequent diminution in the grain outturn compensated by any superiority in the fodder the crop gave, on the contrary, jowari under conditions whereby its stalks are thick and long is not so paying, as far as fodder is concerned, as when the crop remains short and the stems thin, which is the case generally on the poorer soils with the ordinary system of cultivation.

This unfavourable result of garden-grown jowari, *viz.*, the production of small heads on long pithy stems, we avoided at the farm by our having sown our crops later than the garden growers, and the dwarfing of the stalks was no doubt assisted by the unceasing wet weather. As yet the crop is standing, so nothing certain can be said regarding the yield ; but it can safely be asserted that the grain crop in Nos. 1 and 5 fields will be a more than ordinary one, and far superior to the others, although, in the former instances, as well as in No. 16, 3, 4, and 5lb. of seed per acre were sown as compared with 9lb., and more per acre in others. The quantity of manure in Nos. 1 and 2 is very slight ; but yet I am convinced that in both cases the crop being superior is due to the land having been manured as well as to thinner sowing and careful constant weeding.

It was originally intended that the year's experiments with the jowari crop should be conducted with a view to determine the effects of ploughing on the growth and outturn and the result of thinner sowing. The experience gained by the native Superintendent and the farm servants is completely local as regards the crops, and that no doubt accounts for our having hitherto sown so much jowari seed per acre by following, on richer soils with heavy cultivation the measures adopted by the surrounding jowari cultivators in their efforts to grow fodder on the poorer soils with but slight cultivation. The outturn in No. 1 field will I believe show that rich soil well cultivated and thinly sown, yields a good commercial return in its grain value for the extra cost of cultivation, whilst, as already noted, the fact of our ploughed strips remaining green whilst our lightly cultivated bands of soil were withered by an early break, points to the singal advantage to be derived from a seed bed deeper than that usually selected by native cultivators.

In carrying out our experimental growth of jowari with the objects already recorded, we were hampered by some difficulties. The impossibility of getting a suitable large area of uniform soil reduces the value of the experiments, by our having to carry them out on small plots. Otherwise by including various soils in our experimental plots, we introduce elements of uncertainty into the figures on which our results are based. A second difficulty arose during the past season from our sowers being cultivators who from their youth up had been accustomed to sow jowari thickly, and to feed the drilling machines at a certain pace, and who find it difficult to stay their hand and dispense a lesser amount of seed regularly.

On these accounts our original plan of sowing alternate bands with fixed amounts of seed per acre, in fields ploughed crosswise in alternate strips, was frustrated, and the crop if successful will only prove that thin sowing give good results, and that a deep seed bed is advantageous under certain climatic conditions ; but in order to set down with any certainty the amount of seed per acre which will give the best return, a continued course of experiments must be undertaken.

In concluding this notice of the jowari crop, I would refer to the very superior fruit heads yielded by stalks in the thur and cotton bushes, and one

the fact, that a vigorous growth of jowari plants from 10 to 15 feet apart seems in no way to interfere with a shrub under growth of either cotton or thur; whilst, on the other hand the past season has directly shown that whether from any protection afforded by the surrounding growth or assisted by other kindred conditions, a complementary crop of jowari so interdistanced will prove highly remunerative.

I would also state that, by desire, the subject of jowari cultivation has been especially gone into, as its former growth at the farm had left much information ungained or unrecorded.

Cotton.

Since the establishment of the farm, repeated experiments have proved that cotton grown under an expensive and thorough system of cultivation, will amply repay the outlay, while in 1878-79 an attempt was made to put into practice the experience so gained. The monsoon of that year destroyed the crop at a very early stage of its growth ; but during the past season we have succeeded in getting a large well cultivated area stocked with cotton plants of a superior variety, and hopes of a success are entertained.

The plants came up evenly and strong, and when the heavy rains came on they withstood the moisture. Weeding was a difficulty, but no visible harm was done from our not being able to carry it out at the proper season. The fields chosen are uniform in level and soil for a considerable area, and only on the lower fringe was the ground so swampy during the monsoon as to materially prevent the plants from bushing out. Picking commenced in the middle of October, and up to date the outturn from about 25 acres has been 500lb. of clean cotton, representing about 2,000lb. of picked bolls, which, with about 200lb. of soiled cotton, makes up an average of 88lb. of unginned cotton, or 22lb. of clean cotton to the acre. This may be looked upon as the result of the first picking, and a much larger outturn is expected from each of the succeeding ones. Our actual yield would no doubt have been considerably greater had not the final rains of the monsoon induced worm in the first formed bolls, and the cloudy weather at the close of October affected the whole of the flowers and fruit still on the bushes. The bolls now forming are small, partly owing to the last mentioned cause, which interfered with the development of the flower, but the chief reason is undoubtedly the unusually early and severe cold weather we experienced in the months of November and December. Now that the temperature is more even, it is expected that our yield will increase, and the irrigation now about to be carried out will also have a beneficial effect.

It is worthy of remark that the greater portion of the cotton as yet plucked is the fruit of plants which from various causes never branched much and flowered precociously ; while the large mass of the crop was still growing and spreading. This early flowering of a portion of the cotton has been taken advantage of to lay in a stock of the seed in order to try and perpetuate as an early cropper.

Until now the proportion by weight of seed to clean cotton has remained fairly constant at 8 to 1, but it is probable that this proportion will decrease when the crop is in full fruit.

Cotton was also grown on some 5 acres in another section of the farm where the soil was of a much lighter description. The preparatory cultivation was not heavy, and the plants were completely checked by the wet; at the same time the unsuitability of the soil was proved by their never recovering when the lands dried.

There was also an attempt made to grow the later sown variety of Jheri cotton from seed imported from the Chanda district, but i did not germinate freely, and the young plants that did appear made no progress, and many died down. Seeing that it was impossible to get any crop, and that the land was in good order, it was ultimately sown with wheat, which has so far succeed admirably. In future experiments with Jheri cotton at the farm, I would advocate that its cultivation be restricted to small areas, until our knowledge of the particular requirements of the crop is more extended than at present.

The Bhamieh cotton plants are now of two years' growth, and this season a small quantity of good cotton has been yielded by them, though in point of colour our Indian home grown varieties are superior. The plants are tall and flower well, but few of the fruit come to perfection, and even they are generally perforated by worms. This variety of cotton has a remarkable tendency to throw up suckers, which perhaps may account for the weakness of the parent stem and fruit.

Rice.

The Chimur variety was again experimented with, and with some amount of success. Transplants from a large bed of seedlings were put out, and in parts the outturn will be fair, but nothing equal to what would be the return on similar soils from locally grown varieties. The plants grew well at first, but afterwards did not "tiller" out. On the Thelinkheri estate near Nagpur, the same inability to spread out on the part of this variety was very marked; especially as other kinds of paddy grown under similar conditions of soil and treatment succeeded admirably. At the same time it should be noted that a small plot on the farm which in the previous monsoon had been under Chimur rice, gave a small crop of plants self-grown from seed which had remained the whole year in the ground. The produce of these plants was considerable for their number, and the plants themselves were tall and tillered out wonderfully. From this I am inclined to consider that our rice fields are of too stiff a soil for this variety and that the lands would require considerable quantities of vegetable manure to be added to them to cultivate it successfully.

Turmeric, ginger.

Experiments were also carried out with turmeric and ginger, which in the previous year had been tried but found unable to cope with a very heavy monsoon. This year they have done better, but at no time have they been luxuriant. It remains to be seen what their yield will be before determining on their cultivation being a success or not.

Thil.

Thil sowing was carried on at the proper season, but it was found that the ground was too wet for the seed to germinate well, and it had to be done over again. Where the soil was drier a fair crop came up, but its growth is not luxuriant, and I would not suggest its cultivation being attempted commercially.

Gram.

Gram has been extensively sown wherever suitable fallow land was avilable and time permitted. Portions of the jowari and thur fields where the rains had swamped the original crops were put under gram, which has come up well. The outturn is expected to be a good one.

Linseed.

Linseed has been sown over an area of 83 acres. The seed came up fairly, but in parts the ground was so wet and sticky, that no amount of cultivation could get it into order in time for the crop. In one field where germination was markedly incomplete on this account gram, was afterwards sown with success. In other fields the varied nature of the soil has caused an uneven crop. Wherever the "murund" outcrops, the plants are fewer and less strong, and the thinness of the crop on these spots is owing to the ground having become too dry before the blacker soils were sufficiently dry to sow the seed in. This want of uniformity in the soil is the chief consideration, owing to which it is so difficult to obtain a regular *rabi* growth over any area at the farm.

Wheat has been sown in 7 fields over an aggregate area of 44 acres. The varieties selected for cultivation were the "Haura," which has been so successively grown for some years past; the "Pissi," a soft white of superior quality from the ghâts in the Seoni district, and "Jelalia" from the Nerbudda Valley.

Unfortunately the Commissioner's instructions regarding the extensive cultivation of the soft white wheats, which are so highly valued in the home market, were received after our season's sowings had been completed, and an investigation of the conditions of the growth of this class of wheat is therefore reserved for the next year. I would mention that hitherto our chief success in wheats has been with the hard white varieties, which although they may not find favour with the English miller, yet appear to be preferred by the wheat-eating population of this part of India.

From the shortness of the time during which wheat lands must be prepared and sown, great difficulty is experienced in getting any considerable area of ground into good order with the ordinary strength of stock on the farm, and although this year every other work was set aside for the furtherance of this object, yet even assisted by the loan of several head of cattle from the Mahraj Bagh, it was found impossible to get all the seed in by the time the seed bed remained in order to receive it. This is the sole cause of a partial failure to germinate of the wheat in No. 89.

The seed in other fields came up well, but thinly as compared with the number of plants observable in an ordinary ryot's field. This is no doubt owing to our seed bed being deeper and the germination of the seed slower and more uncertain ; but the advantages of our system of cultivation are invariably apparent later on in the age of the crop when each plant "tillers" out.

In continuation of an experiment with English wheat carried out by my predecessor, an area of three acres was thoroughly prepared and manured and put under first-rate fresh seed carefully consigned to me by an English farmer. The varieties he had selected were the "White Foster," "Short Essex," and "Buff Talavera, the last named being a spring wheat. The seed arrived in first-rate order, but the "White Foster" was much weevil-eaten, and both it and the "Short Essex" failed to germinate. The "Buff Talavera" partially came up, and the few plants obtained are strong and healthy.

After the present season, I propose to discontinue experimenting with foreign varities, as our home grown wheats are quite as good, if not better, and as far as English seed is concerned, it is a matter for consideration, whether it is possible to assimilate the conditions of its growth in England to those it must be subjected to in this tropical latitude.

In connection with the cultivation of wheat on the farm during the present season, I would observer that the ploughing of the lands in preparation for the crop was carried out during the fine weather in September, by means of ploughs made on the model of the American one received from Cawnpur.

In the previous year, owing to the impossibility of getting the work done in time by the ordinary English ploughs, or by the improved native ploughs, the lands were simply "bakhured," whereas in the present season, as I have said, the whole area was really ploughed up.

Having now passed in review the various important crops, the cultivation of which has been undertaken at the farm during the present season, I would state that the wishes of the Chief Commissioner imbodied in your review of the last year's report concerning the exact separation of the charges attending the various works have been rigidly carried out; and in conclusion I trust that the superintendent, in submitting the next half-yearly report may be in a position to record some success as the result of the work that is being carried out during the present season.

E. D. M. HOOPER,
Superintendent.

SELECTIONS.

HOW TO SAVE AND KEEP MANURE.

WHEN properly littered one cow or ox would make a ton of manure every month, if the liquid as well as the solid portion is saved. Ten heads would thus make 120 tons, or sixty-two horse wagon loads in a year. A pair of horses will make as much manure as one cow, or 12 tons in the year. A hundred sheep, if yarded every night and well littered, will make 100 tons of manure in the year, and ten pigs will work up a wagon load in a month if supplied with sufficient coarse material. The stock of a 100 acre farm—which should consist of at least ten cows, ten head of steers, heifers and calves, a pair of horses, 100 sheep and ten pigs—would then make in the aggregate 315 tons of manure every year, or sufficient to give 12 tons per acre every fourth year. If this were well cared for, it would be, in effect, equal to double the quantity of ordinary manure; and if a plenty of swamp muck could be procured at least 600 tons of the best manure could be made upon a 100-acre farm. If this were the rule instead of a rare exception, or only a possibility, what a change would appear upon the face of the country, and what an addition would be made to the wealth of the nation!—*American Agriculturist.*

AGRICULTURAL REFORM IN INDIA.

THE *Asian.*—We cannot agree with Mr. Hume that 'the only hope for India' lies in the chance of such questions being better understood and discussed in England, for late events have shown that a discussion of Indian matters of England only means their being made use of in party politics. Agricultural reforms and improvements are best discussed, and can only be effectually carried out in the country to which they are to be applied. The result of such a discussion in England would probably be an invasion of travellers for the sale of complicated agricultural machinery quite unfitted either to the means of the rayats or the crops grown. If improvement is to be made it must be by the establishment of farms under competent men like Mr. Robertson in the Madras Presidency, and by a practical man like Mr. Harman, also employed in that much too derided presidency, travelling round the country and showing the rayats what can be done with an improved plough, the cost of which is not above their means. This brings matters home to them better than the longest and most scientific reports ever written by a Director of Argiculture in the North-West Provinces or anywhere else. But still we would not do away with such an office. There should be some recognized official to encourage improvement in agriculture in every province of the Empire, and not the least good work of the present Lieutenant-Governor of the North-Western Provinces is likely to be his having persuaded the Taluqdar of Oudh to form an agricultural association for the very purposes to which Mr. Hume's efforts were directed. Let other Lieutenant-Governors and Chief Commissioners profit by so good an example.

MR. MARTIN'S PLOUGH.

WE have received the following lettter regarding the experiment of a new agricultural plough, to which we referred last week:—

The current number of the *Indian Agriculturist* briefly notices, in an editorial note, the results of a trial of a new plough invented by Mr. William Martin, indigo planter and zemindar, Mynpoore, North-Western Provinces. The trial in question was held in some of the fields at Belly in the presence of the editor of the *Agriculturist* and a large number of cultivators who witnessed it with great interest. There were two of Mr. Martin's ploughs and two others made at the Cawnpore Model Farm under the superintendence of the Department of Agriculture and Commerce, North-Western Provinces. There was a large gathering of the cultivators, who brought their own bullocks to yoke to these new ploughs, and the result was that they were extremely pleased with Mr. Martin's plough and thoroughly convinced of its superiority over the common country plough. In fact, as the *Agriculturist* says, "they were in perfect raptures and loud in praise of it."

They found they could use it without the slightest difficulty, and it was so light that the bullocks actually ran away with it. The common country plough must be dragged at least a dozen times over the ground before it could pulverise the earth, whereas Mr. Martin's plough attains that object at once by cutting an octagonal furrow to any depth desirable and turns the soil upside down. The ryots readily recognized the advantages of Mr. Martin's plough, which secured deeper ploughing and at the same time economized labor. And in their anxiety to adopt the new implement immediately, they wanted to keep the plough with them. The merits of the plough will be obvious to all, who take the trouble of testing or seeing it. The plough made at the Cawnpore Model Farm was also tested, but the peasants gave much preference to Mr. Martin's plough for the following reasons, that they found the former too heavy for the ordinary draught cattle, and secondly two men wen were required to work it—one to hold the stilts and the other to drive the bullocks. Public interests imperatively demand that Mr. Martin's plough should be made known in this country, and I have no manner of doubt that all cultivators who see it working will be only too ready to adopt it. The plough is now lying at the office of the *Indian Ariculturist*, where it can be seen by all persons interested in agricultural reform in this country.—*Hindoo Patriot.*

PHYLLOXERA VASTATRIX.

THE ravages of phylloxera, the most destructive of all the numerous enemies of the vine, were first observed in Europe in 1865, in the department of Gard, France; but it was only in 1868 that M. Planchon, Professor of Sciences at Mont-Pellier, discovered the insect and named it phylloxera vastatrix; the word phylloxera intimating the drying and withering of the vine leaf. It appears under two forms, the *winged* and the *wingless*. When largely magnified, the wingless insect has the appearance of a tortoise, only it has rather long legs and a trunk; the back is divided into squares, from which project little excrescences; the head is slightly bent under the body, and the brown eyes have numerous facetts. The phylloxera is an American insect, and appears, as already said, in two forms. The first (winged) forms galls on leaves, and is met with in all parts of America on the leaves of wild vine; the second seeks the roots, and is the only dangerous one. Both kinds are of a waxen yellow tint, but otherwise look like the common plant-louse, or aphis, only they are very much smaller—hardly the size of a very small pin's head. As ordinarily found, sucking the rootlets of vines, the insect is wingless, and all are females; or, at least, egg-layers; for there are no males for three or four generations, during which each of the insects may lay from 200 to 400 eggs apiece, which hatch in about ten days. About the fourth generation a winged form makes its appearance, whose wings are so large in proportion to their bodies that they have little control over them; but when they rise in the air they are carried wherever the wind may chance to take them. Those lay only three or four eggs each, which produce two kinds of phylloxera, large and small, the former being females and the latter males. This generation has no digestive organs, being destined exclusively for reproduction. The female lays but one solitary egg, which is especially tenacious of life, being destined to hibernate. From this egg is hatched, on the return of spring, the ordinary root-louse, whose vigor is thus annually renewed. It is the winged form, then, which renders possible the rapid spread already also, that its destruction would speedily put an end to the propagation of the species. But Nature has provided against this contingency, for in time of need some of the common egg-layers undertake to lay the large solitary egg which hibernates; and moreover in a mild climate some of the millions of the common eggs, and a few egg-layers, also survive. These eggs can be destroyed by from twenty-eight to forty day's submergence, which can only be done in winter without injury to the vines.

This, so far, is the "only absolute remedy found," except in very sandy soils, because it is too weak to crawl from one place to another, the grains of sand obstructing its progress. In adobe soils it crawls along the cracks. No one in this state, nor, I venture to say, anywhere is better informed on phylloxera, or has better or more extensive appliances for demonstrating the life-history of this pest than Professor E W. Hilgard, of our State University, and it is to his studies I mainly owe the substance of this short essay.

In France its ravages have been such that, as much as four years ago vineyards were unsaleable, no one would venture to spend any money in such property. As to California, it is fast sweeping the vineyards of Sonoma, and unless some desperate and ultimate measures be taken very soon, nothing can keep it from spreading through the adjacent valleys; and every day renders its extermination more and more difficult. How far submersion may be practicable in the Sonoma Valley, can only be decided by a survey of the creeks. But as the only absolute cure, the destruction of the "large egg," it should be had recourse to if possible, and the adjacent country compelled to contribute to the expense. The system of submersion was originated in France by a M. Faucon, whose vineyard of forty acres is situate close to the Canal de Durance. The submersion is made in October, and continued for forty days. Here are his results: The year 1867, the one preceding the invasion of the pest, the yield was 2,775 galls.; in 1868, first year of invasion, 120; 1869, second year, 105 gallons only; 1870, first year of submersion, 860 galls., 1871, second year of submersion, 1,350, without manure; third year, with manure, 2,547 galls; fourth year, with manure, 2,175 galls.; fifth year, with manure, 3,750 galls; sixth year, with manure, 7,800 galls. So a vineyard that, in 1862, yielded ed only 105 gallons in all, in six years was brought back to yield more than twice as many gallons as it did before the invasion of phylloxera.

The reports from France just to hand say that the yield this year will hardly reach one-third of ordinary years before the invasion.—*Ceylon Times.*

THE INDIA-RUBBER TREE.

(*From the South American Journal.*)

A CORRESPONDENT of an American paper, writing from the Brazils gives the following interesting particulars of the process of tapping the India-rubber or caoutchouc tree, and of manufacturing the gum into shoes and other things:—

The caoutchouc tree grows, in general, to the height of forty or fifty feet without branches; then branching, runs up fifteen feet higher

The leaf is about six inches long, thin, and shaped like that of a peach tree. The trees show their working by the number of knots, or bunches made by tapping; and a singular fact is that, like a cow, when most tapped they give most milk or sap. As the time of operating is early day, before sunrise we were at hand. The blacks are first sent through the forest armed with a quantity of soft clay and a small pickaxe. On coming to one of the trees, a portion of the soft clay is formed into a cup, and stuck to the trunk. The black then striking his pick over the cup, the sap oozes out slowly. A tree gives daily about a gill. The tapper continues in this way tapping about fifty trees, when he returns and with a jar, passing over the same ground, empties his cups. So by seven o'clock the blacks came in with their jars ready for working. The sap at this stage resembles milk in appearance, and somewhat in taste. It is also frequently drunk with perfect safety. If now left standing it will curdle like milk, disengaging a watery substance like whey.

Shoemakers now arrange themselves to form the gums. Seated in the shade, with a large pan of milk on one side, and on the other a flagon, in which is burned a nut peculiar to this country, emitting a dense smoke the operator having his last, or form, held by a long stick or handle, previously besmeared with soft clay (in order to slip off the shoe when finished), holds it over the pan, and pouring on the milk until it is covered, sets the coating in the smoke, then giving it a second coating repeats the smoking, and so on with a third and fourth, until the shoe is of the required thickness, averaging from six to twelve coats. When finished, the shoes on the forms are placed in the sun the remainder of the day to dry.

Next day, if required, they may be figured, being so soft that any impression will be indelibly received. The natives are very dexterous at this work. With a quill and a sharp-pointed stick they will produce finely lined leaves and flowers, such as you may have seen on the shoes in an incredibly short space of time.

After remaining on the forms two or three days, the shoes are cut open on the top allowing the last to slip out. They are then tied together and slung on poles, ready for the market. There pedlars and Jews trade for them with the country people, and in lots of one thousand or more they are again sold to the merchants, who have them stuffed with straw, and packed in boxes to export, in which state they are received in the United States. In the same manner any shape may be manufactured. Thus toys are made over clay forms. After drying, the clay is broken and extracted. Bottles, &c., in the same way According as the gum grows older, it becomes darker in colour and more tough. The number of caoutchouc trees in the province is countless. In some parts whole forests of them exist, and they are frequently cut down for firewood. Although the trees exist in Mexico and the East Indies, there appears to be no importation into the United States from these places. The reason, I suppose, must be the want of that prolificness found in them here.

The caoutchouc tree may be worked all the year round; but generally in the wet season they have rest owing to the flooded state of the woods; and the milk being watery, requires more to manufacture the same article than in the dry season.

JUTE IN BOMBAY.

WITH reference to our remarks last week pointing out what gross neglect there will be on somebody's part if the hemp and jute manufacture is not preserved to Bombay, we have the following from a correspondent:—

As regards the Jute Mills, the property has been advertised for sale, and I do not think it will fetch even two lakhs of rupees. It can now be worked at a profit; and if shareholders could raise among themselves two lakhs of rupees (100 per share would produce that sum), the claims of the creditors could be satisfied, I believe, for ten or eight annas per rupee, which would absorb about Rs. 1,75,000, leaving Rs. 25,000 for working capital. Why should not, as you say, some of our young men get up a small company to work the Jute Mills as they stand? The machinery is fairly good—very good in some respects; and after this favourable monsoon, hemp should be available all up and down the coast of Western India, while the demand both for twine and "hessians" will be very active.—*Bombay Review.*

ARTESIAN WELLS IN PONDICHERRY.

IN the last number of the *Moniteur Officiel* of Pondicherry there is a letter from M. Poulain, Civil Engineer. It is interesting in many ways, and furnishes much information that will prove useful to those who are engaged in agricultural pursuits and who may be considering the chances of striking water through the means of Artesian wells. It appears that Pondicherry is bounded on the north and the west by a geological formation known in science under the name of tertiary. This is nothing more or less than the formation which crops up at the Red Hills. It consists of laterite. To the south of this formation flows the Ponear in a valley composed of *débris* (*detritus*) of the laterite range. Every shower of rain washes down from the Red Hills, the particles that have been disintegrated by the action of the sun and air, and carries into the valley below a mass of mud which consolidates and in the course of years accumulates into an alluvial formation. The Artesian wells which have proved a success lie in the alluvial formation, and they tap water at this point where they meet the tertiary formation. The thickness of the aluvial deposit varies and is found to be over one hundred and sixty-four metres, equivalent to about five hundred and thirty-three feet. At this depth water has been tapped, and the well promises to turn out a success. Is it not discreditable that the Government of Madras should stand idle while this important work of boring Artesian wells is being steadily prosecuted by the Pondicherry Government? It reflects great discredit upon the Public Works Department whose inefficiency is thereby conspicuously brought to light. Colonel Mullins has criticised the good work done in Pondicherry, and Mr. King of the Geological Survey, doubts whether the wells at Pondicherry are really Artesian wells. But facts are proverbially stubborn things and, notwithstanding anything that Colonel Mullins and Mr. King may say, these Artesian wells are very useful in Pondicherry. There are thousands of localities in British India situated under conditions similar to those in Pondicherry—localities in which Artesian wells might be sunk with advantage. Proprietors of land are anxious to have something done in this way to improve their lands, and they cannot but consider the authorities who are responsible, open to the charge of neglecting a duty which will redound to their credit and be of advantage to agriculturists.—*Madras Standard.*

SIR ROBERT CHRISTISON.

THE great Scoth chemist has made some curious observations on the effects of a cold, wet season in diminishing the normal growth of trees. He makes out, on careful measurements, that comparing 1879 with 1878, eleven deciduous trees—not oaks—made on an average 41 per cent. less growth in last year than in the year before. Of 17 pine trees, the average deficiency was 20 per cent.; and of seven oaks, the deficiency was 10 per cent.; so that heat appears to have more to do with the making even of wood than moisture has. It is strange that the growth of the oak, which drops its leaves, seems less dependent on heat than that of the pine, which we usually associate with very cold regions; but perhaps, it need not be the tree which is most stunted by cold, which is most easily killed by it. The arrest of growth may sometimes be a safeguard against vital injury.

MINING IN NEW CALEDONIA.

A FRENCH company has been formed, with a nominal capital of £1,920,000, for working the nickel and cobalt mines of Bel-Air, in New Caledonia. The copper mine of Ballade produces nearly a thousand tons of ore a month, which is all forwarded to Newcastle (New South Wales). The gold mine of Galatino is being worked vigorously, and it is said to be of great richness. A new branch of mining industry has lately been opened up in the Chesterfield guano deposits, which are being worked by experienced men, and are said to equal in wealth any similar deposits in the southern hemisphere. Three hundred tons of chromate of iron were recently despatched to Brodeaux on board the *Saint Marc* as an experiment, and it is expected that a considerable trade may grow up in this product, as it is believed to contain an unusually large percentage of oxide of chrome.

THE JUNCTION CANAL AND WELL WATER.

A QUESTION some time ago arose as to the effect of the Junction Canal on the well water in the Mylapore district. In a letter to the President of the Committee appointed under G. O. No. 4544, dated 27th November 1878, Dr. Cornish, Sanitary Commissioner for Madras, stated that to test the question whether the salt-water of the canal would affect the neighbouring wells, specimens of water would be periodically examined. Three wells were chosen for observation; one distant, 100 yards from the canal, another 150 yard distant, and one 25 yards, and all to the eastward of the canal. Specimens of water were selected in December 1878, and again in December 1879, as near as possible on the same date, and the result of the Chemical Examiner's analysis shewed that wells distant 100 and 150 yards, respectively ly, have become slightly more saline, the chorides increasing from 0·292 grams, per litre to 0·345, and from 0·331 to 0·404, but in the well nearest to the canal, and distant only 25 yards, the amount of sodium chloride has *decreased* from grams, 0·169 per litre in December 1878 to 0·071 in 1879. The deduction Dr. Cornish draws from the facts is, that there is no present evidence to show that the canal has increased the saltness of the neighbouring wells. The slight increase noted in wells 150 and 100 yards distant may be due to the temporary disuse of them for irrigation purposes. The observations are to be repeated next year.—*Madras Times.*

THE NEGLECT OF POULTRY BREEDING.

TWO million and half sterling per annum is a large sum to send out of the kingdom for eggs, especially since, if we liked, we need not spend a penny in this way. Poultry breeding is strangely neglected in England. We go on growling at the high price of fowls and fresh eggs, and yet the remedy is in our own hands; and while the prices were being brought down, we might eat our own fowls and eggs, and reap pretty little profits out of surplus stock.

A person interested in the subject has drawn up a balance-sheet according to which a capital of £400 laid out on 100 hens, their

housing, food, and other necessary expenses connected with them would yield a return of 570, *i.e.*, £170, profit in four broods of chickens at £125 per brood and ten tons of dry dung at £7 per ton. Here is another of his calculations. Five hens would cost say, 15s. their food for a year another 15s. During that time they would lay about 700 eggs, which at 1s a score, would yield 35s. or a profit of 5s. on 30s.—over 16 per cent.

And here is a third estimate. A man and his wife could take charge of 10,000 hens not for breeding, fatten and sell 3,000 every year, and buy the same number of young, which would begin in November, if hatched in the previous spring, to lay about four eggs a week each until next maulting. The hens' produce might be put down at from 120 to 150 eggs a piece per annum, which, at the rate of thirty a shilling, would yield a good profit.

It seems that when hens will not brood, capons and cocks can be induced to take their places as sitters; but cheaper than any animated hatcher is M. Carbonnier's incubator. In this eggs are laid on hay in a drawer placed under water raised to a temperature of 110 degs. by a colza oil lamp. This heat gives the eggs a temperature of 105 degs. or 104 degs., and like the warmth from the hen's breast, comes from above. All that has to be done is to keep the lamp burning, and to pull out the drawer twic in the twenty-four hours to turn the eggs, and to expose them for a quarter of an hour to the cooler outside air. The chick finds its way out of the shell unaided, is kept in the incubator for twenty-four hours after hatching, and is then admitted to a nursery provided with lambs' wool for the unfledged little thing to snuggle into when it feels cold. Forty eggs can be thus hatched at a cost in winter, of 3s. 6d., in summer of less than half that sum.—*Leisure Hour.*

OUR FOREIGN EGG TRADE.

THERE are in London, says a writer in the *Leisure Hour*, some hundred egg dealers, big and little. One of the largest of these is Mr. Auguste Le Miere of Clerkenwell, who allowed me to visit his place of business, where I was favoured with some interesting information. In the warehouse, a low-pitched chamber with a pillar-propped ceiling and a boarded office, a million eggs might be stowed away. It held, when I was there, eggs from Ireland—5,000 in crates; and in cases with battens instead of complete covers nailed over their straw, cases holding 1,440 and 600 a piece—eggs from France, Spain, Italy, and Hungary. Irish eggs are said to be about the best eggs going, far better than French, than which they would command a higher price if they were only packed more carefully. Italian eggs are also preferred to French, and are rapidly bringing down French prices. Italy will soon have a place to herself in egg returns, instead of being ranged with other countries. The house of which I speak imports five or six hundred boxes of Italian eggs a week. Next year it will have large supplies from Canada, that vigorious child which, for a consideration, provides her mother with so large a proportion, of her food—corn, beef, and mutton, dead and alive; ham, bacon cheese, canned fish, fresh salmon, and now eggs. Spanish eggs are exposed to this disadvantage. If brought over in the same hold with oranges, they become impregnated with an orange scent and flavour, and thus are spoilt as eggs. Eggs should be kept to themselves in cloistral seclusion. The proverb about their immunity from impunity is, as I have already pointed out, a delusion and a snare; they imbibe foreign odours and savours with the greatest readiness. If the cases are made of green wood the eggs will be ruined, and the some fate awaits them if the straw in which they are packed is not perfectly dry. It will ferment and communicate its fusty smell to the eggs. At Mr. Le Miere's depôt at Honfleur, the straw used for packing is turned over and over again in the sunshine, like mown grass meant for hay. This depôt is supplied with eggs by poultry breeders living within a radius of twenty miles round the town. At the depôt the eggs are sorted into extralarge, large, middling, small, and dirties. Eggs sent on commission are sorted by the senders. They have their money forwarded to them every Thursday. Eggs from the Azores are not favourites in the market, on account of their small size.

Most of the eggs imported come in steamboats either direct to London or else to the outports, from which they are hurried up to town by the London, Chatham, and Dover, South Eastern Brighton and South Coast, South-Western and Great Western Railways. But small sailing vessels are still used, especially in summer. Mr. Le Miere has one of thirty to forty tons, which plies between Honfleur and Shoreham. Some 300,000 eggs a week pass through his hands, that is 15,600,000 a year. At the rate of 50,000 a day they are distributed in one and two-horse vans amongst the firm's customers chiefly London porkmen, buttermen, and cheesemongers. Very few are sent into the country, and none are sold to manufacturers.

Spring is the busy time in the egg trade. Christmas, in spite of its puddings, does not appreciably stimulate the demand. When asked whether it is possible to hazard a 'wide solution' of the question. How many eggs are used for puddings, &c., and how many eaten from the shell? The good-natured manager chuckled, and says that that is a riddle which passes his wit and anybody else's, he thinks; that customers do not tell provision-dealers what they are going to do with the eggs they buy. The average wholesale buying price of eggs is from 7s. to 8s. the selling from 8s. to 11s per hundred. Ducks, eggs are worth 1s. a hundred more than hens The egg hundred, it has been intimated, means 120.

THE FOOD OF PLANTS.

BY W. IVISON MACADAM, F.C.S.

(*Continued from page 54.*)

COMPOSITION OF FARMYARD MANURE.

	Fresh.	Rotted.
Water	71·0	79·0
* Organic matters	24·6	14·5
† Ash	4·4	6·5
	100·0	100·0
* Containing nitrogen	0·45	0·58
Equal to ammonia	0·54	0·70
† Containing potash	0·52	0·60
" soda	0·15	0·18
" lime	0·57	0·88
" magnesia	0·14	0·18
" phosphoric acid	0·21	0·2[illegible]
" sulphuric acid	0·12	0·18
" chlorine	0·15	0·16
" silica	1·25	1·70

On association standards the above are worth about 10s per ton.

Sea-weed.—The weed cast up by the tide is much used in some parts of the country, more especially in the Highlands bordering on the sea. The following table gives an average analysis, which shows that whilst the nitrogen is very similar in amount to that contained in farmyard manure he salts are higher.

COMPOSITION OF SEA-WEED.

Water	80·44
* Organic matter	9·25
† Ash	10·31
	100·00
Containing nitrogen	0·45
Equal to ammonia	0·54
† Containing potash	1·95
Phosphoric acid	0·47

Bones.—We must then look to some other source of supply for manure, and this we find in the bones of animals, which consist principally of phosphate of lime and organic matters capable of yielding nitrogen, along with certain other materials of less importance to the plant. So as to render the bone more readily acted on, it is necessary to have it reduced to a fine state of division, and when so broken, the bones are known commercially by several names depending on the size of the pieces. The more common of these are—

½ inch bones.
¼ inch bones.
Crushed bones.
Bone dust.
Bone meal.

The following table gives the analyses of 6 samples of bone :—

COMPOSITION OF BONE MEAL.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
Moisture	7·36	9·68	9·63	7·41	8·46	9·16
* Nitrogenous organic matter ...	29·22	34·54	28·46	35·48	29·61	29·22
Alkaline salts	0·64	0·72	0·74	0·62	0·71	0·64
Phosphates	54·32	48 54	51·82	46·12	52·68	50.96
Carbonate of lime	6·78	11·08	6·64	8·69	7·91	8·58
Silica	1·68	1·04	2·66	1·68	0·62	1·44
	100·00	100·00	100·00	100·00	100·00	100·00
* Containing nitrogen equal. to ammonia	4·58	4·86	4·58	5·12	4·81	4·26

Degelatinized Bone Meal.—When bone has been boiled so as to obtain the larger proportion of the glue contained in it, the residue after drying is readily pulverised, giving a coarse white powder, which is known as 'Degelatinized Bone Meal.' This material contains a higher percentage of phosphates, whilst the nitrogen is much lower than in pure bone. The analyses of three samples of this substance are given below :—

DEGELATINIZED BONE MEAL.

	No. 1.	No. 2.	No. 3.
Moisture	6·52	9·13	12·24
*Organic Matter	15·05	11·27	16·18
Alkaline salts	1·27	1·06	0·78
Phosphates	64·24	63·89	65·[illegible]
Carbonate of lime	10·65	6·87	4·[illegible]
Silica	2·24	7·86	0·87
	100·00	100·00	100·00
*Containing nitrogen equ. to ammonia	1·67	1·32	1·[illegible]

Fish Guano.—Another manure which resembles bone in supplying phosphate and ammonia is known as fish guano, and consists of waste fish scrap dried and ground. It is a fine meal, less rich in phosphates but with much more ammonia and salts than bone, and containing a lower percentage

of carbonate of lime. The higher class of fish manure is known as 'Polar Fish Guano,' whilst the 'American Fish Manure' contains less phosphates with more ammonia and alkaline salts than pure bone. The composition of these two classes of fish guano will be seen from the following tables:—

POLAR FISH GUANO.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5
Moisture	10·54	9·98	8·48	5·72	10·18
*Nitrogenous organic matter ...	56·48	56·04	57·24	64·04	53·64
Alkaline salts	2·56	1·23	1·16	1·82	1·24
Phosphates	26·48	28·48	29·04	23·86	29·84
Carbonate of lime	3·06	3·48	3·63	4·54	4·12
Silica	0·88	0·84	0·43	1·02	0·98
	100·00	100·00	100·00	100·00	100·00
*Nitrogen equ. to ammonia... ...	11·15	9·81	9·96	10·21	10·12

AMERICAN FISH MANURE.

	No. 1.	No. 2.
Moisture	20·52	22·64
*Nitrogenous organic matter	57·16	49·63
Alkaline salts	1·98	1·36
Phosphates	18·52	15·44
Carbonate of lime	5·78	9·92
Silica	1·04	0·96
	100·00	100·00
*Containing nitrogen equ. to ammonia	9·08	7·96

In all the manures yet treated of it will be seen that the phosphates are present in the insoluble condition of the tri-calcic phosphate (Ca32PO.) and as such are not in a state to be readily taken up by the spongoles of the rootlets. The actions by which the plant assimulates these insoluble bodies into its system are not perfectly known, and the study of the subject is necessarily surrounded by much difficulty. Many theories have been advanced for its solution, some holding that the spongoles of the plant root have a special dissolving power, by which they take up their food. Others, on the other hand, declare that the carbonic acid contained in the atmosphere being washed down by rain, &c., seizes hold of part of the lime of the phosphates to form the carbonate of lime, at the same time rendering the insoluble phosphate soluble, and so allowing of its being dissolved by moisture, and passed into the plant structure. Another theory holds that the ammonia being oxidized in the soil into nitric acid, that that substance at the moment of its formation acts upon the lime of the phosphates to form the nitrate of lime, liberating at the same time the soluble phosphates in a condition fit to be of use to the plant. The two last theories assume the necessity of the phosphate being in the soluble condition before it can be of use to the plant. In practice it is found that, although a manure such as bone meal is useful where the effects are desired slowly and the results more permanent, yet a much more quick and ready manure is one which holds a certain amount of its phosphate in a soluble condition, and ready for immediate assimulation by the plant.

Guano.—Such a manure is obtained in a guano which is composed of the excrements and bodies of sea birds, which congregate in large colonies on certain islands, &c., more especially during the breeding season. These manures differ according to the country in which they are deposited, for if the climate be hot and dry, the deposit is quickly dried and disintegrated with the loss of only a small quantity of the nitrogen, and the result is a guano of the *Peruvian class*; whilst if there be much rain or sea spray, and the manure be slowly dried, there is an almost total loss of the nitrogen, and a guano is obtained of the *phosphatic class*. Besides these two extremes there are many intermediate classes depending on the varying circumstances to which they are exposed. The first or nitrogenous class contain a proportion of ordinary guano phosphates which is insoluble, along with a certain amount of alkaline or soluble phosphate, and a considerable percentage of ammonia. In this class the principal guanos now employed are Peruvian and Ichaboe, but there are other and less important sources. The composition of these guanos are as below :—

PERUVIAN GUANO.

	No. 1.	No. 2.	No. 3.	No. 4.	Mo. 5.	No. 6.
Moisture	16·82	11·68	17·68	16·72	11·64	11·48
* Organic matter and ammonia ...	33·56	39·56	37·46	31·32	35·52	34·56
† Alkaline salts ...	17·16	16,64	15·52	17·24	17·28	18·42
‡ Ordinary guano phosphates	27·52	21·88	24·38	26·96	23·48	28·82
Silica	4·94	10·24	4·96	7·76	12·08	6·72
	100·00	100·00	100·00	100·00	100·00	100·00
* Containing ammonia, equ.	9·14	11·32	10·72	8·32	10·24	8·47
† Phosphoric acid in alkaline salts equ. to bone phosphate rendered soluble ...	11·16	10·21	10·14	11·42	8·68	10·76
Ordinary guano phosphate	27·52	21·88	24·38	26·96	23·48	28·82
Total phosphates ...	38·68	32·09	34·52	38·38	32·16	39·58

ICHABOE GUANO.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
Moisture	19·52	20·54	19·47	19·68	19·78	20·99
* Organic matter and ammonia ...	38·94	47·36	39·82	40·26	41·83	47·34
† Alkaline salts... ...	8·92	9·28	11·46	11·27	8·17	10·38
‡ Ordinary guano phosphates ...	13·21	17·16	14·41	14·18	14·38	12·07
Carbonate of lime ...	3·87	5·12	5·12	4·98	5·17	2·38
Silica	15·54	0·54	9·72	9·68	10·67	6·87
	100·00	100·00	100·00	100·00	100·00	100·00
* Containing ammonia, equ.	12·62	14·21	12·42	12·83	11·34	15·76
† Phosphoric acid in alkaline salts equ. to bone phosphate rendered soluble ...	7·12	7·52	6·17	5·84	6·27	7 16
‡ Ordinary guano phosphate	13·21	17·16	14·41	14·18	14·38	12·07
Total phosphates ...	20·33	24·63	20·58	19·97	20·65	19·23

Of the intermediate class betw een the highly nitrogenous and the purely phosphatic guanos, the following may be given as examples :—

	Penguin Island Guano. No. 1.	No. 2.	No. 3.	Lacepede Guano.	Bahamas Guano.
Moisture	10·64	21·08	21·22	15·33	15·16
*Organic matter and ammonia	34·04	24·78	21·62	6·93	14·27
† Alkaline salts ...	8·62	9·12	6·34	2·63	15·64
‡ Ordinary guano phosphate	19·44	19·36	29·12	67·84	38·92
Carbonate of lime ...	7·54	7·18	10·56	5·76	18·49
Silica	19·72	18·48	11·14	1·48	2·52
	100·00	100·00	100·00	100·00	100·00
* Containing ammonia, equ....	5·21	3·72	4·75	1·23	0·84
† Phosphoric acid in alkaline salts equ. to bone phosphate rendered soluble	0·72	0·48	1·14	0·12	0 14
‡ Ordinary guano phosphate ..	19·44	19·36	29·12	67·84	38 92
Total phosphates ...	20·16	19 84	30·26	67·96	39·06

Dissolved Manures.—It will be remembered that in bones the phosphates are entirely in the insoluable condition. A more rapid fertilizer may be obtained by the addition of acid, which dissolves out part of the lime of the insoluble phosphate and leaves a soluble phosphate. The acid employed for this purpose is sulphuric acid, and according to the amount added, there is obtained a greater or less amount of soluble phosphate. The action of the acid is, that starting with the insoluble tri-calcic phosphate (Ca32PO4) and adding to it sulphuric acid (H2SO4) to the extent of two parts, there is formed two parts of sulphate of lime (stucco, CaSO4), and at the same time the hydrogen of the sulphuric acid replaces the lime in the phosphate, giving the tetra-hydric monocalcic phosphate or hydrated soluble phosphate of lime. The change may be expressed in symbols, thus :—


CaCaCa2PO4


H2 SO4


H2 SO4


=CaH42PO4+2CaSO4.

When only a small quantity of acid is employed, the resulting product is called 'vitriolated bones;' whilst if a larger quantity of acid is used, there is obtained 'dissolved bones.' In the first of these the amount of soluble phosphates may be as low as 3 or 4 per cent., whilst the insoluble phosphate is high. In dissolved bones the soluble phosphate is much greater and the insoluble phosphate less in proportion. The following analyses will show the composition :—

VITRIOLATED BONES.

	No. 1.	No. 2	No. 3.	No. 4.	No. 5
Soluble phosphate	6·87	4·79	6·89	5·48	8·31
(Equ to bone phosphate rendered soluble	10·72)	(7·48)	(10·76)	8·56)	(12 96)
Insoluble phosphate	27·72	32·38	30 52	34·64	25·34
Hydrated sulphate of lime... ...	26·28	18·24	19·16	18·46	26·28
Alkaline salts...	2·64	2·18	2·98	2·92	2·17
Silica	3·43	3·21	3·34	2·67	5·13
*Organic matter and ammonia ...	20·82	27·96	23·99	28·69	19·65
Moisture —	12·24	11 24	13·12	12·14	13·12
	100·00	100·00	100·00	100·00	10·00
*Ammonia	2·46	4·32	2·93	3·18	2·46

DISSOLVED BONES.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Soluble phosphate	14·92	13·28	14·04	13·15	11 74
(Equ. to bone phosphate rendered soluble	23·28)	(20·72)	(21·91)	(20·52)	(18·32
Insoluble phosphate	16·14	19 16	11·56	10·83	9·86
Hydrated sulphate of lime	32·16	28·43	31·23	30·27	36 24
Alkaline salts	2·56	2·18	3·18	3·28	3·18
Silica	3·12	3·94	5·43	3·87	3·62
*Organic matter and ammonia	17·64	18·89	20·14	21·87	20·52
Moisture	13·46	14·12	13·42	17·24	15·84
	100·00	100·00	100·00	100·00	100·00
*Ammonia	2·83	2·24	2·43	2·56	2·16

Ammonia-Fixed Guano.—The addition of a small quantity of sulphuric acid to Peruvian guano causes the formation, with the ammonia of the guano, of sulphate of ammonia; and at the same time a portion of the insoluble phosphate is dissolved to the condition of soluble phosphate, and there is obtained a more rapid fertiliser. Besides this, the ammonia being fixed, it cannot escape as vapour, so that a loss of ammonia is avoided, whilst a manure is obtained in a more suitable condition for the use of the plant. Such manures are known as ammonia-fixed guanos; and the composition is given below:—

AMMONIA-FIXED PERUVIAN GUANO.

	No. 1.	No. 2.	No. 3.
Soluble phosphate	13 05	13·98	12·13
Equ. to bone phosphate rendered soluble ...	20 ·36)	(21·81)	(18·92)
Insoluble phosphate	10·52	8·32	12·41
Hydrated sulphate	22·16	19·46	19·56
Alkaline salts	6·89	6·64	6·92
Silica	5·19	8·11	5·97
*Organic matter and ammonia	30·27	31·03	30·87
Moisture	11·92	12·46	12·14
	100·00	100·00	100·00
*Ammonia	8·02	8·32	8·52
Nitrogen in nitrates equ. to ammonia ...	0·46	0·41	0·56
Total nitrogen as ammonia	8·48	8·73	9·08

Besides these sources of both phosphates and nitrogen, there are many other materials used in agriculture to give a supply of either phosphate or nitrogen separately. The class of incomplete manures may occasionally be used with advantage, when the soil may happen to want one ingredient to make it fruitful. The sources of phosphate are not as a general rule used in their natural condition, as they invariably contain that constituent in the insoluble form. It will be necessary, however, to note the composition of the various substances used, so that we may more fully understand the manufactured article.

(*To be continued.*)

RHEA FIBRE.

THE following are extracts from a report on the preparation and use of "Rhea Fibre," by J. Forbes Watson, M.A., M.D., LL., D, &c., in 1875.

(3).—*Cultivation of Rhea in Assam.*

With respect to the cultivation of the Rhea plant and the preparation of its fibre in Assam, I cannot do better than quote from Colonel Hannay's published observations, as well as from a communication received from that gentleman in 1859.

"The sole cultivators of this plant are the dooms or fishermen, who use it chiefly in making their nets; they cultivate it in very small quantity however, and as the fourth crop is that which bears seed, and they cut it down before the seed is formed, the plant is propagated entirely by dividing the roots. The ground is a small plot close to their huts, which they have great opportunities of attending to and manuring well with ashes and cow-dung, a quantity of which is essential to the proper growth of the plant.

"I have mentioned four crops; but as I have now a crop, the fifth, since planting, fit for cutting in February, and I see others belonging to the dooms in the same state, there will be five crops since planting, or six crops from April to April; the last or cold weather crops, cut in February, being considered to produce the strongest fibre. However, as moisture seems so essential to the quick growth of the plant, generally speaking, after the early November or fourth crop, the dooms allow the cattle free ingress into their plots, and it is thus kept down till February, when some plants are taken in opening out the roots, heaping up the earth, and manuring them, as well as enclosing a fresh the plot of ground. The soil from repeated manuring, is of course rich; and on this, and a good degree of shade and protection from storms depends the luxuriance of the crop, which I have been here eight feet high, and the extracted fibre six feet long. So much attention, indeed is given to length of stalk amongst the Kakoos of the Chinese frontier, that the gardens are walled in (with wattling) like a *pan* [*Piper betel*] garden.

"From the roots thus dressed up in February, a crop will be cut in April, another in June, another in August, and another early in November; the most luxuriant crops being those of June and August, as naturally receiving the greatest quantity of moisture. The fifth crop takes from early in November to February to come to maturity. Between the cuttings, all that seems necessary is a fresh opening up of the ground around the roots which in a regular plantation is best done by hoeing between the rows with a spade-shaped hoe set in a long handle; the person, as he performs this, going backwards so as not to step over his work,—in fact, nothing can be more simple them the cultivation on this plant, all that is required being a loose rich soil, and protection to the crop by a good strong fence. The roots throw up at least 12 shoots when in full bearing; should they increase, and the crops get too thick, the roots require to be separated; and by this means of planting out fresh ground and new plants from seed, the cultivation can be carried to any extent.

"The stalks are considered fit for cutting when they have become of a brown colour for about six inches above the roots. To cut them, the doom seizes the leaves at the upper end with his left hand, and passing the right hand down to the root, strips off the leaves. He then cuts the stem two or three inches from the ground."

(4)—*Notes on the cultivation of Rhea in India. By W. King, Officiating Superintendent, Botanical Gardens, Saharunpore, 1869.*

LIMIT OF GROWTH.—The garden in Dehra Doon is about 2,500 feet above the sea level, and the plantations in the Kangra Valley are probably higher. There are no exact records known to me, showing the height at which the Chinese nettle thrives best. It grows, however, freely in the plains at very low elevations. At Saharunpore, which is about 1,000 feet above the sea the plants are very green and healthy, and reach a height of five to seven feet.

SOIL AND SHADE.—The Chinese prefer a rather stiff soil; but I gather, from a communication in the journal of the Agri-Horticultural Society that in Assam a loose rich soil is considered the best. That in the Dehra Doon gardens is of the former description, whereas the patch of ground planted with Rhea at Saharunpore is rather light and sandy. My own experience, which however, is but limited, leads me to think moderate shade is an advantage. The finest plants in the garden at Saharunpore are a few grown under trees; and shade appears to be the only condition of growth in which these differ from less vigorous plants near them.

MOISTURE AND MANURE.—A good supply of moisture is undoubtedly required, and regular irrigation would be necessary in the plains. But of all the requisites for successful cultivation, I believe the first to be manure, and this is the one least recognized in Indian agriculture. The Chinese manure extensively. They plant out in soil which has been carefully prepared and richly manured. They also use liquid manure, and in the cold season give a top-dressing of stable litter.

PROPAGATION AND CULTIVATION.—The plant being one of those in which the male and female flowers are separate, and situated on different parts of the stem, the production of seed is uncertain in localities where the insects by which fecundation is probably accomplished are not indigenous. In district where Rheea has been *introduced*, propagation has therefore not been conducted by seed but by cuttings, and by division of the roots of old plants. By cuttings it may be propagated very easily as scarcely one fails to strike. During damp weather roots of old plants may be freely broken up into smaller ones, and these, if planted out into well-manured nurseries thrive well. This is the favourite mode of propagation in China. Both cuttings and fragments of root should be planted about 1½ feet apart. The soil between the plants should be frequently broken up so as to keep it loose and should, of course, be kept free from weeds. Top-dressing with manure is strongly insisted on by Chinese cultivators.

AGRICULTURE IN THE NORTH-WEST.

THE Lieutenant-Governor of the N.-W. Provinces has issued the following notification, dated the 29th January 1880:—

RESOLUTION.

READ—

Letter No. 194, dated 15th January 1880, with its enclosures, from the Director of Agriculture and Commerce, North-Western Provinces and Oudh.

OBSERVATIONS.—The Lieutenant-Governor has for some time been desirous of inducing the Talukdars' Association in Oudh to take into consideration the questions whether, and in what way, the interests of agriculture can be promoted by them, or by Government in co-operation with them, and of enlisting their active sympathy and aid in furthering any schemes which are likely to conduce to improvement in agriculture, and to the prosperity of the agricultural community, whether sub-proprietors or cultivators. There can be no question that the Talukdars can render material assistance in this direction, and the matter is one in which their best interests, as also those of the large agricultural community, are concerned. Many of them have capital which can be profitably invested in the improvement of their estates, and all can further objects recognised as useful and profitable by advising and aiding their tenantry, or adopting improvements on their home farms. Hitherto measures of this kind, if taken up in this country at all, have been originated by the Government, and have too often failed to reach the classes for whose benefit they were designed. But when the aid of

large landholders deeply interested in agricultural improvements is secured, advance cannot but be more appreciable and tend to a wider development of the agricultural resources of these provinces.

All the request of the Lieutenant-Governor and Chief Commissioner, the Director of Agriculture and Commerce accordingly placed himself in communication with the members of the "Oudh Talukdars' Association" at Lucknow, and preliminary meetings were held on the 20th November 1879, and 5th January 1880 when a definite programme was sketched. The main features of this programme are—

(1). That an annual meeting be held at Lucknow for the purpose of discussing questions of agricultural reform, and of instituting such action as after discussion may appear desirable.

(2). A special committee, consisting of the following members, has been nominated for the arrangement of business connected with these meetings:—

His Highness the Maharajah of Balrampore, *President.*
Rana Sankar Bakhsh, *Vice-President.*
Kunwar Harnam Singh.
Chaudhri Khaslat Husain.
Rajah Ajit Sing.
Mirza Agha Ali Khan.
Thakur Baldeo Bakhsh.
Shaik Imam-ul-lah.
Altaf Hussain Sahab.
Munshi Kali Prasad.
Munshi Newal Kishor.
Lala Ram Shankar.
E. C. Buck, Esq., C.S.
Major D. G. Pitcher, *Honorary Secretary.*
Shaikh Nasrat Ali, *Assistant Secretary.*

(3). The first general meeting is fixed for the 5th April 1880; and the points decided upon for discussion at it are—

(*a*) whether, and how far, by the action of the Talukdars, or of Government, or both, the extension of canal or well irrigation is desirable or possible, and, if so, by what means;

(*b*) whether any steps can or should be taken for the improvement of cattle, or for the better supply of fodder in the province;

(*c*) whether any system can be usefully adopted for the distribution of better seed;

(*d*) whether the English plough modified to meet the conditions of this country is likely to be useful in Oudh agriculture, and how best to give the plough a thorough trial;

(*e*) whether the arboriculture of the province can usefully be extended.

It will be open to any member of the Talukdars' Association to send to the Secretary of the committee any further questions of a general character for discussion.

Subservient to this meeting, as illustrating its object, affording substance for discussion, and tending to excite healthy emulation and competition, the committee have decided upon holding an exhibition of agricultural stock, produce, implements. The Lieutenant-Governor and Chief Commissioner has perused with much interest the papers now laid before Government, and cordially approves the measures proposed by the committee. His Honor is satisfied that the energies of the Association cannot be applied to a more laudable and useful object, and he will gladly contribute to the expenses connected with the meeting, and as far as possible aid the movement now started on a basis from which excellent practical results may be anticipated.

INDIA AT THE SYDNEY EXHIBITION.

THOSE who are able to find the space assigned to the most important of Britain's dependencies, which is by courtesy designated a court, first express surprise that such an important country should be so scurvily treated by those who had the division of the interior of the Palace. Had it not been for Major Clementi, the Government of India would have found a very good excuse for not naming a Commissioner for the Sydney Exhibition, in the disturbances which have recently taken place upon its frontier. Major Clementi, fortunately was a visitor to Sydney about the time the Exhibition movement was brought to a head, and through his good offices the Viceroy had a sum of money set apart for the representation of the Empire. Unfortunately, the powers that be, far from hailing such action as that taken by the visitor with pleasure, took advantage of some delay in the transmission of Major Clementi's credentials, and when they arrived, apportioned the angle formed by the galleries of the nave and eastern transept to the Commissioner, at the same time refusing to permit any partition to be erected, because the wall space had been assigned to a certain British paper-hanger. Nothing could be more incongruous than the exhibit of tawdry modern decorations and the quaint ancient style of those of the Great Eastern country. However, the gallant Commissioner has made a really creditable show, and those who visit his court will not regret the hour or two which passes as they are induced to linger over one interesting subject and pass on to others. Every one knows what the extent of the British Empire is, but few perhaps have really taken the trouble to look into the figures which demonstrate its enormous trade and resources. The revenue for 1876-77, for instance, was no less than £66,000,000, whilst the expenditure, including outlay upon productive public works, was £58,000,000. The private foreign trade return show a net excess of exports of the value of £18,109,747. The catalogue, which has but recently been issued, has a well written commentary upon these and other figures, whilst the industries are described and dwelt upon at judicious length.

Taking the classes in order, we find the Government of Madras exhibiting a number of chemicals, which include samples of castor oil, which is now so extensively used as a lubricator all over the world. Indeed it has done much to cripple the once famous whaling industry, which employed so many British, American, and Colonial ships. Cocoanut oil is also largely traded in, whilst the industry of the natives of Malabar, in the preparation of fish oils, is shewn in three samples taken from the horned shark, and short shark. Indigo is of course an immense article of commerce, and in 1877 the exports of it reached £2,962.786. Some excellent photographs show the process by which the raw material is compressed, and in a glass case are to be seen blocks of the article ready for foreign shipment. Native pottery is always regarded with delight by those who have a taste for displaying curious articles in their drawing-rooms; consequently many visitors regret to find that the agent here for Messrs. Watson & Co., of Bombay, has altogether neglected to furnish particulars concerning the very handsome exhibits which appear in a large glass case. The same may be said with even more force respecting the unique carved blackwood furniture which Messrs. Watson & Co. have forwarded. A suite of this has for some time had a place in the avenue downstairs, and numerous expressions of curiosity have from time to time been heard as to the country which produced such really beautiful furniture. Considering the very rough and rude character of the tools which the natives employ, the carving is wonderful. From the North-Western Provinces a number of cotton fabrics have been sent, to show the capacity of the people in the direction of manufacturing clothing suitable for hot climates. The Muir. Mills Company, of Cawnpore, send various patterns of drill, which have been strongly woven. Some chequered and striped cotton goods from the Elgin Works, of the same town, are of a pattern very much like Shepherd's plaid. Hitherto, our principal trade with India has been cornsacks and wool packs—very useful articles, no doubt, but hardly of a character to monopolise the relations of two countries affording such wide fields for the interchange of products. Lady visitors always find their attention arrested by the Cashmere and other shawls from the North-Western Provinces. These are really beautiful articles, the tints being very bright and gratifying to the eye. One fawn-coloured shawl deserves special notice, because of its exquisite braiding. Grey vampire, a species of satin, is also of rich texture and colour, Azamgarh fabrics, which are a union of silk and cotton are very neat. The ash colour is well tinted. In the same case are found a quantity of very fine muslins, which would be of great utility for making ladies' dresses here. It is used by the natives for turbans. The Government of Madras is responsible for the exhibit of cinchona bark, which is so largely exported for making quinine. A number of carpets are suspended from the roof, but only in one instance can it be discovered what a great depth of "pile" they have. They have been made in the various gaols of the Empire, and in two of them the Persian pattern has been adopted. Already the best of them have been bespoken. Messrs. Watson & Co., of Bombay, whose exhibits in other classes we have previously noticed, show some handsome inlaid sandalwood dishes, and other useful articles which may also ornament drawing-rooms. A work-box, inlaid with pearl, which is exhibited by Messrs. Cruvance, of Bombay, is a splendid article, every inch of its surface being a study. Benares engraved brassware is shown profusely, not only by the Government of the N.-W. Provinces, but also by Messrs. Lassetter & Co., of this city. It is all remarkable for the extent and beauty of the chasing, which has been affected by the natives. Major Clementi has placed a white marble card tray, of mosaic design, which the natives follow as closely as do the Italians; indeed it is averred by many persons that the celebrated Taj Mahal at Agra was the work of the latter, and that the Hindoos make this the copy for most of their work. Tobacco is of course largely grown and manufactured. The exhibits, however, is confined to cigars, of which a great many descriptions are shown. We understand that small Havana shaped cigars are sold as low as 24*s.* per 1,000. Tea is perhaps the greatest object of interest in the court, and strenuous efforts are being made to prove how extensive is the trade carried on in this respect, no less than 116 being catalogued. We find that the value of this article as exported in 1876-77 was £2,680,140. Large quantities of Indian tea are sold by our own merchants, but our retailers nearly always describe it as Chinese. Seeing the difficulties which the Celestials are ever and again throwing in the way of our traffic with them, it certainly should be the aim of all our traders to patronise the Indian article, more especially as it will be proved that it is as good as anything grown in the Flowery Land.

The best crop is produced in Assam, at an elevation of from 2,000 to 3,000 feet. One sample from this district, an orange Pekoe, priced at 12*s.* per lb. has such a strong and fragrant aroma that it does not appear to possess any when re-applied to the nostrils. Coffee is shown in almost every form, and admittedly of finer quality than anything displayed from other countries. Preserves, pickles, condiments, and jams are of course to be looked for, and there is certainly no lack of them. Messrs. Clifford and Love, of this city, show a fine collection, which, in addition to samples of tea, contains various preserves which were not specially prepared for the Exhibition. The chutney shows the fruit, and is very tempting. We find mangoes pickled, preserved, jellied, and in fact bottled in almost every possible way. Curries are here in galore. Jam is represented, made of pineapples, mangoes, plaintain, tamarind, and guavas. A number of sauces and high relishes also find places, but we regret to learn that the firm's last ventures in these articles had to be transferred to Queensland. Bass & Co.'s India pale ale has of late years been losing so much ground in India through the superiority of the local brews, that the importation of this once celebrated beer is reduced to a minimum. The Murree Brewery Company,

Punjab, supply the troops in India with the article that is exhibited bottled form. It is designed to keep any length of time, and is merely exhibited for competition, because the demand is already greater than the supply. Samples of sugars grown and prepared in the North-Western Provinces invite special attention because of their purity. They can be supplied in large quantities at a low rate, seeing that labour is so cheap. The famed cleanliness and patience of the native are guarantees that every care has been taken in the preparation. This exhibit should attract the attention of dealers in sugar, though there is much ground for the assertion that is often made that the trade in Australia is greatly monopolised. In conclusion, we must congratulate Major Clementi on the success which has attended his efforts, notwithstanding the many impediments he found in his way.—*Sydney Daily Telegraph.*

ON THE CYCLAMEN.

THERE are few more attractive winter flowing plants than the various winter and early spring flowering cyclamens. They combine the charming features of neatness of growth, foliage of handsome form and coloring, and flowers of most elegant structure and brilliant colours. The flowers in all the species, but especially in the varieties of the Persian species, which are most extensively grown for greenhouse and conservatory decoration, are very profusely produced. It is no unusual thing, under skilful treatment, to see as many as two hundred fully expanded flowers open at one time in a flowerpot of six inches diameter, and as many more to follow peeping up amongst the beautiful leaves. These are gems of the first water, simple in character, but all the more attractive because they are so.

With the exception of *C. persicum* and its innumerable varities, and *Crepandum*, which must have the protection of the greenhouse, and during the growing season are benefited by a little more warmth than even the greenhouse affords, all the other species in cultivation will bear with impunity the temperature of our outdoor climate. Cold is not the worst enemy to fear in the management of cyclamens in the open air; damp is much more destructive of them than cold, so that they should, when an attempt at their culture is made out of doors, be specially provided for in the matter of drainage, and, as far as possible, also protection from drenching rains in autumn and throughout the winter should be afforded them. But though hardly enough to endure out of doors, it must be stated that there are very few parts of the country where the beauties of the plants may be seen unmarred and in perfection. The uncertain and variable weather which we experience during the flowering period of most of species, is apt, in the majority of seasons, to lead to the destruction of the flowers before they expand, or to destroy them prematurely after they have expanded; so that, after all, it is better to treat them as plants requiring protection than as hardy plants; if we would enjoy their beauty to the full. A cold or unheated frame or pit is all that is required by the hardy species, which are the most numerous, and in their way not inferior in beauty to the more floriferous *C. persicum* and its varieties. A cool greenhouse may be made very gay with these hardy species during the winter and spring months, by having a good store of them in a cold frame.

The soil in which these plants thrive best is a good yellow loam, such as may be obtained from the top spit of old pasture. It should be the best that can be got, and should be further enriched by being incorporated with a third part of sheep or cow dung, the mixture being made up not less than three months before it is required for use. To this, when it is to be used, add a good allowance of sharp river or pit sand to render it porous. The spots should be well drained, and the soil must be made very firm round the roots. The last instruction refers only to roots of some age; small or very young roots should not be potted so firm. Having indicated the kind of structure and the soil in which these beautiful flowers may be cultivated successfully, so that their beauty may be thoroughly enjoyed without that liability to disappointment which attends their culture in the open air, we will treat of their propagation and culture from the seedling state to the fully developed plants.

The only successful means of propagating cyclamens is by seed. Some have attempted increasing them by means of division of the corms or roots, but with very indifferent results; it is a slow and unsatisfactory method, even when most successful. The seeds should be sown as soon as they are ripe. Shallow pans well drained are the best form of pot, to sow them in. The soil should be composed of equal parts of the loam above referred to, and leaf mould well decomposed, taking care to pick small sticks, beech-nuts, and other woody matters likely to breed fungy, out when turning it over. Sow the seed thinly on a smooth surface, and cover them with the finer portions of the compost to the depth of their own diameter. Water them and place a square of glass over the pot or pan, so as to cover it completely and prevent unnecessary and rapid evaporation. They should be shaded during bright sunshine to prevent their becoming scorched while the process of germination is going on, and care must be taken never to allow them to become very dry or to become saturated with wet while they are in the seed-pans or indeed at any period of their growth. A mild hot-bed will facilitate germination, but it is not essential in the case of the hardy species. The persicum varieties, however, must have heat while germinating, and it should be continued to them till they have attained size sufficient to be placed in their first pots from the seed-pans; but when they are established in them they may if it is summer, be kept in a cold frame. But as the sowings of these are sometimes made in September, they will require to be kept in a temperature of 50 to 55 degs. throughout the winter. Returning to the hardy species, their treatment should be carefully attended to from their first appearance above ground. Keep the seed-pans close to the glass, admit every ray of light except direct mid-day sun, which would be destructive to them. Dew them overhead night and morning with water from a fine rose watering-pot. As soon as the plantlets are fit to handle, let them be pricked off singly into small sized pots,—thumb or two-inch pots being the proper size,—using the same compost as for the seed pans, and draining the pots well. Return them to the frame, and for about a week after, they must be kept close and shaded during the brightest and warmest part of the day. At the end of the week begin to admit air by degrees day and night, and gradually discontinue the use of shading till its use may be dispensed with wholly, except during the three hottest hours of the day. Dew the plants morning and evening, as before directed, overhead, and continue this treatment till late autumn, when they begin to manifest a cessation of growth, and may be allowed to become gradually drier at the roots. During the course of the growing period they should be shifted into larger sized pots according as they require; never allow them to become pot bound, else they will cease growing. At the same time avoid over-potting the plants, one of the greatest errors that can be made is giving too much pot room. They make comparatively few fibres, therefore want but little pot room, the corm being the principal feeding part, and in which the assimilated food that is to go to the development of the flowers and leaves is stored up.

Established plants should be treated precisely in the same way as seedlings after they have been taken from the seed-pans, with the exception that they will require less shading. They will require to be turned out of their pots in autumn, or immediately before growth begins, to see the condition of the roots, which, if not satisfactory, should be improved by repotting or redraining, as the case may require.

The principal hardy species are as follows:—

C. coum.—Of which there are two varieties besides the normal form with bright red flowers, one being white, the other blush or light pink.

C. europæum.—An autumn flowering species, with variously coloured flowers, white, red, and purple; some individuals producing flowers combining all these colours.

C. hederæfolium.—Another autumn flowering species, with, as the name implies, ivy-like leaves. The flowers are rosy-lilac.

C. ibericum.—A very distinct sort, flowering in March and April. The flowers are variable in colour, rose and white being the predominating shades, having a dark crimson blotch at the base of each lobe of the corolla.

C. vernum.—A very beautiful but diminutive species, with deep crimson flowers—*N. B. Agriculturist.*

OUR AGRICULTURAL CONDITION AND PROSPECTS.

IN an almost purely agricultural country like India the well-being of the people depends on the land; and as the rainfall is concentrated into a period of a few months, the character and distribution of the rains make themselves felt in every part of the social fabric. During the rainy season of 1879, the rainfall was more than the average throughout the country generally. The consequence was that the autumnal harvest failed to a large extent from too much rain; but the vernal harvest, owing to the great quantity of moisture in the soil, will be an abundant one in every part of the country. The cotton crop in the principal cotton-growing districts has largely failed from the effects of the severe cold in the early part of the winter—the plants having been bitten by the frost and stunted in their growth and increase. The other crops, especially the cereals, are in excellent condition, and will produce on the whole a full average yield.

It is certainly the first duty of Government in such a country as India, where its main source of revenue is the land, to provide all feasible advantages and facilities for the most productive cultivation. Much is now being done in every part of the country for the storing and distribution of the rainfall. Our large irrigation reservoirs with their systems of canal distribution are greatly increasing the productiveness of the soil. The great advantage of this to the country may, however, be counteracted and thwarted in two ways: first, by a too heavy land-tax. It has been satisfactorily proved that the settlement in this presidency has been injudiciously and improvidently high. The land has consequently been frequently changing hands, getting out of the hands of practical agriculturists into those of mere money-lenders, who employ the agriculturists as mere farm labourers who have no interest in the improvement of the land nor in its increased productiveness. The Deccan Ryots' Relief Act is not going to effect any improvement in this direction. Some flying straws have already shown how the wind is blowing from this Act. The ryots must and will have money. They can only get it from the sawkars or money-lenders. These latter have now discovered, as everyone who knew anything about them foresaw that they would discover a means of lending money to the ryots without restriction, and in spite of any provisions of the Act to their disadvantage in so doing. A money-lender says, in answer to the solicitation for a loan,—yes, you can have what money you want by simply transferring your land to my name. Debt-bonds and mortgage-bonds will now be out of fashion, and deeds-of-sale will come into vogue. These will be duly registered. And Dr. Pollen's occupation will be gone; or, if not absolutely gone, it will simply lead to further litigation which will be wholly in favour of the money

lenders. This state of things, so favorable to money-lenders, is intensified by the following measures: when the assessment is not paid by the ryot, his land will not be sold by public sale, but it will be resumed by Government. The ryots will greatly prefer to get money from their savkars by transferring their lands to their names—that is, by deeds-of-sale, than to have their lands resumed by Government and thus pass out of their view for ever. The savkars promise that when the loans are paid off, the lands will be restored to their former owners. The ryots will always believe that they have better chances of getting back their lands by transferring them by deeds-of-sale to the savkars than by allowing them to be resumed by Government. Thus this Relief Act will afford no relief to the ryots; and therefore it will not remove the existing hindrances to production notwithstanding the great advantage afforded by our irrigation systems. A very different state of things exists in the Central Provinces as regards the land settlement. The present Chief Commissioner was the original Settlement Officer of those provinces. The assessment was designedly fixed so low that the agriculturists might not feel it a burden. They have never felt it to be a burden. Government has itself done much to improve the land, and has afforded great facilities to the land-holders to do so themselves. The result will be that at the approaching renewal of the settlement the revenue will be increased by about Rs. 4,000,000 without the agricultural population feeling it. Secondly, the advantages to greater productiveness of the land afforded by our water storage and distribution may be counteracted by expense of carriage to market for export produce. Some of the best wheat growing districts are the Berars and Central Provinces. The growing crops there are in the finest order and promise magnificent yields. The growers, however, cannot afford to sell their wheat at the price at which it requires to be laid down in Bombay, in order to compete with that of other countries in the English market. The railway charges for carriage are too high to admit of Berar and Central Provinces, wheat being laid down in Bombay at remunerative rates. This is a very serious matter this year, when the supply of wheat here will be so great and the demand in England unprecedentedly great. Of wheat-growing countries only the United States of America, Canada, Australia, and little Denmark have produced an average yield in 1879. The average production for the whole of Europe is 962,866,150 bushels, while that of 1879 is only 763, 987,500 bushels, being a falling off of 198,878,650 bushels. The average yield for other parts of the world—that is to say, the United States, Canada, and Australia, is 1,367,687, 500 bushels, and for the past year, 1,489, 467,500 bushels showing a decrease of 178,400,000 bushels. The deficiency of the crop for the whole world (not including India) is 377,279,150 bushels. The average yield of Great Britain is 83,500,000, bushels, and the yield for 1879 was 47,500,000 bushels. Great Britain, then, has to get 36,000,000 bushels from the rest of the world and can only look to America and Australia besides India. The whole average yield of Canada and Australia is only two-thirds of Great Britain's deficiency. France, Spain, Italy, Belgium are almost each of them as badly off as Great Britain as regards deficiency of yield. Indian wheat, moreover, is a favourite in the English market—preferred to that of any other country. If therefore the wheat-growing districts could lay down their wheat at the seaport at remunerative rates. for the exporters, India would have a certain market for her forthcoming yield of wheat. The railway charges, however, do not admit of the wheat from the best wheat growing districts being laid down in Bombay at such rates. What is true of wheat in this respect is also true of cotton. This article is selling in Berar and the Central Provinces at Rs. 140 a khandi; the price at Bombay is Rs. 145 a khandi; it cannot be laid down in Bombay at the price at which it is selling there. If the railway charges for these articles were less, the traffic in them this season would certainly be unprecedently great. If producers cannot afford to sell at rates remunerative to dealers, they may as well not produce, and all the advantages afforded for greater productiveness of the land are in vain.—*Deccan Herald.*

OUR RYOTS' AGRICULTURAL CUSTOMS.

THE vast majority of persons who know, or think they know, anything of India, its inhabitants, and their customs, look on the latter as so time-honored that any alteration of them is not only difficult but undesirable. A few are aware that trained English agriculturists consider most of them conducive to the exhaustion of the land, and consequently to a decline in the material prosperity of the agricultural classes, and, as these form the bulk of the population, to the impoverishment of the Empire. Some, who from long residence in rural districts consider themselves authorities on all matters brought within their observation, boldly assert that the trained men's views are wrong, forgetting that while the man with local knowledge may know the essentials of native cultivation better than those who make but hurried tours through a district, his knowledge is not equivalent to a thorough acquaintance with the principles on which agricultural science is based, combined with observations of the result of the application of those principles in England and of observations of the disregarded in India. The idea that every one may make a farmer, however worthless he may have proved in other occupations, is, we presume, the origin of the belief that the observations of trained agriculturists are scarcely worthy of attention when applied to native agriculture; but a consideration of only one practice—let us take that of manure manufacture—in which the customs of scientists and ryots are so divergent, may prove that after all the former may be of use to India, if he be allowed sufficient latitude.

Roughly speaking, the ryot gets two loads of manure per annum per head of cattle kept, and by burning this he gets fuel gratis; he gets also some 500lb. of grain per acre. The experimental farmer gets twenty loads of manure per head of cattle, no fuel, and 2,000lb. of grain under similar conditions of land and climate. Now is fuel gratis equivalent to 1,500lb. of grain per acre, when wood can be purchased in Madras at Rs. 7 per ton, and could be grown for nothing if that wasted article, a ryot's spare time, were properly utilized? There can be but one answer to this, and as the difference in result is due in a great measure to the different practices, we believe they are worthy of attention. To take the ryot's first. We are all familiar with the sight of women collecting the droppings of cattle, and the bratties drying on the walls of the mud hovels of the villagers in which the cattle are tied up at night, standing on the bare floor. The little heaps of rubbish and ashes on one side of the hovel is also too general a sight to need comment, and if our journey in the mofussil be taken before the sowing season, the little heaps of manure, few and far between, attest the attempt of the ryot to make his small supply cover as large an area as possible; but even with the aid of sheep folded on the land, Mr. Robertson showed that, in the Coimbatore district for instance, 75 per cent. of the land receives no manure at all. The friends of the ryot assert he uses green leaves and deposits to eke out the supply, and thus manures his wet lands; but those who know the presidency must be aware that while such a custom prevails the exuberance of vegetation is never so great as to allow any considerable area to receive such a benefit. We asserted that for twenty loads of manure made on a Government farm but two are made by the ryot, and these he frequently reduces to ashes.

The next inquiry is naturally the relative value of the two products. That on the Government farm, being made by keeping the animal in a sunken pit on litter, allows the liquid as well as the solid excreta to be utilized, but as the beasts are kept under, over, no moisture from rain can get into the pit, so that an undue dampness, which might be injurious to the hoofs of the stocks is avoided, while their trampling about free in a stall so condenses the manure and litter accumulating under them that no injurious exhalations are given off. Some months since the *Gazette of India* published an experiment from the Bangalore Experimental Farm that proved conclusively the approximate relative value of manure thus made, contrasted with the native methods of its manipulation. Cattle fed on grass only were kept in the sheds, and from a grazing ground manure was collected and stored in a heap. Equal weights of each were taken, and an equal weight of native-made manure burned, and the ashes applied to the land. The results over an unmanured plot of equal area with that manured were as follows:—

		Grain.	Fodder.
Cattle box manure	...	÷ 74 per cent.	+ 71 per cent.
Dry cattle dung ...	...	÷ 33 do	+ 26 do.
Ashes ...	...	× 37 do	— 20 do.

the action of ashes in lessening the yield of fodder being due to the forcing nature of its action, by which the production of grain was hastened at the expense of the growth of the plant. So much for the relative value of the manures in a first crop. On a second, their value was tested at Sydapet, where it was proved that the ashes affect only a single crop to any appreciable extent while the cattle-box manure has a lasting action, extending over more than one crop. In this case, the soil being lighter, the ashes forced a heavier crop, fodder only being grown, than was given by the cattle-box manure; but in the long run the total yield was in favor of the cattle-box manure. The mechanical value of the organic matter in the manure in assisting the soil to absorb and retain water would also be lasting, and increase with each additional manuring the field received. As we pointed out in a recent article, when commenting on the excess of water, the ryots use for paddy cultivation, an addition of five per cent. of organic matter to a soil is, according to its composition, equivalent to between a third and two-thirds of an inch of rain.

If we want further proof of the value of manuring with a lasting manure, such as cattle manure combined with organic matter in the form of litter, Mr. Lawe's experiments at Rothamstead prove that while land that formerly yielded 30 bushels of wheat, say 1,800 lb. per acre, when farmed as farming was conducted in England forty years ago, it has now decreased its yield when left without manure to 8 bushels of 480 lb., while with continuous manuring the yield has increased to 3,600 lb. per acre. With such facts before them, why is it the Government do not make some attempt to set them before the ryots. There are no conditions that they cannot overcome. Mud exists to build walls for buildings, and grass to thatch them. Litter can be procured in many districts simply by cutting coarse grass. There is no reason why the liquid excreta should be wasted by evaporation; its collection interferes with no caste prejudices. As to the loss of fuel that would occur if bratties were not made, Mr. Benson has clearly pointed out the ease with which casuarina trees may be grown for fuel to supplant their use; and if once the order were given, for tree planting, and insisted on by the proper authorities, things would soon slide into an improved groove. Roadside tree-planting, by which the roads of Mysore may be traced until lost in the misty horizon, were but the result of an order of Mr. Bowring when Chief Commissioner, and who can say that their growth was a harsh measure and is now unpopular with the ryots. The people of India are so plastic when once a thing becomes a custom that we have no fear but that, were the planting insisted on, it would follow as a

matter of course; but alas! the order never comes and the hapless country is allowed to steadily, if almost imperceptibly, decline, because our rulers will not adopt reasonable measures for securing Nature's own fuel supply in India.—*Madras Mail.*

RAILWAY CONSTRUCTION IN AMERICA.

IN my letter of last week I sent you a report of an interview with a prominent iron merchant, who in speaking of the probable mileage of railroads to be built next year, said it might exceed 7,000 miles. Such estimates always have an element of uncertainty, but from a subsequent and more thorough examination of the matter, I find that the generally accepted figure is much higher than that named, namely, 9,000 miles. Should this enormous total be even approximated it will explain whatever is mysterious in the present excited and abundantly prosperous condition of the iron trade. This alone would involve an enormous and probably unprecedented consumption of iron. Nine thousand miles of new railroad would consume, for rails, fish-plates, spikes, and bolts, not less than 15,000,000 tons of metal. It is expected that at least 125,000 cars of all descriptions will be built next year, which will consume 500,000 tons; 160,000 tons of iron will be needed to repair old cars, and enough new or re-rolled rails to repair 10 per cent. of the 90,000 miles of railroad in operation, which will be equivalent to building another 9,000 miles of road, so far as iron is concerned. Without this last item, which is to some extent off-set by the quantities of old iron to be turned in for remanufacture, we have an estimated consumption, on railroad account, of 2,460,000 tons. We may, I think, safely accept this figure if, to cover all possible exaggerations, we leave out of account all consumption for locomotives, bridges, and telegraph wire, as well as the actual loss of iron in dropped links and pins, which never find their way back into use. It should be remembered that the railroads will also consume considerable quantities of iron in depôts, water piping, pumping machinery, and tools of all kinds. Indeed, 2,500,000 tons would seem to be a low estimate of the amount of iron which will be consumed by the railroads in 1880. Now, as I remarked in a previous letter, activity in railroad building has always been attended with general prosperity and activity in nearly all the trades which consume iron largely. The building of a new road in any direction induces settlement along its line, which means the building of houses and the sudden up-spring of villages and towns. However cheaply and quickly such houses may be built at first, they use more or less hardware, nails, and screws. It also brings into communication with the markets a greater or less extent of new land, which is quickly brought under cultivation. This calls for agricultural machinery, implements and tools. Every family needs a new supply of cooking and heating stoves, each weighing from 100 to 300. In fact iron in its innumerable forms is the first requisite of a new community, and such new communities are found establishing themselves along every new line of railroad which traverses good farming districts. This will be better understood from an examination of the actual figures in certain localities. From the land office reports it can be ascertained that during the 10 years closing June 30, 1879, the Government sold for cash 57,660,970 acres of land besides large grants under the Homestead Act. Mr. Robert P. Porter, a careful collector of facts and figures, writing in a recent number of the *International Review* upon this subject says:—"The present immigration, especially, perhaps, in Minnesota is unparalleled in the history of any of the States, and is accompanied by a demand for railroad and public land unprecedented. The offices of the Northern Pacific, St. Paul and Sioux City, and other railroads with lands to dispose of are daily crowded with applicants for the purchase of new wheat lands in the Dakota region, while the Government is literally besieged with claimants under the homestead and pre-emption laws in a manner surpassing all previous experience, even of the great immigration West from 1856 to 1857. During the three months ending November 30, 1874, the different land offices of the United States Government in Minnesota disposed of 429,467 acres. The railroad companies sold in the same-time 589,136 acres of land in Minnesota and Dakota. In all, over 1,000,000 acres of land were appropriated to actual settlement in the two Red River, States in these three months and most of it in the immediate water-shed of that river. The general summary for the quarter ending March 31, 1878, in the district of Minnesota alone showed a sale of 1,207,871 acres. In 1871 there was scarcely a settlement along the route of the Northern Pacific road either in Dakota or the Red River Valley. Within the past year or two all this is changed. The district it travels is now enlivened by the influx of settlers whose houses, stores, schools, churches, and other appliances of civilised life are dotting the surface in all directions, and during the past year 250,000 acres of land have been opened for cultivation, and 65,000 souls have been brought into the country, to which hundreds are being added every day." But Minnesota is not the only State where such figures might be compiled by the careful investigator. Similar scenes may be witnessed all over the Western country, which is bustling with life and activity. Migration partly accounts for this, and immigration partly. There have been 134,058 immigrants entered at the port of New Your alone during the 12 months ended with November, against 120,000 for the same time last year. Nearly 6,000 men came this year who were not classed as immigrants, and of which an uncertain percentage will remain. I have no figures for other ports, and none for the immigration from Canada, which if not large, is pretty steady. Besides these additions from foreign sources, we have what amount to additions from within—the sub-division, of families by the marriages among the youths and maidens who leave their parents' homes and start out life for themselves. Of this class there is a constant westward flow, which does not weaken the older and more densely-settled portions of the country. Such a gradual redistribution of population is in the largest degree beneficial to the country, increasing the number of active producers, and swelling the aggregate of the national wealth. Meanwhile the whole country is prospering, with no element of weakness visible in any part of our business system. Such activity of railroad building necessarily sets in motion a vast aggregate capital, mostly paid out in wages to labour, and filtering back again through the countless channels of trade into the banks at the great financial centres. Such a movement is practically a stimulated circulation of the nation's life-blood, which courses through the veins and arteries of trade, throbbing at the pulses, vitalising the remotest extremities, and surging back again to the great heart, to be itself re-vitalised and again set in motion. If these somewhat confident predictions are warranted by facts and probabilities, as I believe them to be.—*Correspondent of the Ironmonger.*

THE BARRINGTON GOLDFIELD, NEW SOUTH WALES.

(Communicated).

THIS new goldfield is situated some 150 miles from Sydney and covers an immense stretch of country, but the parts most in favour at present are the Back Creek diggings. The field presents a far different appearance to what it did when it was first opened; at that time there were only a few diggers fossicking up and down the creeks. Our party struck a reef at 42 feet level, where the very place is now surrounded all round by claims. The greater part of the population is gathered round the township of Back Creek, where only a few months back but a few prospectors were camped. Back Creek would be known as a digging township if there were no signs of digging near it. The wooden buildings have been rashly thrown together, the streets badly laid out and with no regard to levels, and everything presents the appearance of a rush. It was daylight when I arrived after riding some 30 miles during the night, and there were crowds of loungers about the bars and in front of the public house doors. Generally speaking, this would indicate prosperous times. Diggers unfortunately imbibe in proportion to the gold they get. But as I will have occasion to show, there are many miners so-called at Back Creek who are too lazy to work, too lazy even to earn honestly the money they recklessly squander. In too many cases do they prefer to sell share in leases they have only applied for choosing rather to live in idleness than prospect their ground. These are the loafers, these are not the men who have made Back Creek what it is and will make it I think before the end of this summer the greatest goldfield in New South Wales. There are men about Back Creek pioneers of the good of old stomp who have lived on wallabies and wallaroos, dollying and crushing enough gold to keep them alive while crushing machinery was being erected. These are the men to whom Back Creek is indebted for its present condition.

My first night on the Creek gave me time to look around and make a few inquiries. The nights are usually spent in rivalry. Drinking and card playing are great amusements, and added to these there is a skittle alley. Let no one picture Back Creek as a large extent of canvas tents—most of the buildings are of wood, and considering its proximity to Sydney this is as it should be; and there are evidences of civilization that would not be met with on any of the remote gold fields in Queensland.

After having a good look round the field and having inspected the principal claims I have very little hesitation in saying the Back Creek has a brilliant future in store for it. Let no poor man go there, it is not a poor man's field. The ground on all sides is taken up and not worked, the mining regulations in this colony allow this, whereas in Queensland, in Victoria, not an inch of ground can be taken up without working it. This is the blight of faulty mining regulations, encouraged by the mining department of this colony. Many men have gone to Back Creek willing to work, men of experience, men of energy, and men with means sufficiently ample to weather, a few months' bad luck, but the opportunity has been denied them The loafers at Back Creek; who either expect to sell shares to new comers and expect the gold to be taken out for them, or hope to delude speculators have fastened on the ground. Many of the leases that have been applied for have never been surveyed, and many that have been surveyed have never been granted. Another drawback to Back Creek is the deficient and defective crushing machinery, for I am certain that a great deal of gold is lost in the process of crushing. But worse than all, the crushing power falls far short of requirements. There are only three batteries with ten heads of stampers each, capable of crushing 100 tons of quartz each per week.

That falls far short of what is wanted. I am certain that at last 2,000 tons of stone are raised weekly. A finer field for the erection of crushing machinery has rarely presented itself—a good supply of wood and water. The rate for crushing is 20s. per ton, every bag of quartz being weighed; and this may be considered high seeing that quartz in many of the Victorian goldfields can be crushed for 10s. per ton. Looking at Back Creek generally, the goldfield present a perfect net-work of reefs, several of which are payble, but most of them have not had time as yet to be proved. The reefs are high in the ranges and they are thickly timbered, which affords great economy for the working of the shafts and the field generally. At present as high as 11s. a ton is paid for carting the

quartz to the batteries. It is estimated there are over 2,000 miners on the field, and should some of the new reefs turn outwell, there is not the slighest doubt but that the population will be doubled before long. Considering its proximity to Sydney good roads might easily be made, as the goldfield is only about 50 miles from the railway, and most of the miners have swagged it, and swaggers are to be met daily on the road. A few speculators have come to the field of late, but from hearsay they have not seen the field in the same light as it has been represented. No doubt there has been and will be a lot of blow. I know of an instance where claims have been reported to be extremely rich, and when the quartz has been crushed it has been proud that they did not consider it payable.

Back Creek is divided into a right-hand branch and a left-hand branch. The latter has been most worked, and by far the largest amount of gold has been obtained from it. Here and there on the ranges abandoned shafts told their tale of failure. A time may soon come when 20s. a ton for crushing and 11s. a ton for carting will be relics of a bygone period. The first line of reefs is known as the Melbourne. The claim is held by three men, who are down with their shaft 60 feet. The last crushing gave them at the rate of 4 oz. to the ton, and in one piece of stone weighing 11 oz. 9 oz. of gold were got. The No. 1 South-West have had two crushings of 128 and 129 tons respectively which averaged over 8 oz. to the ton ! there are 18 men in the party. On the Mechanics' prospecting claim, there is also a shaft some 150 feet down with a lode 8 feet wide, which has yielded as follows :—9½ tons of quartz 4 oz. to the ton, 74 tons 1¾ oz. to the ton. The Hidden Treasure claim is one of the best at Back Creek. On the Tunnel the lode has averaged about 2 feet and the returns have been as follows :—112 tons, 286 ozs. ; 35 tons, 106 ozs ; 112 tons, 288 ozs. There are only five shareholders in the claim, but eighteen men all work night and day. In connection with the Hidden Treasure reef, there are about it greater indications of permanence than about most of the others. The walls are of nice slate with clay and soft slate between that and the reef; soft greasy slate is what a minor likes when he is after gold, and in this claim it is to be found in abundance. In the No. 1 North Hidden Treasure gold has been found in an open cutting. This claim has been sold for £350. The Mountain Maid prospecting claim stand prominently forward as the richest mine on the Barrington. Gold was struck almost on the surface and has been followed down to ninety-four feet. The first two crushings were as follows:—83 tons, 7,328 ozs.; and 153 tons, 2,295 ozs. The next crushing after that a greater width of stone was taken and the result from 325 tons was 2,200 ozs., so that in round numbers about £24,000 worth of gold has been obtained from the reef in three crushings. There was scarcely a piece of quartz I saw that I did not see gold in the solid stone. The first two crushings were picked stone, the last crushing was not. Like nearly all the gold at Back Creek, that in the Mountain Maid claim contains about one-tenth part of silver.

This will give you an idea of some of the best claims of this goldfield.—Yours, &c.,

* * * *

1st December 1879.

—*North China Herald*, January. 22]

PREPARATION OF SAGO.—The Sago-palm (*Metroxylon sagus*) yields the principal food of the inhabitants of the islands, stretching along the western coast of Sumatra, who obtain the sago as follows:—The trees having been sawn into pieces four to five feet in length, each piece is split into four parts, which, after the bark has been removed, are placed in a shady place until dry, when the pith is rasped into a rough meal, transferred to a coarse cotton strainer, suspended over wooden trough, and kneaded into a smooth thin paste with water ; this kneading is continued as long as the milky liquid saturated with starch runs from the strainer. The contents of the trough are then allowed to settle, the supernatant water is removed, and the white sediment dried in the air.

MINERALOGY.

NEWS has been received at Rangoon by telegram from Akyab, that Messrs. Gillam & Co. have been successful in striking oil in the Boroogas. They had carried their boring down 275 feet when they came upon a large reservoir. The extent of the yield is not mentioned, but it is believed to be considerable. Hitherto the company were able to get a daily supply of between 170 and 180 gallons of oil, not thick like the ordinary crude mud oil, but much more liquid, and of the appearance of dark brown sherry.—*Englishman.*

A CORRESPONDENT at Ootacamund writes to a Madras contemporary :—"I told you in my last that a Mining Engineer has been sent out to relieve Mr. Severn, who proceeds immediately to England in view to select and bring out the requisite machinery and appliances for working the gold mines of Wynaad. Mr. Severn tells me he is exceedingly well pleased with his prospections in the Wynaad. He has commenced operations which will be continued during his absence by the Mining Engineer, Captain Poole. Mr. Severn has had much experience in the matter, having been employed both in New Zealand and Australia for over fourteen years, and is very sanguine that the gold mines of the Wynaad will ultimately prove remunerative speculations. Mr. Severn will return to India in June next. He is in raptures in regard to the Nadagany Valley gold reefs. A tunnel has already been cut, and the preliminary works in connection with his operations started."

FORESTRY.

FORESTS OF THE CAUCASUS.

REPORTING on the trade and commerce of the Caucasian Provinces, Acting Consul Lyall, after referring to the immense extent of forest-covered area existing in the Caucasus, points to the fact of their being of little or no commercial value. He says wherever means of transport to a market exists, either by rafting down a river or the vicinity of the sea-board, the forests have either been already denuded of good trees, or exorbitant prices are demanded for the right to fell. The mountains round Tiflis have for many years been completely cleared even of brushwood, and firewood is in consequence very dear. The practice of denuding the mountains, which goes on throughout the valley of the Kour, has resulted in either completely drying up, or diminishing seriously, the volume of water in the rivers. It may be expected, unless measures are taken for re-afforesting the mountains, or some scientific methods of irrigation introduced, that famines will before long take place.

The Government of the Caucasus have long had a complete reorganization of the existing Forest Department under consideration, but this reform, like many others just as urgently required, has hitherto been postponed *sine die.*—*John R. Jackson, Kew.*

TEA.

ACCOUNTS received from different parts of the district, both Hill and Terai, all concur in anticipating an early tea manufacturing season this year. It is, of course, full early yet to hazard an opinion as to when manufacture is likely to begin generally in the district ; as it is quite within the range of possibility that the temperature may drop suddenly this month for a few days or so, and if such should happen the result would be to throw the opening of the manufacturing season back a good deal.

THE letter we reproduce in another column from our Lahore contemporary explains a main disadvantage under which Indian tea suffers in the home markets. The writer's suggestion for a comparative trial of the two methods of packing tea deserves to be taken up, and we shall be very glad to know the results. A new reason for taking the greatest care in the preparation of Indian tea is the prospect of a competition between it and the China article, in Australasia.

THE DRYING OF INDIAN TEA.

HIMALAYAN writes to the Lahore paper as follows :—

A paragraph, in the *Pioneer* of the 4th instant, which says "an export on Indian teas states in a home paper that the chief drawback to their extended consumption in England, is the fact that they speedily deteriorate and will not keep," adding that "this is attributed to the insufficient drying of the leaf, or the use of machinery in the rolling process," is drawing attention. "Expert" is wrong so far as my experience goes, and is further likely to do the industry harm by his remarks.

With reference to the paragraph quoted here, I am very far from agreeing with "Expert" that Indian tea speedily deteriorates and will not keep; in fact, I assert that tea which is *panned* will keep, if properly packed in boxes lined with lead, for years, and instead of deteriorating will improve by keeping. Any one who knows anything of tea, will admit that tea is far more pleasant to drink after it is one or two years old, provided of course proper care is exercised in the factory in the packing and closing down of the lead. Had EXPERT attributed the cause of the tea he has found not to keep and deteriorate, to want of panning or bad packing, one could understand him. I know there are a few estates in the Kangra valley which do not pan, and I do not hesitate to say, that such tea, going home, is, on being opened and bulked in London, likely to lose both flavor and strength ; but tea manufactured as I have seen it (I do not speak here of leaf withered, rolled and dried by machinery), where care is taken with the withering of the leaf, the fermentation, panning, and final drying off, one may back to keep against China, Java, or Ceylon tea. Every broker knows, immediately on testing the tea, whether the withering or fermentation is defective, and if so the valuation of the broker would be depreciated immensely ; but then if the broker would explain the reason for his low valuation it would not be that the tea had deteriorated or would not keep. Of course, when tea is carelessly manufactured, and the day's tea thrown into the bins, or may be packed there and then in sheds and

despatched to the Calcutta auction, without being properly dried off over the charcoal fires, it must deteriorate in every way; but such cases are of rare occurrence.

Since the paragraph in the *Pioneer* to which I here allude appeared, I have had a long and exhaustive conversation with an experienced planter from the Kangra Valley, who entirely concurs with my views on the subject. This gentleman offers to prepare, as an experiment, 40 lbs. of tea, which he will pan and 40 lbs. which he will not pan, and pack both in cases lined with lead, ship to London, leave there for say two years or more, and have them brought back to Calcutta to be opened in the presence of three or more brokers there, who would report on both cases.

I recommend tea in lined lead boxes to families. The lid of the box should be carefully removed and a hole in the lead made just sufficient to admit the hand; take enough only out to fill the tea caddy, then press the lead down and close the lid, repeating this simple plan till the bottom of the box is reached, when it will be found that the last of the tea is equal in strength and aroma to the first cup. This is most necessary in damp weather. Next to this is tea packed in 1lb. foil packets and carefully covered with thickish paper. The objection to packets is that the tea gets broken, but that does not affect the quality of the tea. Tea packed in tin boxes is bad, because once the tin is opened there is no closing it down air-tight again, and the least damp getting to it deteriorates it in a very short time.

On many estates in Assam the sun does everything for the manufacture of tea. The article is neither panned nor fired, when they have sun enough to lay it on zinc sheets in the sun. Tea so treated will not keep. I further think that tea manufactured entirely by machinery is not up to that made or passed through the hand in every process.

GRADES AND QUALITIES OF INDIAN TEAS.

THE very varied and unnecessary assortments of teas sent forward from some gardens cause heavy expenses to owners, and undue trouble to the brokers and dealers.

Some invoices have no less than eight or nine different descriptions of teas, and some gardens still further lengthen their invoices by dividing all or some of these descriptions into breaks or divisions, differing only in value by a penny or so. We think managers should make up their invoices with as few grades as possible and limit them to the following kinds:—Pekoe, Broken Pekoe, Pekoe Souchong, and Broken Tea; or, in other words, two fine teas, one medium and one common tea. This plan has much to recommend its favourable attention on this side, and if the quality be good, competition will not only be secured, but entirely confined to these four kinds.

Too many gardens make what they consider fine teas, but which are, in reality, only very medium ones, the Pekoes from such gardens being inferior in cup to the Souchongs from the best gardens. There is generally an over-supply of medium teas on the market, and are therefore subject to much depression, more so than the finer or commoner grades, not only because of their abundance, but also to their close connection with good China teas.

Having confined his manufacture to the above four kinds, with a good marginal value between each, the planter should aim at making the quality of a distinctive character, and, even though it be a little peculiar, if it has any worth it will soon be discovered on this market. The following are the characters best liked in their order of merit:—1 strong, full, and pungent; 2, strong and fruity; 3, strong and malty; 4, pale, or light and pungent; 5, strong, and rather burnt. The make of leaf is quite a secondary matter; many an ugly-looking tea fetches a long price, owing to its wonderful liquor.—*Home and Colonial Mail.*

TEA MANURES.

ANALYTICAL experiments made on some samples of soil taken at various depths from tea gardens in Assam. The result of these experiments, which were made by Mr. Joseph Cripps, went to show that silicious matter very largely predominated, to the extent of 84 to 93 per cent.; while three very valuable forms of plant food—lime, potash, and phosphoric acid—existed only in very small, indeed in some cases, infinitesimal quantities. Turning to the constituent elements of the tea plant, it will be seen from careful analysis of tea-ash as made by Mr. Cripps, that the plant itself contains a very large proportion of the before-mentioned elements. The exact analysis is as follows:—

Potash	39·22
Soda	·65
Magnesia	6·47
Lime	4·24
Oxide of iron	4·38
Protoxide of manganese	1·08
Phosphoric acid	14·55
Chlorine	·81
Sulphuric acid	trace.
Silicate	4·85
Carbonic acid	24·30
	100·00

As Mr. Cripps forcibly observes on these data:—"The tea plant is one which extracts from the soil very large quantities of potash and phosphoric acid; and it is to the replacing of these constituents that the attention of the grower should be directed. It would appear that phosphoric acid and potash are most necessary for the full development of the tea plant, and, unless stores are developed from the subsoil, or their constituents are applied in the shape of manure, the soil will become exhausted, and disease of the plant a natural consequence of such exhaustion." The Odams Company's tea manure appears to have been prepared with a special regard to these facts, for, according to the independent analyses of no less than four eminent analysts—Dr. Voelcker, Mr. John Hughes, Dr. Macadam, and Mr. Cripps—it is very rich in all the elements which tea requires for its successful cultivation; and, therefore, specially suited for the soils of Indian tea gardens.—*Home and Colonial Mail*, December 19.

DECOMPOSED TEA.

MESSRS. J. C. SILLAR & CO., in a letter to the *Times*, direct attention to another case of adulteration in tea:—"In the year 1874 the steamer *Gordon Castle* was sunk near Lisbon, and after remaining under water for two or three weeks was raised, and 14,000 chests of her teas were sold in Lisbon at the rate of a third of a farthing per lb. The teas were in a state of fermentation, and condemned as quite unfit for human consumption. Notwithstanding this, they were redried and, had it not been for *The Times* calling attention to the matter, they would have been imported into this country, in all probability mixed with sound teas, and consumed long ago. We have now received information that this mass of impurity is being packed in empty tea boxes, which have been forwarded from London, and shipped from Lisbon at the rate of 100 half-chests per week. We have been unable to ascertain the final destination, but we hear that Hamburg is the place to which they are to be first sent. We have received a bag of the rubbish, and forward you a sample herewith. As you will observe, it has the appearance of coffee grounds, and the putrid smell having passed off, it will be difficult to detect when mixed with sound tea. It is to be regretted that the dealers here are what is called 'running for price,' and a heavy premium is thus held out to importers of common and adulterated teas. That the importation and mixture of such compounds with the food of the people will cause much sickness, we do not think there can be much doubt, and we trust that you will assist us in directing attention to the matter."

On this subject "Old China" writes to the *Times*:—"As a tea importer for upwards of 30 years, I can quite endorse Messrs. J. C. Sillar's remarks in their letter in your edition of last Saturday, and I think too much publicity cannot be given to the demoralised state into which the tea trade has fallen within the last few years, cheapness and not goodness being the *desideratum* to which all the energies of the dealers and retailers appear to be chiefly devoted. In years long gone by such was the demand for good tea that buyers in China, to obtain the finest quality, advanced beforehand to native hongs the principal part of the purchase money for the quantity required, with the object of securing as early as possible the finest and best well-known chops, to enable them to give the earliest despatch to the clipper ships, which they loaded at high rates of freight in order that their teas might arrive first on this market; but what we see in the present day is a premium and an encouragement given to the unscrupulous merchants, both native and foreign, to ship at a low cost anything resembling tea, only that its appearance is made so good as to deceive and cause it to be passed by the Customs. Within the last two months of November and December a very large quantity of such tea has been imported, and has been eagerly bought by the wholesale dealers at prices which have given the importer very large profits, while at the same time good pure tea, which could have been bought within 1*d.* per lb. of this trash, and really fine flavoury tea at 2*d.* per lb. above it, has been almost neglected. At the present time the little demand there is for good and fine tea is principally for export, the rubbish being retained in this country for the benefit of the working man and his belongings, and in a season too when he can ill afford to waste his money on a spurious article and who has been in the habit until lately of paying 2*s.* to 2*s.* 6*d.* per lb. for tea, which has cost the wholesale dealer not more than 11*d.* to 1*s.* 2*d.* duty paid. If you will continue your valuable support in exposing the nefarious practices of the trade and putting the public on their guard against the purchase of cheap and spurious tea, you will, I feel assured, be benefiting the poorer classes considerably, and may ultimately, I hope, induce the wholesale dealers to forsake the cheap and nasty and pay a little more for a good and pure article, which will alike be a pleasure and an advantage to the consumer."

TEA IN AMERICA.

CONTINUING our notice of the special report issued by the Government Printing Office of Washington on the subject of "Tea Culture as a Probable American Industry," the writer draws the attention of his countrymen to the adulterations of tea, enumerating the substances stated to have been found in tea, which are as follow:—Iron, plumbago, chalk, China clay, sand, Prussian blue, indigo, tumeric, starch, gypsum, catechu, gum, besides the leaves of the following trees:—camelia, elm, chloranthus, willow, poplar, oak, elder, beech, hawthorn, and the wild plum. The writer might have added that this statement applies only to China tea. "It is generally understood," he continues—with the evident purpose of inducing his fellow-countrymen to undertake the cultivation of the tea plant—"that much of the manipula-

tion given to tea in Asiatic countries is directed toward fitting it for ocean voyages. For this transportation the leaves must be roasted before shipment, and thus the aroma developed by firing is largely dissipated before the tea is used. It is an old saying that the best teas are only to be had in their highest excellence in tea-growing countries, where they can be procured before they have been submitted to all the severity of the heroic processes which they have to undergo before being packed for long voyages in the holds of vessels. It may therefore be found that for home consumption only a less elaborate method of preparation may suffice, and that, as already mentioned, the article may enter into domestic commerce in cakes of dried leaves pressed into solid shapes, as is done with many other herbs, and the roasting which developes the aroma takes place immediately before use, as is now done with coffee. Probably it will ultimately be ground like coffee to secure the most delicate beverage." Our readers will, we think, be of opinion that this style of manufacture would not produce tea at all. He remarks:—"It will probably be many years before tea culture will engage the general attention of farmers and planters in this country. There are many reasons why this may be expected. The profits of the culture are not established; the management of the plant and the proper application of the processes must be for many years of a purely experimental character; and even where seemingly fair tests have been made failures will occur, and although these failures may be traced to causes which persistent effort would overcome, yet where there is outlay and loss, accompanied with some loss as to ultimate success, the effort will in most cases be abandoned."

Any attempt to estimate the profits of teaculture in America would, he says, "simply be futile; this can only be reached after we see the results of actual and fairly conducted experiments."

It has been suggested that the United States Government could at a compartively small cost materially assist in determining the feasibility of tea culture and the solution of the question of profit. "What has already been accomplished by modern tea manufacturers in the way of improvements upon the older Asiatic methods only suggests that still further innovations may be possible."

"Seeing," he adds in conclusion, "that much of the care bestowed upon the manufacture of tea is merely for the purpose of meeting commercial exactions in regard to the appearance of the article, it may be that by ignoring mere appearance an equally good beverage may be produced by an entirely different system of preparation of the leaf. Of this I have," he says, "strong hopes."

"We procure the essential virtues of other herbs without subjecting them to such complicated processes, which, after all, are mainly to prevent the leaf from mouldering and decomposition; and there seems to be no valid reason why tea should differ from other herbs in this respect."

"To solve all doubts on the point, and to answer all questions," the writer of the report makes the following suggestion:—"For the Government to secure say 20 acres of land in a suitable locality, and plant a portion of it yearly with tea plants until ten or twelve acres of it are planted. Then when the plants have become sufficiently matured, provide a small laboratory fitted with the necessary apparatus, and place it in charge of a competent person, who would make such experiments in the preparation of the leaf as might be suggested. This service need not cost more than 20,000 or 25,000 dollars; but it would require at least six years for its completion."

In an appendix, numerous extracts from letters submitted by cultivators of the tea plant are inserted, to show that the necessary soils and climates are to be found in America to suit the growth of the tea plant. Mr. Forster, writing from South Carolina, is evidently at issue with the author of the report on the method of preparing tea. He writes:—"The Chinese method of curing tea is impossible in this country, where we cannot obtain labour at five to ten cents. per day. Yet some equivalent to this process is necessary to the production of tea such as we drink it, for a decoction of the leaves dried without this manipulation has little resemblance to the beverage we all so much appreciate. I am convinced," he adds, "that the slow rolling and pressing at certain intervals and then the heating and rolling over and over before the final drying are required to break the sap vessels in the leaves in order to produce in the juices by contact with the air, a certain degree of fermentation necessary to bring out the flavour or develope the properties we find in the Chinese preparation."

A lady appears to have been the most successful planter hitherto among our Trans-atlantic cousins. Mrs. Screeven, whose address given as McIntosh, Liberty County, says of her mode of preparation:—"I have only prepared black tea, the process being very easy and simple. The leaves are gathered the day before they are to be dried, and spread thinly over tables to will (wither). The small leaves are cured by themselves as they make the most superior quality of tea. The day after being plucked, they are taken in the hands, and rubbed until they become soft and flaccid. They are then placed in heaps, and allowed to remain so for about one hour. They are then put into a Dutch oven which is heated by a few coals under it. While in the oven they are constantly stirred with the hand to prevent scorching. They are roasted five minutes, taken out and rolled again upon the table. After being rolled they are exposed in the open air, in the sun, and frequently stirred. While these are out in the air another set is in the oven. When all have been roasted, those first put out in the air are brought in, and roasted again for five minutes; then taken out and rolled, again. They are now placed in a sieve about an inch thick and held over a few hot coals, stirring all the time. They are then taken out and rolled again. This process of rolling and toasting is continued until the tea assumes a dark colour. After all the leaves have been treated thus they are put in a basket and hung over a few coals, and frequently stirred until the tea appears black and dry."

After taking all these pains, the lady, we think, fairly deserves the credit which is given her of making "a good article for home use."

Another cultivator makes the somewhat startling statement that "half-a-dozen plants furnish my family of five or six persons with more tea than we can use," It is fortunate for him that he can add, "My plants have never suffered from insects of any kind," for on such a small estate "blight" might deprive him of his whole crop of tea.

It is evident that for some time to come India need not look for much rivalry from American tea, and we advise our friends on that side of the Atlantic to put their faith in pure Indian teas in preference both to the China teas with their adulterations and to the home-grown article.—*Home & Colonial Mail.*

IMPORTS, DELIVERIES, AND STOCKS OF INDIAN TEA.

	1879.			1879.			1877.			1876.			1875.		
Month.	Import.	Delivery.	Stock.	Import.	Delivery.	Stock.	Import.	Delivery.	Stock.	Import.	Delivery.	Stock.	Import.	Delivery.	Stock.
January ...	4,182,000	3,230,000	15,568,000	5,579,000	3,203,500	17,803,000	2,155,500	2,378,000	11,340,500	3,445,000	2,403,000	10,426,000	2,198,000	1,899,000	8,134,000
February ..	3,212,000	2,871,000	15,881,000	2,827,000	3,069,000	17,560,000	2,150,500	2,019,030	11,474,000	1,919,000	2,409,000	9,937,000	1,578,500	1,673,000	8,039,500
March ...	3,677,000	4,232,000	15,328,000	3,127,000	3,374,000	17,319,000	2,800,500	2,170,000	12,105,000	2,549,000	2,336,000	10,153,000	2,339,000	1,701,000	8,777,500
April ...	2,540,000	3,803,000	14,067,000	1,899,000	4,210,000	15,010,000	1,757,000	2,122,900	11,743,000	1,739,000	2,130,000	9,769,000	3,350,500	2,127,000	9,003,000
May ...	708,000	2,203,000	12,573,000	894,000	2,582,000	13,325,000	812,000	2,337,000	1?,215,000	744,000	2,385,500	8,121,500	837,000	1,938,500	7,910,000
June ...	597,000	2,057,000	11,160,000	978,000	2,596,000	11,334,000	817,000	2,027,000	9,095,000	461,000	2,134,000	6,223,500	589,000	1,956,000	6,551,500
July ...	885,000	2,327,000	9,721,000	1,838,000	2,550,000	10,622,000	1,617,000	1,897,000	8,726,000	1,673,000	1,795,000	6,102,000	913,000	1,675,000	5,791,000
August ...	2,077,000	2,365,000	9,879,000	2,409,000	2,935,000	10,097,000	2,571,000	2,207,000	9,089,500	2,428,000	1,897,000	6,633,000	2,582,000	1,592,500	6,781,000
September ...	5,125,000	2,691,000	11,715,000	2,876,000	3,123,000	9,850,000	3,285,000	2,549,000	9,829,000	3,227,000	2,272,000	7,587,000	3,001,000	2,123,500	7,688,500
October ...	5,253,000	3,6?4,000	13,297,000	3,941,000	3,331,000	10,461,000	6,851,500	2,922,000	13,488,000	3,595,000	2,414,500	8,769,000	2,344,000	2,347,500	7,673,000
November ...	5,048,000	3,340,000	14,998,000	3,871,000	3,207,000	11,142,000	3,913,000	2,905,000	14,496,000	4,064,000	2,556,000	10,280,000	2,842,000	2,328,500	8,188,000
December ...	5,259,000	2,440,000	17,818,000	5,768,000	2,585,000	14,324,000	3,424,000	2,480,000	15,424,000	3,540,000	2,003,000	11,818,000	3,309,000	2,014,000	9,485,000
	38,483,000	35,243,000		36,007,000	36,706,000		31,784,000	28,013,000		29,384,000	26,735,000		24,883,000	23,275,500	

COFFEE.

LEAF DISEASE IN NORTH COORG.

IN this month of February, the trees on a coffee estate have the appearance of drooping, dejection, and languor; the late luxuriance of leaves have fallen pale and yellow on the dry red ground, and stripped of their load of purple-red berries, they little resemble the same trees of two months ago.

Pruning is being diligently pushed forward; and walking down the long rows of trees that the workers have lately been at work upon, shewing the trees in their most naked aspect, all superfluous wood removed, and the branches, that will give next year's crop, with but a few leaves toward the ends of their branches, the spikes of formation of the blossoms, but as yet visible on close examination, the ground strewed with the cut-off twigs, and a hot burning sun shining full on the over-parched grounds, gives but a poor description of the aspect of the trees as they now are; and if this is of the healthy and undiseased trees, what can be said of those that were attacked with leaf disease in November last. Then they became bare, excepting the unripe crop upon them which never came to maturity, and now they are but as a raised up heap of twigs without sap that break off with a sharp report as the hand is passed roughly through them.

At present this disease has not attacked the more fertile estates lying in South Coorg. It is to the north and west where it is most apparent, and although it is spreading through the medium of abandoned estates, and neglected native holding no extraordinary precautions have been taken to stop its progress. By extracts from the Madras papers, and through the courtesy of a friend who forwarded the published report, as issued from the *Ceylon Observer* office, I read of Mr. Morris's active and learned investigations regarding this disease (the Hem. Vestatrix) and of his many and practical attempts to stop its further advancement, and at the same time to restore the sick trees to health again by means of different manures, acting as a medicine and skilfully applied. All this was then eagerly discussed, and several copies of this pamphlet were sent home to England to some of the proprietors resident there, and interested in this part of Coorg. Notwithstanding the very large cost of importing the flowers of sulphur, and the bringing up from Mysore (distant 80 miles) of large quantities of lime, orders were about to be issued, when there quickly appeared different paragraphs shewing how these medicines did not act on the diseased trees as had been hoped, and thus leaving the question in abeyance, and the orders were not sent.

Some planters have a firm belief that this disease will disappear as mysteriously as it came, now seven years ago, in proof of which instance is made of the attack of bugs, or black insects which many years ago infested every coffee tree doing great damage and mischief, and after stopping one season and a half then disappeared, not to come again.

It has lately been remarked by a correspondent in the *Indian Agriculturist* that under living or forest shade, the trees are more healthy, and are less liable to sickness than those exposed in the open; but trees so grown seldom give one-tenth of the crop, that a healthy tree without shade would annually bear: and in certain localities shade is really dangerous to the coffee trees growing beneath.

Some forest land that was bought many years ago (when the delays and hindrances of to-day were not known,) was about to be felled last December; then the subject was mooted of how to commence, whether to fell straightway and afterwards to burn; or to mark and carefully fell only those trees that would not be needed for shade, and afterwards have small fires to clear away the under growth, &c.

With very little discussion the first plan was decided on for the enormous drip-drip of above two hundred inches of rain, would be ruinous alike to the trees and to the newly disturbed soil.

There is an example in an estate a short distance away, that was planted under forest shade or trees now six years ago; the stems are thin, the branches are long; and the crop very, very small; the shade may be too thick, and the drip from the lofty trees too heavy for the coffee plants to thrive under, for many die; any how, it is decided by the owners of the two clearings that make the total for many miles around Mercara, to ignore the natural shade, and trust to science for the future to clear away the mystery of Hem-Vestatrix.—*Madras Standard*.

THE CROP OF 1879 IN THE THREE GREAT COFFEE COUNTRIES OF THE WORLD.

TAKING it for granted that Messrs. Patry & Pastour's figures are close to the truth, it would appear that, in the year recently closed, Brazil went beyond all previous experience in her export of coffee. Up to a few years ago the accepted figures for the total production of the great South American Empire were 260,000 tons, of which 200,000 in round numbers were exported, leaving the odd 60,000 for internal consumption. In 1879 the quantity exported far exceedeed the previous figures for total production, thus:—

Rio	208,000 *tons*
Santos	70,600 ,,
TOTAL	273,600 ,,

Adding the usual 60,000 tons for home consumption, we get a total production for Brazil as shewn below:—

Exported	273,600 *tons.*
Consumed	60,000 ,,
TOTAL	333,600 ,,

or a third of a million of tons, equal to 6,672,000 cwts.! In the face of such figures, the only wonder is that prices have not gone lower. The safety-valve has been the United States market, and we in Ceylon have special reasons for wishing that prosperity in the Union may continue and increase. Beyond the astonishing figures for 1879, it seems impossible that Brazil can go. Her land resources are ample, but the labour difficulty will daily become greater.

Java (and Sumatra) did not, like Brazil, shew her culminating crop in 1879, but it was only 6,000 tons under the round 100,000 tons. Local consumption we have not figures for, but, probably, it may bring the figures for total production up 180,000 tons. The population is about twice that of Brazil, but we suspect the vast mass of the Javanese never taste coffee, unless in the shape of a decoction of the leaves. Ceylon, alas! shews decadence of a marked character, but the quality of her produce is still high. Local consumption is so restricted that we do not suppose a higher figure than 45,000 tons should be used to represent the total production of Ceylon in 1879. Taking the figures as indicated, we get for the three great coffee countries of the world for 1879:—

	EXPORTED.	CONSUMED.	TOTAL PRODUCTION.
	Tons.	*Tons.*	*Tons.*
Brazil	273,600	60,000	333,600
Java (and) Sumatra ...	94,000	86,000 (?)	180,000
Ceylon	41,200	3,800 (?)	45,000
Total	408,800	99,800	508,600

For all the other coffee countries of the world, our estimate, as given in the last edition of our Hand-book, is less than half the above. If it is near the truth we get for

	EXPORTED.	LOCALLY CONSUMED.	TOTAL PRODUCTION.
	Tons.	*Tons.*	*Tons.*
Minor coffee countries ...	173,500	75,050	248,550
Add three great countries	408,800	99,800	508,600
Coffee production of the world	582,300	174,850	757,150

This gives the total production of coffee in the world at over three-quarters of a million tons, or say in cwts 15,143,000. About a dozen years ago, our calculations led us to adopt 13,000,000 cwt. as about the quantity, and after very extensive inquiries and the examination of all the official, consular, and general publications within our reach during 1876-78, the following were the estimates we arrived at as embodied in our last Hand-book:—

THE WORLD'S PRODUCTION OF COFFEE.

COUNTRIES.	Estimated Area under cultivation. Acres.	Present Max. Export of Coffee. Tons.	Estimated Local Consumption. Tons.	Total Max. Production. Tons.
Brazil (including exports from Rio, Santos, Bahia, Pernambuco, and Ceara)	1,500,000*a*	240,000*j*.	60,000*b*	300,000
Java and Sumatra	1,200,000*c*	90,000*j*	20,000	110,000
Ceylon	263,000	50,000*j*	5,000	55,000
India	150,000	25,000*j*.	7,000	32,000
Central America (between United States and Venezuela) *d*	210,000	40,000*d*	5,000	45,000
Venezuela *e*, Peru, Bolivia & Guianas	220,000	40,000	8,000	48,000
Hayti or San Domingo ...	200,000	28,000	7,000	35,000
Cuba & Porto Rico	180,000	17,000	8,000	25,000
West Indies *f*	40,000	5,300*f*	3,500	8,800
Arabia, Madagascar, Mauritius, Reunion, Abyssinia, Mozambique, and North-East Coast of Africa ...	220,000*h*	7,500	22,500*g*	30,000
Natal	800	50	50	100
Liberia and West Coast from Loanda to Cape de Verde Islands, including Lagos, Siera Leone, Gambia, Gold Coast, Elmina, St. Thomas St. Helena, &c., &c. ...	100,000*h*	4,500	10,000	14,500
Manilla, Celebes *i*, and rest of Eastern Archipelago and Australia	45,000	5,000	3,000	8,000
Sandwich Islands and rest of Pacific Isles, including Fiji and New Caledonia	12,500	1,200	1,000	2,200
Total ...	4,291,800	553,550	165,050	718,600

a This area includes old and young coffee. It must be remembered that the style of cultivation and number of trees per acre differ greatly in different countries; for instance in Brazil each tree bears far more than in Ceylon, although the number per acre (from 300 to 500 being much less than in Ceylon (1,200 to 1,400) and the cultivation being less systematically attended to, the rates of production per acre do not show so much difference. According to Mr. Scott Blacklaw, coffee in Brazil bears at the rate of 10 cwts an acre, but this is in the exceptional cases where regularly planted.

b Including the consumption in the adjacent States of South America.

c Mr. Abbay estimated that 19-20ths of the Government Coffee land in Java yielded only 1 cwt an acre.

The value of the world's production of coffee (over 14 million cwts.) would be about 50 millions pounds sterling in the wholesale markets.

d Including exports of New Grenada (Savanella and Maracaibo) 90,000 cwts; Costa Rica 340,000; Nicaragua 45,000; Salvador 120,000; Guatemala 290,000; Southern ports of Mexico 85,000 cwts.

e Including districts of Laguayra, Porto Cabello, Ciudad Bolivar, &c.

f Including exports from Jamaica 3,500 tons; Trinidad 50; Dominica 250; and French Colonies Martinique, Guadeloupe, Cayenne, and other small islands, Bermuda, Grenada, St. Lucia, &c., 1,500.

g Including consumption in Syria and Turkey of Arabian coffee.

h Including wild or indigenous coffee.

i Celebes is said to produce 25,000 cwts from 3 500 acres.

j Brazil crop in 1874-5; Java 1876; Ceylon 1869-70, and 1872-73; India 1871-72.

THE WORLD'S CONSUMPTION OF COFFEE.

OUR calculation of the World's Consumption (usual not maximum) is as follows:—

	Tons.
Continent of Europe	800,000
United States and Canada	110,000*a*
Mexico, Central America, and the West Indian Islands	28,000
Brazil and the rest of South America ...	86,500
Asia including Java and the Eastern Archipelago...	76,000
Africa *b*	35,000
United Kingdom	15,000
Australasia and Pacific Isles	6,000
Tons ...	686,500

This is the average in a year of abundant production. In 1820, the world's consumption of coffee was not more than 150,000 tons.

It will be seen that, while Ceylon has fallen off in production, Brazil and Java have given crops above our maximum estimates. Looking at the enormous advance of Brazil, even if we suppose that a good deal of the crop of 1878 was exported in 1879, it seems pretty clear that 15,000,000 cwts., now closely represent the quantity of coffee produced and consumed in the whole world. Ceylon at present scarcely ranks for one-fifteenth of this quantity, but then nearly all the produce is exported, and we hope that export will yet be largely increased. The taste for coffee is so widespread and is increasing so rapidly that there seems little fear of glutting the market, especially looking at the manner in which the enormous Brazil crop has been disposed of. Pretty soon "Ceylon Liberian coffee" will be figuring in consuming markets, and by the time the railway to Nanu-oya is completed, we trusted the Arabian bean will have shaken off the incubus which has weighed it down in the past decade, and that Ceylon will come in as a far better third than she now does.—*Ceylon Observer.*

a What tea is to England coffee is to the United States, more especially in the Southern States; the consumption has increased from 80 million lb. in 1868 to 116 millions in 1871, but high prices and reduced production as well as adulteration have stopped this continuous increase latterly.

b Cape Colony has imported from Rio as much as 60,000 cwts of coffee in one year. Algeria at the other end of the Continent also imports 60,000 cwts.

CINCHONA.

THE YIELD OF CINCHONA BARK.

THE utmost diversity prevails in the experience gained by cinchona planters in Ceylon of the yield of bark per tree in respect of both the crown and yellow description. That different districts and varying altitudes should give different results was to be expected, but even in the same district and under somewhat similar circumstances we have been surprised to learn how great has been the discrepancy between the returns got from trees of nearly the same age. It is evident that the proper age for stripping bark will vary considerably at different altitudes and nothing but the collection and comparison of the available experience throughout the country, can enable fair and reliable deductions to be made for the guidance of both planters and merchants. There is no doubt that valuable property is lost if not destroyed through premature coppicing and stripping, and yet on the other hand we have reason to believe that in some instances trees are left too long to secure the fullest advantage from their crop of bark. A planter at a high elevation the other day informed us that he meant to cut down a large number of officinalis trees, five years old, to satisfy financial demands in this year of depression, but on experimenting with a few trees he found that instead of three-fourths of a pound of dry bark per tree as he had hoped for, the return was not likely to average much more than one-fourth pound per tree. Now in such a case it is very probable, considering the altitude, that the growth of two more years would double, if not treble the average crop of bark. Lower down the case is very different. "What do you think,"—writes a Kelebokka correspondent to-day—"of 7¾lb. dry crown bark from a 5½-year old tree (large-leaved variety)?" We can only say that we suppose this return is the maximum yet experienced in Ceylon of crown bark for the age mentioned. Our correspondent should have said whether root bark was included. We suppose not. The largest return of red bark reported to us was that obtained by Mr. Chippindall from an old tree in the Nilamber district which made up—with roots, stem, and branch bark—the grand total of 60lb. when dry, but we have since heard of three trees on Durrawella estate, Dikoya, yielding an average of 62lb. each, and of another tree on New Forest cut for the third time, the total of three crops including root bark being over 60lb.! In Dilosbagie, Mr. Blackett not long ago cut down a thirteen-year old tree from which he got, we believe, 28lb. dry bark. It is only by bringing together such varied experience that reliable data can be framed as to the prospects and value of cinchona cultivation in different districts. The large number in our planting and mercantile community who are interested in this important industry, will therefore, be glad to learn that in connection with the preparation of a "Ceylon Cinchona Planters' Manual" (which has been placed in competent hands) we have arranged to have all the valuable information in the *Observer* files and directories collated and a circular issued to obtain the results of experience gained in different districts in regard to a number of doubtful and interesting points.—*Ceylon Observer.*

RENEWING OR COPPICING CINCHONA.

THE suggestion made in a communication by a correspondent in our present issue, in regard to experiments on the renewing system by means of cattle manure, instead of moss, will we hope be tried on a small scale. There has never been, we believe, any doubt as to the superior advantage of the renewing system over that of coppicing; and if it be found that the substitute for moss recommended by our correspondent is equally efficacious, a great part of the difficulty will be overcome. The removal of the bark from a standing tree in alternate longitudinal slips, is a task involving no doubt more trouble, care, and time, than the stripping of bark from felled trees, but in the case of the experiments which are recommended, it will be sufficient that the planter carries out the process on such a number of trees as he may be able to bark with his own hands: should it be found successful, there need be no difficulty in training careful labourers to perform the work on a larger scale hereafter. The question to be determined by the process suggested is of course, not merely to promote the formation of bark, but to assist in the deposit of the alkaloid within it, and although the bark may be rapidly restored, as related by our correspondent, it will still remain to be seen what period is required for the formation of the only alkaloid whose presence alone can give it market value. There is no reason that we can see why the substance recommended should not aid in the formation of these substances as rapidly and as effectually as moss. The experiment is, however, well worth the trial, and it must be left to time to demonstrate the results. There is no doubt much yet to to be learnt in regard to the growth of cinchona as a profitable investment, and naturally as the supply of the article increases, and the market value declines, which must inevitably be the case, the inducement to effect improvements in our mode of culture will become stronger from the very force of competition. We have yet to learn the comparative effect of various soils and altitudes, and modes of cultivation on the formation of alkaloids, as well as the nature of manures to be applied, and looking to the fact of the age at which trees are most productive, all this knowledge can only be acquired by a long course of patient and careful investigation. For some time to come there will no doubt, be a good deal of hasty cropping in order to take advantage of the present favourable state of the cinchona market, but as larger supplies go forward there will be less inducement to rush this produce for shipment, and thus time will be allowed for the accumulation of useful facts. If planters will take the trouble to keep a record of experiments and their results, a valuable mass of information will be accumulated that may in the end be turned to good account.—*Ceylon Times.*

PROGRESS OF CINCHONA CULTIVATION.

NOT many years ago the world was dependent for its supply of the most valuable tonic and febrifuge medicines ever discovered, on certain naturally inaccessible and politically disturbed regions of South America, where, at elevations varying from four thousands to eleven thousand feet above sea level, the various species of cinchona trees grow wild. When quinine, first extracted from cinchona bark in 1820, began to be recognised as a prime necessity of healthy life in many quarters of the globe, the utter disregard of future requirements shown by the native bark collectors in their wanton destruction of the cinchona forests gave rise to fears that the supply of bark might eventually cease, and forced European communities to consider the practicability of transplanting the cinchona from the western slopes of the Andes to other and more accessible regions fitted by soil and climate to receive it. For its proper development, the necessary elevation, with a moist atmosphere and an equable temperature equally removed from frost and from excessive heat, were indispensable, and these the Dutch and English Governments were advised would probably be found in certain portions of their extensive tropical possessions, where the need of an efficient febrifuge was specially felt, the Indian Government at that time (1852) spending no less than £30,000 annually in the purchase of quinine and bark. The initiative in this important experiment in acclimatisation was taken by the Dutch, who in the forest-clad mountains of Java found the requisite conditions for cinchona cultivation; and although for many years they were unsuccessful, owing to want of practical knowledge, and to the fact that the species obtained from South America proved

deficient in quinine-producing quality, they have at length overcome their chief difficulties, and Java now exports a considerable quantity of exceedingly rich bark, one of the best quinine-yielding species having been found to thrive there better probably than anywhere else out of South America. In order to obtain plants of the various species of cinchona most valued for their bark, the Indian Government sent an expedition, under the leadership of Clements R. Markham, which penetrated the dense forests of New Granada, Ecuador, Bolivia, and Peru, and after encountering the greatest difficulties and privations, owing greatly to native jealousy of its objects, returned to India with a stock of plants and seeds, greatly reduced through shipwreck in the Red Sea, but sufficient to start the plantations which are now beginning to yield a yearly increasing harvest of bark. The chief plantations are on the Nilgiri Hills, the most salubrious region in India, in British Sikkim, in the Himalaya slopes, and in Ceylon. In Dr. King's recently issued report f r 1878-79 on the Government cinchona plantations in Sikkim, it appears that the number of the trees there planted out amount to more than four millions from which during the same year 264,000lb. of bark had been taken, while the number of trees in the Nilgiri Government plantations is probably not much less. In Ceylon and in the Wynaad, on the other hand, cinchona cultivation is carried on vigorously by private enterprise, the Government gardens being devoted to the propagation of plants and the raising of seedlings. According to a recent writer in the *Pharmaceutical Journal*, there are not fewer than seven millions of cinchona trees planted out in Ceylon. So familiar, indeed, have they become, both to natives and colonists, that, according to the same writer they are now looked upon as indigenous, and the natives, having now the fullest confidence in their remedial properties, "do not hesitate to help themselves to a strip of bark from the nearest tree when occasion necessitates it." Unfortunately the species which thrives best in India, and which is fast superseding all others, is the red cinchona bark—a native of the western slopes of Chimborazo—which contains a smaller proportion of quinine than most of the other species. Quinine, however, is only one of the alkaloids extracted from cinchona bark; quinidine, cinchonidine, and cinchonine being others. These have hitherto been regarded too much in the light of waste products. The Madras Cinchona Commission, however, after experimenting on the comparative values of these four alkaloids as febrifuges, came to the conclusion, which more recent experiments have confirmed, that quinine and quinidine are of equal value in this respect, while cinchonidine is only slightly less efficacious, and cinchonine, though inferior to these, yet possesses sufficient febrifugic virtue to render it highly serviceable as a substitute for more expensive preparations. The Red Cinchona bark which promises to replace all other species in India—3½ millions out of the 4 millions of trees in the Sikkim plantations belonging to it—is specially rich in cinchonidine. The discovery of remarkable febrifugal properties in all the cinchona alkaloids has led the Indian Government to prepare a cheap medicine for the use of the fever-stricken native population, the majority of whom have hitherto been without remedy for their frequent agues owing to the high price of quinine. The new medicine is known as "Cinchona febrifuge," and consists of the alkaloids extracted as a whole. Considarable prejudice existed for some time against this compound, owing, it was said, to the fact that it produced nausea similar to that caused by an overdose of quinine; this effect, however, was proved to have been due to overdosing with "febrifuge," on the supposition that it was weaker than quinine. Taken in equal doses with the latter, it is quite as efficient and not more nauseous. The growing popularity of the Government febrifuge is seen in the increased demand for it. Thus in the year 1874-75 the turn out of the medicine was only 49lb, in 1875-76 it had increased to 1,040lb., and last year, according to Dr. King's report, it had risen to 7,001lb. It now costs about one shilling and ninepence an ounce. Strenuous efforts have of late been made to bring into use in this country the sulphate of cinchonidine as a cheap substitute (two shillings an ounce) for the expensive sulphate of quinine, but although it is believed by medical men who have used it to answer as well as quinine it has not yet overcome the suspicion which always attaches to new and cheap drugs.

It was feared that the cinchonas removed from their native forests and brought under cultivation would yield less of the febrifugal alkaloids than when in a state of Nature. The opposite, however, has been the result, all the leading species seeming to improve in this respect under cultivation. Still more remarkable was the discovery made by the late Mr. M'Ivor, chief of the Nilgiri plantations, that the cinchona could be made to yield a still greater amount of alkaloid by simply protection its bark from the action of sunlight. Exposed to light, the bark was observed to have a tendency to redden, the colouring matter being supposed to be produced at the expense of the alkaloids, and Mr. M'Ivor found that, by covering up the stems of his plants with moss, he could double and even triple the productiveness of the bark. In South America it has been the invariable practice to cut down the tree in order the more readily to denude it of bark, but in the Indian cinchona plantations, this wasteful process has been proved to be unnecessary, the trees there being made to yield successive crops of bark by taking off longitudinal strips from top to bottom in successive years, and covering over the naked portion with moss, when a renewal of bark takes place. This method has been attended with success in the Nilgiri plantations. Owing however to the presence of ants which, getting beneath the moss, eat the young bark as quickly as it is formed, this highly economical method is not available for the Sikkim cinchonas. Another method largely adopted in India and Ceylon is that known as "coppicing," in which the tree being cut down almost to the ground, a crop of shoots is given off from the still vigorous roots which in the course of a few years yield a valuable bark. Up-rooting is also practised enabling the cultivator to obtain the root bark, which is the part containing the largest proportion of alkaloid, this proportion diminishing, it is said, as we ascend the stem. Owing to the wreckless manner in which the bark-peelers of the Andes have conducted their operation they have gone far to kill the goose which for about two centuries has laid for them the golden egg. Thus of yellow cinchona the richest of all the barks, little is now obtained from its native forests of Bolivia and Peru, our supplies being chiefly drawn from Java and India. Considerable quantities of what are known in commerce as Columbian and Carthegena barks are exported from New Grenada and are employed exclusively in the preparation of quinine. That the importance of this source of quinine is still considerable, was shown in the great increase a few years ago in the price of this alkaloid due to civil war in New Grenada and Columbia which for a time at least, almost, annihilated the trade. That the closing of this source of supply was not more severely felt, was entirely due to the large imports of bark from Java and India. The wealthy landed proprietors in the cinchona States of South America are beginning to realise the necessity of fostering, if they would not lose this source of wealth, and should they begin to plant where hitherto they have only reaped, they might easily retain their hold on the markets of the world. Cinchona culture has been attempted in many parts of the United States, but even in California, where the conditions are most favourable, it has not yet succeeded. Better success, however, has attended its introduction into Jamaica, where, during the last ten years, cinchona plantations have been gradually extending. Jamaica bark is now in the market, and a parcel of it sold in London in September last, fetched 2s. 10d. per pound, "being a higher price," says Sir J. Hooker, in his recent report on Kew Gardens, "than was reached by either East Indian or Ceylon bark sold at the same time."—*Chambers's Journal.*

SILK.

THE Government of the Punjab is evincing considerable interest in the silk industry. An exhibition of silk cocoons was held at Nurpur on 25th April 1879, and a report on the subject, with others of the same nature, has just been issued. The number of exhibitors was 305 as against 5 in the previous year, and the quantity exhibited 70 maunds 20 seers, against 33 maunds and 11 seers at the previous meeting. The sum of Rs. 1,098 was distributed in rewards, and the general impression of the committee was that the industry was steadily gaining ground in the estimation of the people. Extensive plantation of mulberry trees have been laid out, and an experiment tried with the castor-oil plant on the leaves of which certain silk worms feed; but this turned out a failure, the plant not having sufficient strength to resist the Punjab winter. For this variety of worm, it is proposed to cultivate the castor-oil plant afresh every year, in certain suitable localities. One great difficulty in that district is the effect of the periodical hot winds, which is to destroy large numbers of the worms. There seems all the greater reason why the castor-oil leaf-feeding variety of worm should be attended to, as it has been found that it is not so much affected by the hot winds. An English firm has sent an agent with a liberal credit, to commence operations on a large scale, and by means of advances in money and eggs, to encourage the industry among the natives, the firm undertaking to purchase the entire produce for cash. This may tend to develop this useful and eminently suitable industry among the natives of the Punjab.

TOBACCO.

TOBACCO STATISTICS.

THE last number of the *Imperial Statistics of Germany* compares the taxation of the chief nations of the world in respect to tobacco. Of the countries where the sale is a Government monopoly, France last year stood first, the gross duty, with profits, amounting to 7s. 1½d. per head of the population annually, the net revenue from the article being 5s. 8¼d. per head. In Austria the gross was 5s. 5¼d., the net, 3s. 5d., in Hungary, the gross 3s. 3½d., the net 1s. 7d. in Italy, the gross 3s. 11d., and the net 2s. 8½d. In Great Britain, the duty and licences brought in 4s. 10¾d. per head of the population for the year, and in the United States 4s. 4½d. In Germany, on the

other hand, where the duty was very light, the average was no more than 7½d. per head of the population. The new tariff which has been passed this year will make the next return for Germany much heavier. The value of the tobacco consumed in Germany in 1878 is calculated to have been 353 million marks, or £17,650,000 sterling, the total return to the revenue being 26,383,966 marks, or £1,319,198. The quantity consumed in that empire in the year is stated at 2,196,000 cwt., or rather more than 100,000 tons. Of this quantity 589,600 cwt., or upwards of 29,000 tons, were consumed in the form of cigars. Reckoning a hundred cigars to a pound in weight, the number of cigars consumed in Germany in 1878 would be upwards of seven milliards, which would give two cigars a day all the year round to ten million smokers. But besides cigars the Germans smoked in the year 1,327,200 cwt., or upwards of 60,000 tons of tobacco more or less manufactured. In the form of snuff they took 160,600 cwt., or 8,000 tons in the course of the year, while in the way of chewing tobacco they limited themselves to the moderate quantity of 14,200 cwt, or about 700 tons. Rather more than one-third of the total weight of tobacco consumed was grown within the limits of Germany, the quantity so produced in 1878 being 5 377[illegible] cwt., while the imports amounted to 1,768,855 cwt. of [illegible] leaves 4,827 cwt. of roll tobacco, 14,870 cwt. of cigars [illegible],32[illegible] [illegible] of stems, for snuff, 513 cwt of snuff, and 801 cwt of chewing tobacco. The total area of land engaged in growing the plant in 1878 was 10,016 hectares, or about [illegible],520 acres. Two-thirds of the quantity was grown in Rhenish Bavaria, Baden, South Hesse, and Alsace-Lorraine, in which districts [illegible]1,623 hectares were employed in the cultivation of the plant.

TOBACCO IN [illegible]

BIJNOR has witnessed several interesting [illegible] in the growth of tobacco, and as the subject has not yet been [illegible] in [illegible] treated in any part of the Gazetteer notices, the cultivation of [illegible] Indian weed deserves some special notice. [illegible] is not one of the principal crops of the district, and indeed the area over which it is sown [illegible] its usually to less than [illegible] acres [illegible] year. Of this area about [illegible] [illegible] by the sites of abandoned cattle [illegible] on the edge of the [illegible] and the remainder [illegible] village homesteads, or in spec[illegible] the low [illegible] [illegible] the two [illegible] [illegible] with manure, where [illegible] are peculiar [illegible] and in order [illegible], tob[illegible] [illegible]. [illegible] it is grow[illegible] however, have [illegible] as well as a [illegible] enough [illegible] to be strong, and enough [illegible] be loose. As, moreover, the crop is an exhausting one, it must never and is never grown on the same land for two years running. It requires the most careful manipulation and tending, and hence the Sani clan, most painstaking of husbandmen, are the only cultivators who manage to bring it to perfection. The native tobacco grown [illegible] is of three varieties. The *Almarya*, first introduced [illegible] from the Native State of Alwar, has short, broad crumpled [illegible] grew[illegible] [illegible] The *Baingan* on the other hand, [illegible] long thick smooth leaves resembling those of the egg-[illegible] from which [illegible] its name. Lastly the *Desi* or common [illegible] tobacco, has long, narrow pointed leaves, not unlike those of the Virginian variety. The poorer classes prefer to smoke *desi* tobacco on account of its cheapness but the two first mentioned kinds fetch in the market a price fully 2[illegible] per cent. higher. Tobacco is propagated by seed sown in nursery beds during November and December. As the seed is minute, and resembles the earth in color, it is mixed with [illegible] or white sand, to enable the sower to see that he is not scattering it too thickly. During their stay in the nursery bed, the seedlings must be well protected from wind and frost; and when removed hence (in the latter part of January or February, if the season be exceptionally cold), they have usually attained a height of about 2 inches. The beds in which the young shoots are now planted, 6 or 9 inches apart, are about 6 feet square and have been ploughed four times, as well as throughly cleaned. These beds "are flooded once every third day, and the appearance of a weed is the signal for its destruction," but more trouble is experienced in extirpating a nicotine-loving worm which sometimes attacks the roots of the crop.* From the middle of May to the middle of June the mottling of its leaves announce the approaching maturity of the plant; and when those leaves [illegible] crisp if bent, it is considered ready for cutting. The crop is now cut down the whole at once, and left to lie out all night as it fell; no attempt is made to sort the foliage, and indeed no distinctive names for the variously placed leaves exist. In the morning when the leaves, limp and pliant from the dew, are in no further danger of breaking under handling, the crop is gathered up and carried to some smooth spot, generally beneath the shade of a tree. Here they are piled together in fermenting heaps of about a cubic yard in size, the leaves pointing inwards towards the centre, the stalks outwards; and the process of natural fermentation begins. No attention is paid as elsewhere to the drying of the "mid-rib" before fermentation, nor are the leaves artificially damped during that process. But the plants are frequently turned over in the heap, to make fermentation as general and equal as possible, and care is taken to avoid over-fermentation which burns and blackens the leaves. When the process has sufficiently advanced, the heaps are opened out and allowed to cool; and when the leaves are sufficiently dry to be put together without risk of further fermentation, the stalks are plit into four and tied with the leaves int small bundles. The tobacco is, now ready for market. No time for mellowing before sale is given, or indeed required; for native tobacco is meant, not to be smoked by itself, but merely to form the basis of a smoking mixture in which sugar, spices and other foreign elements are largely represented. From the roots left in the ground after reaping, springs a scanty second crop; but this is too worthless to repay the care of the Sani, who leaves it to be gathered by the cow-herds, or trodden under foot by their cattle.

Experiments in the growth of foreign tobacco have been carried sufficiently far to show, that were this cultivation sustained by professional planters, the district would be enriched with another source of wealth, and perhaps, another valuable industry. There was apparently no difficulty in finding a profitable market for what was produced; but the producers were amateurs with other work to absorb their attention, and other means of livelihood. In 1868-6[illegible] some land in the Bijnor forests belonging to Colonel Parrott and Major Smith, both of the Stud Department, was sown with seven varieties of tobacco, viz., (1) Virginia, (2) Kentucky, (3) Connecticut, (4) Havanna (5) Manilla, (6) Latakia, and (7) Bhilsa. The seed of the first three was procured from America direct, of the 4th through England, of the 5th and 6th through Calcutta, and of the 7th from Delhi. The Connecticut and Bhilsa growths may be at once dismissed from this narrative, as the latter was a complete failure, and the former, of which nothing is heard, was presumably not a success. By far the most successful in every way was the Virginia, which throve vigorously. Its leaves grew from 2¼ to 3 feet long and from [illegible] to 1¼ foot wide at their broadest part, while its stalks were [illegible] [illegible] in diameter. But its quality was proportionate to its quantity. [illegible] tobacco [illegible] produced was well flavoured and strong, being on that [illegible] account highly appreciated by natives. It was grown for two years [illegible] imported seed, and the plants thus propagated, themselves yielded seed from which in the 3rd year a crop by no means degenerate [illegible] raised. The Kentucky plant, which resembled in appearance the [illegible] [illegible] *Baingan*, produced a coarse and strong tobacco much fancied by natives, [illegible] as a small quantity only of its seed had been obtained it was not grown for more than one season. The same cause prevented the prolonged cultivation of the Latakia plant, which, however, yielded as long as it lasted fair quantities of well flavoured tobacco. Neither Havanna nor M[illegible] plants appear to have thriven, and it is probable that the coldness of the winter climate, and perhaps the soil also, disagreed with them. [illegible] both a small supply of fair tobacco was obtained, but the flavour of the latter [illegible] was too mild to satisfy the native taste. The system of tillage adopted for the foreign, was much as that for the native tobacco, the [illegible] difference being that when transplanted from the nursery beds, the young seedlings were placed more widely apart, at intervals of at least three feet. [illegible] plants were moreover, [illegible] dressed, only 6 or 8 of the most [illegible] [illegible] being allowed to remain on each. Sowings were in one year [illegible] as early as August, when the transplantation was effected in October [illegible] [illegible], ex[illegible] resulted in failure, and about three-quarters only of the crop [illegible] realized. For the preparation of the tobacco, drying sheds [illegible] [illegible] approved principle were erected, from which sunshine was [illegible] excluded. Great care was bestowed on every stage of the manufacture. A sailor from Cuba, who had once worked on a tobacco plantation in that Island, was induced to exchange the longshore fascinations of Calcutta for the less hospitable wilds of Bijnor, and the arrangements were placed under his charge. But some secrets of the curing process adopted he obstinately refused to divulge. A smoking mixture manufactured at Bhogpur out of Virginia mixed with Manilla and flavoured with Latakia, was sold in tins to European purchasers, and obtained for the [illegible] some [illegible] [illegible]. But the growth and manufacture of these tobaccos was not energetically sustained, and a promising experiment was gradually abandoned. Mr. Markham estimates the cost of producing native tobacco at Rs. 81, and the returns at Rs. 144 per acre, the net profit being therefore Rs. 60. The average outturn per acre he gives as 3,837 5/7lb. avoirdupois, and the average price per 92 5/7lb. as Rs. 4. For the European tobaccos larger figures must everywhere be substituted. Even the dried stalks and midribs fetched as large a price as ordinary native tobacco, while the refuse leaves rejected by the curer sold for 2¼ times as much.—*Delhi Gazette.*

* Settlement report paras, 179-80. All Mr. Markham could ascertain about the name and characteristics of this worm was that it is *Kirchi kiem* a kind of creeping thing." The omnivorous white ant leaves the tobacco plant unmolested.

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.

Calcutta, 1st Feb. 1876.

CONTENTS.

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

CORRESPONDENCE.

THE MIDDLEMAN IN TRADE.

TO THE EDITOR.

SIR,—The co-operative movement at home points to the existence of a system, which it is intended to supersede; I mean the interference of the middleman. He is doubtless a necessity, and it is not so much the man as his mode of doing business that is objected to. The usual course of trade at home is for the merchant to import the goods in immense quantities at a time. He acts either as an importer on his own account, or as the agent of some foreign exporter. In either case he deals only in very large quantities. These large parcels get into the hands of the first set of middlemen, who as a rule work for a reasonable profit, and who re-sell to another class, who constitute the middleman, who is so much reprobated, and who disposes of his stock in larger or smaller quantities as may best suit the requirements of his constituents, who as a rule are the vendors who come more immediately into contact with the ultimate consumer. He it is, in conjunction with this vendor, who lays on the prices and leads the consumer to pay a much higher rate than he ought. In the matter of home produce, say beef, we find the retail consumer keeping almost all the profit in his own hands. The current price-lists tell us that the present price of the very best beef is 6 shillings per stone of 8lb., or 9*d*. per lb. Now we know that portions of this meat will sell again for rather less than this amount; on the other hand, the parts that sell at a better price are very much greater than those selling cheaply. We may, therefore, safely affirm that this sum of 9*d*. is a fair average wholesale price. Now let the consumer try what a pound of good meat will cost him in London, and he will understand how much profit the retail dealer makes. The same applies to the course pursued with regard to tea in India. From the published prices realised at the weekly auctions, we can easily understand why the shares of tea companies are, so many of them at least, at a discount, but we cannot understand from those lists why one cannot purchase a pound of tea in Calcutta under a price at least double that realised by the producing company. At random we take the present prices of retail houses in Calcutta :

	R.	A.	
Golden Tip Flowery Orange Pekoe ...	4	8	per lb.
Flowery Orange Pekoe	3	0	"
Flowery Pekoe	2	3	"
Orange Pekoe	1	13	"
Pekoe	1	6	"
Pekoe Souchong	1	5	"
Souchong	1	8	"
Broken Souchong	0	15	"

And this at the very time when the average wholesale price of tea does not exceed 11 annas per lb. If the tea-planters of India wish their teas to secure a market here, they must make other arrangements having that object in view, and that such a market exists is shown by the fact that in the year 1878-79, the quantity of tea imported into India from China and elsewhere abroad was close on two million of pounds. The Indian tea-grower should be able to secure all this traffic for himself, and the importing of China tea should be quite an abnormal transaction.

M. M.

TEOSINTE "REANA LUXURIANS."

TO THE EDITOR.

SIR,—In an article headed "Reana Luxurians" in the *Indian Agriculturist* of the 1st October 1879, we are informed that "this grass is a native of Guatamala, where it is known by the name of "Teosinte." I lately sent a small parcel of seeds for distribution to friends in the Mysore district as "Teosinte." This being the name that it is known

by in its habitat, while "Reana Luxurians" is the name given to it by the President of the Agricultural Society of Paris. Further on it is stated :—" This Teosinte is *trepsaccem monastachyum*, this can only be another name for the same plant, and if so, does not in any way set aside the oneness of "Reana Luxurians" and "Teosinte." One gentleman wrote :—" Thanks for the Teosinte ; there is nothing of the kind in these parts. I have just sent to England for a supply. I have plenty of "Reana Luxurians." Now as I do not know where he got this information, all I can say is, that the article in your October's issue of 1879, has misled us as to the identity of the names, or that allowing it to be the best authority as to the identity, then surely sending to England for "Teosinte" seed was not at all necessary, while the seeds are to be had in India for the mere asking.

In the same article above referred to, it states, "mules, horses, oxen "throw themselves on the cuttings and devour all, even to the stalks " and roots, which shows it is a most saccharine vegetable." A medical gentleman, high up in the service, has come to the conclusion that horses are subject to great pains in the stomach after eating it. If this be correct, then no one will go to any expense or trouble to cultivate it for horses, when consequently its value will be entirely lost as far as fodder for horses is concerned.

Hoping some of your numerous readers and correspondents will kindly give such information as will be useful to all that take an interest in this subject.

OBSERVER.

22nd March 1880.

TEA AGENCIES.

TO THE EDITOR.

SIR,—I have been very much pleased to see you have taken notice of the deplorable position of the jute industry, and that your correspondent, ONE INTERESTED IN TEA, draws attention to one of the numerous heavy burdens we are suffering under in our tea industry.

I think it has not been sufficiently brought out that the agents of the Gowhatty Tea Company, Limited, in charging their Rs. 500 per mensem—equal to 12 per cent. on the gross proceeds of sales last season—have acted only in accordance with the Articles of Association, which were framed in the *rosy days*, when prospectuses were handed about amongst us promising large dividends, and it would then have been ungenerous to have framed these articles excluding agents from participating in the promised golden harvest they were good enough to offer to the public. It is not customary for individuals to draw less than their stipulated incomes, even when unselfish enough to feel that they are overpaid ; but from what I know of the public-spirited agents above referred to, I feel sure they have only to be asked to participate in the misfortunes of shareolders to willingly consent to the reduction of their agency commission to a fair and reasonable amount for the services rendered. They do not stand alone in their present exorbitant agency charge, and it rests with shareholders to bestir and help themselves in looking after their interests.

With the discovery that agents exist who, in addition to an annual or monthly allowance, charge commissions on stores, coolies, &c., and others who cannot account for Companies' funds, it appears high time that shareholders should take a more lively interest in the affairs of companies in which they have a stake than they generally do.

There is but little to be expected from the majority of boards of directors, constituted as they too often are of gentlemen not unfrequently under pecuniary obligations to the agents, or members of, or assistants to, the agents own firm.

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INFORMATION WANTED.

TO THE EDITOR

SIR,—Will you or any of your readers kindly let me know where I can get a thoroughly popular and practical treatise on the cultivation of sugarcane, and on the manufacture of sugar, molasses, rum, &c., also which sugarcane is most suitable for India.

R. C. B.

PROPER TIMES FOR SOWING.

TO THE EDITOR.

SIR,—Will you or any of your readers kindly inform me what is the best time for planting out and sowing the undermentioned :—

Ginger	Cotton
Turmeric	Castor-seed

I have started an experimental farm and any informations regarding the cultivation of the above, with the best soil suitable, will be thankfully received.

I mean to cultivate *Colgong* castor-seed, as it commands a better sale.

What would be the best kind of cotton suitable for cultivation in Bengal?

RAOUL.

FOREST DEPARTMENT.

TO THE EDITOR.

SIR,—I regret to have to say that my last letter did not catch the eye of the proper authorities. It has been my conviction that unless Dr. Brandis changes his mind or makes room for another man, natives will never be allowed a fair share in this branch of the State service. I have already pointed out that natives are admirably fitted for executive service in the Forest Department, if a judicious selection is made. The Forest School at Dehra Doon is a move in the right direction. But though it was started about a year ago, it has not proved successful, for the simple reason that the arrangements are most defective. There are two classes attached to it—one for the probationers, and the other for the apprentices. The candidates for the former must possess a good knowledge of English, surveying and mathematics, &c., and for the latter, a smattering of their own vernacular is all that is required. The anomaly is that after passing the final examination, both obtain certificates of *Forest Ranger*, except in the case of Europeans or East Indians generally, and *exceptionally* promising native students *specially*, when certificates of Sub-Assistant Conservator will be granted. The preliminary obstacles thrown in the way of a native's getting admission into the school, and the relaxation of the rules in the case of the Europeans, betray the narrow mind of the framer of these rules. Now that the Forest School has been started, it is very desirable that it should meet with success. In order to this, as stated by me in my former letter, the Government ought to fix a certain standard. The Conservator of the School Forests may be selected as the examiner, and question papers should be sent to the different centres of examination which may be fixed at the head-quarters of each local Government. The candidates, without distinction of color or creed, should be allowed to appear in the examination, on payment of a certain fee, as in the case of the P. W. Department. The answer papers should be sent to the Director of the School Forests, who would admit the successful candidates in the Forest School. The certificate of Sub-Assistant Conservator should be granted to those who can finally pass the examination among the probationers, and of Forest Ranger to the successful apprentices. The rule that all candidates for appointment should have preliminary training for six months in a Forest division at their own cost, should be withdrawn. For this service will be mostly resorted to by middle-class men, who can little afford to pay for this expenditure. The well-to-do classes would not care for service at all, far less in the Forest Department.

In my last letter I referred to the case of Mr. Battie, who was a Forest Ranger, on Rs. 50, and was promoted to the rank of the Sub-Assistant Conservator on Rs. 200, thus overtopping hundreds of natives who ranked above him. In this I shall refer to Captain Wood's case. He has served as Conservator of Oudh on Rs. 900 for a long time, and his merits have always been recognised both by the local and Supreme Governments. For some reason or other, he is not a particular favorite of Dr. Brandis, and the result has been that on the occurrence of a vacancy in a higher grade of Conservators, the appointment was given away to Mr. Sykes Gamble, who was only an Assistant Conservator, but the *Personal* Assistant to Dr. Brandis for some time. Now, should not the Government of India interfere and put a stop to such a high-handed proceeding of the Inspector-General?

Lord Lytton may be personally engaged in looking to the affairs in Afghanistan, but he has an able Secretary in the person of Mr. Bernard, and can he not look to the important details in connection with this department? It is high time that the Government should redress all such grievances, and frame such rules as would render the working of the department as smooth as possible.

FORESTER.

BAMBOO FOR PAPER STOCK.

TO THE EDITOR.

SIR,- In my last communication I referred to the valuable monograph on the Bambusaceæ by General Munro, published by the Linnean Society ; since then I regret to record the death of that eminent botanist. To him and the late W. Sulpiz Kurz we are indebted for the best standard works on Bamboo, the last publication by Kurz specially published in the "Indian Forester," gives

the most interesting details of the habits and universal uses to which this prolific land is applied throughout the Archipelago and Southern India.

Having enjoyed the privilege of corresponding with both the gentlemen referred to, from their publications as also from information gained from numerous other sources, I will briefly ennumerate some of the varieties of bamboo which appear most suitable for paper-making material.

Although suffering from the disadvantage of not having seen this gigantic grass growing in all its native tropical luxuriance, I have specimens of most of the varieties referred to, these being duplicates of exhibits supplied by the Indian Forest Department for the Paris Exhibition 1878 (sent me from Kew.) Besides these, which are mostly from mature stems, and not collected with reference to paper material, I have received others cut at the early stage of growth, and as mentioned in previous letters, I have carefully and practically tested and found them, as I anticipated, well adapted for that purpose.

The following abound throughout Burmah and Pegu: *Bambusa Brandisii* (wa-boe) *Bamb-Polymorpha* (kya-thorm-wa.) *Bamb. Gigantea* (wa-bo) *Cephalostachyum Pergracile* (Tin-wa or Teng) *Dendrocalamus Rembranaceous* (wa-yai) *Gigantocloa Macrostachya* (wa-net or Talagu) all these grow from 50 to 100 feet or more in height with long internodes and thin annulus or stems, due to which characteristics I find the fibre produced therefrom is finer, stronger, and the yield or propuce greater than from varieties with shorter internodes and thicker annulus.

Bamb. Tulda (Thaik-wa) *Bamb. Longispatha* (wa-ya) abound indigenously in Arakan: Dr. Brandis reports the bamboo forest covers by far the greater portion of the area of this province extending over thousands of square miles. Dr. Schlich reports, "I had to travel for days at the rate of half-a-mile an hour, having "four men (alternately two and two) in front cutting a passage just "wide enough for a man to pass through, the forest is composed "of *Bambusa Longispatha*, and *Bamb. Tulda*."

The supply therefore from the native jungle or forest both in Burmah and Arakan is practically inexhaustible, and the collection of the young season shoots due to the facilities afforded by the numerous rivers for floating, enables this valuable paper-making material to be laid down at a Central Stock Factory at very low cost. I am informed at from Rs. 7 to 15 per 1,000 stems—sufficient to produce from 1½ to 2 tons paper stock.

Bambusa Arundinacea, Bamb. Balcooa, Bamb. Tulda. Bamb. Stricta, prevail throughout Southern India, all of these will produce excellent paper material, although being somewhat less prolific and smaller in growth, their cost for paper stock, dependent however on local circumstances, may be higher than those above referred to.

At all times desirous to receive, as also to afford further information on this subject, sooner or later destined to assume an important position as a profitable industry in our great Indian Dependency.

THOS. ROUTLEDGE.

Claxheugh, Sunderland,
March 4th, 1880.

TEA BULKING.

TO THE EDITOR OF THE HOME AND COLONIAL MAIL.

SIR,—Some time since you were good enough to insert a letter from me, in which I alluded to the experiment which two or three tea planters had made of bulking their teas at the gardens before shipment. I then stated that it was somewhat early to pronounce a definite opinion on the subject, and I am still inclined to the same view; but a circumstance has occurred this week which bears upon the subject so closely, that I think it only right to put you in possession of the facts, that your readers may draw their own conclusions, and guide their policy of garden management accordingly.

On the 26th January the Borelli Tea Company offered for sale, at the London Commercial Sale Rooms, a shipment of 158 chests of tea, in eight lots, average say 20 chests in each, stated to have been bulked in India. Amongst these were two breaks Pekoe and three breaks broken Pekoe, so closely similar in quality, respectively, that it was difficult to make a preference. The remaining three breaks consisted of a Pekoe Souchong, a broken Souchong, and a broken Congou. When the sale commenced some dissatisfaction was expressed by several of the buyers at the apparently needless trouble which had been given them in having to taste five breaks instead of two (of the finer qualities), and the market being rather inanimate at the time, no satisfactory bids were made. The other three lots being complete in themselves and without duplicates, were sold. Shortly after the sale the brokers endeavoured to get offers for the five lots which had been withdrawn; but failing in this they accepted an all round bid for the string from one of the leading buying brokers. As soon as he obtained possession of the teas, he gave instructions to the Dock Company to bulk the two breaks of Pekoe together, and the three breaks of broken Pekoe together, and printed them for sale in their new condition as two breaks. The tea, of course, was not in any way improved. The market was in quite as depressed a state on the second appearance of the tea as it was on the first; and notwithstanding the fact that it was now offered as secondhand, and not on account of the importers, the proceeding was viewed favourably by the trade, and both breaks were sold at a remunerative profit.

Tea planters can draw their own conclusions from this. It is clear that had the teas at first been in only two lots, a better result would have been shown to the garden. It is explained by some that the facilities for bulking teas at the gardens will not admit of treating more than twenty chests at a time. If so, common sense would suggest that if planters have not already the facilities they might easily provide them. There is no reason why it should not succeed if done carefully, and so as to leave no room for doubts as to its thoroughness in buyers minds. It has been said that "the man who makes two blades of grass grow where only one grew before, is a benefactor to the human race;" but, judging by appearances, the planter who makes one large break of tea into two or three small ones, is not by any means similarly regarded by the trade.

I am, &c.,

12th February. D. F. SHILLINGTON.

A CEYLON PLANTER ON TEA PROSPECTS IN AUSTRALIA.

TO THE EDITOR CEYLON OBSERVER.

MELBOURNE, 6th Feb. 1880.

SIR,—Having seen some remarks of yours in an Overland Summary on the subject of Ceylon tea, I send you a few lines to let you know what chance there is of a market being found for it here.

In proportion, to its population, this is the largest tea-consuming country in the world, and when visiting it some months ago, I was much struck with the vile decoction which every one seemed content to drink as tea. At present, the whole of the tea imported comes from China and sells in the auction rooms at prices varying from 8*d* to 15*d*., and it does not suit the merchants to have the Indian or other teas introduced.

I brought down some samples with me, and was told at once that it was not the slightest use attempting to introduce Indian teas, as the public would not have them.

I, however, sent a letter on the matter to the *Argus* and succeeded in drawing public attention to it, there will undoubtedly be a demand for your teas, once they are fairly introduced and made available to the public at a reasonable figure.

The Indian teas are undoubtedly too high priced for this market, but if the growers in Ceylon are not too grasping at first, and are willing to secure a sound and certain market for their produce in the future, I shall succeed in doing it for them in these colonies.

The samples which I brought down were tasted and reported upon by all the leading men here, and they all make the same report, *viz.*, "Good liquor but bad leaf." The leaf is too rough and irregular and buyers are, of course, guided a great deal by appearance. I sent up some offers to growers for their produce by last mail, and, if these are accepted, shall be able to give the public a fair trial of them.

Should the venture be successful, a steady demand for your teas will grow up; if it is a failure, it is hardly necessary to say that this market will be closed to you for years. I have not yet heard whether you intend having a Court at the Exhibition here. It is getting rather late, to apply for space, and every other country in the world seems determined to do its best. It will tell very badly for Ceylon, should the Government and the community not make every endeavour to have it properly represented.

I shall address you again on this subject. Thanking you in anticipation for giving this a corner, I am, yours faithfully,

H. M. ROWBOTHAM.

SOLUBLE *versus* INSOLUBLE PHOSPHATE.

TO THE EDITOR N. B. AGRICULTURIST.

SIR,—Your notice of Mr. Yool's results obtained with ground coprolite phosphate and superphosphate as manures for turnips, cannot be properly called a test of value between soluble and insoluble phosphates.

The manure superphosphate is composed of two salts, sulphate and phosphate, while ground coprolites consist only of one, a phosphate of lime, consequently the turnips grown upon the superphosphate had two of their chief inorganic constituents, sulphuric and phosphoric acids, while those upon the ground coprolites had only one of these acids phosphoric; and to this additional constituent, sulphuric acid, in the superphosphate plot of turnips, may be attributed the better result, and *not* to the solubility of the phosphates.

Six cwt of ground coprolite phosphate, against six cwt. of superphosphate, '*both good of their kind*,' is stated to have been used '*upon the same area of land*.' As such, the turnips upon the former would have an advantage in point of phosphates over those upon the latter manure, as six cwt. of ground coprolite phosphate would contain one hundred per cent. more phosphoric acid than that of the soluble phosphate in the superphosphate applied; and from phosphate in a fine state of division, as that of ground coprolites, the action of the soil would render available sufficient phosphoric acid for doing all that phosphates could, or are required to do, in producing a crop of turnips.

As an inorganic constituent of manure *necessary for application* to turnips, sulphuric acid as actual nutriment stands first, and phosphoric acid second; which is clearly shown in statistics of the chemistry by all analysts of eminence—British, French, and German. The weight of sulphuric acid necessary for application for turnips has been estimated by the same authorities as being about one-third more than that of phosphoric acid, or in other words, phosphates; and what is still more conclusive as to its importance as a manure for turnips, and for the whole of this class of plants when cultivated as green crops, is the deficiency of sulphates in comparison with phosphates in the soils upon which such crops are grown.

Phosphates are found upon the average in loamy, clayey, marly, sandy, and chalky soils, to be seven times more abundant than sulphates; consequently the only logical conclusion to be drawn is, that as turnips and the same class of green crops require about one-third more sulphuric acid as their actual nutriment than phosphoric, and from the soils upon which they are grown containing upon the average seven times more phosphates than sulphates, sulphuric acid for such crops must have a higher agricultural value. Taking the subject from another point of view, results in the field since 1854 point to the great value of sulphuric acid.

The exhaustion of the principal guano deposits about that period, except Peruvian, gave an impetus to the trade in manufactured manures, and which owes its great progress to sulphuric acid. Experimental agriculture twenty years previously had been conducted to a greater extent than it is at present, and by a class of men of higher agricultural research. Ground phosphates had been fairly tried, and many other inorganic constituents considered necessary as manures for promoting the growth of green crops, yet no progress was made until sulphuric acid had become a part of their composition; and no sooner was this done, and means were found to produce sulphuric acid at a reasonable price, than its consumption with phosphates as manure sprang almost at once into an enormous trade, which is still increasing; and the turnip crop from its introduction has become tenfold. The cost at which sulphuric acid can now be produced is not one half of what it was ten years ago, and at this it cannot fail to be one of the mainstays in maintaining the fertility of land under agriculture; for, apart from its value as manure for green crops, its solvent properties exceed those of all other acids; and when in a *proper form for direct application to soils*, its action upon all their inert mineral matter, such as potash and phosphates, locked up in the heaviest and best soils, would undoubtedly render them more fertile.

As an adjunct necessary to apply with guano, sulphuric acid is of the utmost importance; as such manures as ammoniacal or phosphatic guanos, which have passed through all stages of decomposition, and the sulphurous compounds originally in the organic matter of birds' or animal dung composing them having been dissipated, it is to the absence of these that the produce of crops manured with guano have been found inferior in quality to those produced from farmyard dung, where both sulphuric and carbonic acids are present, and to which the better quality of crops well known to every practical farmer may be attributed. Consequently Mr. Yool need have no fear about inferior quality of turnips, or of their containing more water when grown upon superphosphate, without the growth is *too* much *forced* and the *bulbs too large*, as sulphuric acid is one of the principal *constructors* of organic growth in plants; and their albuminous compounds, which represent the highest class of nutriment, cannot be formed without sulphuric acid is present in soils, or is a constituent in manures applied in their cultivation.—I am, &c.

B.

CULTIVATION OF THE PEA.

TO THE EDITOR.

SIR,—With the endeavour to further a rotation of crops in the drier portions of the colony where seeds (grasses) fail, I send the following:—In my harvest report last season, from this district (Oxley) I said "I have a good deal to say about the pea," and promised to send you a few ideas upon the subject. I will now endeavour to do so, otherwise time will run into another "harvest return," which would appear very remiss on my part.

I then said "I thought they (the pea) were destined to be the farmer's best friend as a change, and possibly be the means of establishing a rotation." I was glad to see that several of your correspondents in their harvest reports, were giving their attention to pea cultivation. One said: "They clean the land, and wheat-sick land will carry a good crop of peas, and the following crop of wheat will be quite as good, if not better, than if the land had been in fallow." Another, "Peas are in great favour, and in my opinion, deservedly so, being great cleaners of the soil, cheap to harvest, and as renumerative as any corn crop," &c. One individual, however, gave a very lame and unfarmer-like excuse thus:—"Peas—A few grown with fair results, but the great draw-back to pea cultivation is that they come in at harvest time, and consequently get neglected and shed on the ground."

Regarding leguminous plants in general, such as peas and beans, as a rotation crop, these remarks cannot apply so much to those portoins of the colony enjoying a comparatively cool climate, either from latitude or elevation. In those districts there cannot, or should not, be any difficulty whatever—as a criterion, we may say, all those districts where the potato and other roots grow to perfection, and where ground can be laid down to grasses, clovers in particular. In these districts it is the farmer's own fault if he has no regular system of rotation. There is no difficulty of farming profitably too. Fortunate men thus situated, say I, In fact, the saying is, "any old woman could farm there," peas or no peas. But when we come to the hot and dry portions of the colony, where roots and grasses fail, there you must set your wits to work, and lucky will you be if on one hundred acres in corn, you can show a balance on the right side, after the ground has been cropped for a few years. It is on such land we must cast about for a change, and strive to form a system of rotation, unless science can show us a renumerative "artificial manure" for general purposes, point out what soils it is suitable to, and show us where it is to be procured, and the price we ought to pay for it; something definite, and tangible, so that upon dry soils we may ensure a crop; for although we have had a plethora of talk upon the science of farming for some years now, it has had but little pratical result as far as I know. We must therefore fall back on the system of rotation, for manure we cannot make for one-twentieth part of the land under crop, and even that manure in most cases is procured upon the "rob Peter to pay Paul" system; the cattle rob the pasture in the day time, and deposit the same at night in the yards. But how about the poor grass land?—that, at east, must shift for itself. Bone, flesh, butter, cheese, wool, &c., being continually drawn from mother earth's bank, and nothing whatever placed to credit. This will never do. But to return. The pea therefore appears to be an exception to almost all other farm plants (clovers and rape have some peculiarities, however, but of these another time), science has never been able to explain satisfactorily in what way they provide themselves with nitrogen, not even the famous experimentalists, Messrs. Lawes and Gilbert. They only "suppose that the pea has the power of drawing it from the atmosphere," for, strange as it may appear, on land exhausted apparently of almost every element, they are richest in, *viz.*, the phosphates (the principal corn element), they have the power of procuring the same in some way or other and not only so, but leave the very same land in a better state to grow another crop of wheat, rich in the very same elements—in fact, not only a change, but a preparation for another, crop of wheat. Thus—phosphoric acid in 25 bushels wheat—grain, 11·47; straw, 8·15; total 19·62. Do. in 30 bushels of peas—grain, 16·9; straw 8·11; total 24·20 Thus we see that 30 bushels of peas take more phosphoric acid out of the soil, than 25 bushels of wheat—24·20 against 19·62. This is one of the mysteries whereby Nature manipulates her wonders, and observed long before agricultural chemistry was thought of, as the old rhyme says:—

> "The essence which within them lurkes
> Doth help another rape to be;
> Soe God in endless circle workes,
> And thus ordains His alchime."—OLD M.S.

This, then, is peculiarly the farmer's province, to watch the results and practice, and thereby, in great measure, make himself independent of science. This is why I think farmers in the drier portion of the colony should endeavour to establish the pea in farming rotation of crops. A good rotation, I think would be—first, wheat; second, peas; third, wheat fourth and fifth, grass; or rest with all the manure put on the same and fed with sheep. Anything is better than a bare furrow, as nearly all our outlying soils are deficient of humus; "Nature also abhors a vacuum." But mind, and give so valuable a plant a fair chance. Cultivate (dwell upon that word there is great meaning in it), them, not just throw them on the land, and leave all to Providence; the best faith, which gets the blessing is that which uses the means. Should the ground be stiff, plough twice, the, scarify, and drill if possible, and as the pea is eminently rich in lime and potash—(thus—lime, pulse 2·58 straw 90.25, total, 92·83; potash, pulse 17·50, straw 8·50, total 25)—these should be provided. In clay soils

However, the potash might nearly be dispensed with. The advantages of drilling should be obvious to all. It will come to that ultimately, even our corn crops; as many now perish from being hide-bound with winter rains, the soil should be aërated, but fallow crops more particularly should be drilled. A very efficient drill can be purchased in England for £12 to drill peas, &c., 8 rows from 15 to 24 inches apart, with manure, same time to the amount of 12 bushels to the acre with regulator to deposit more manure in poorer portions of the field, consequently the quality of the soil and crop are rendered more uniform. It is always with reluctance instead of pleasure that one mentions machines when we have such enormous duties staring us in the face. This and a pea-puller £4 in Melbourne (I am now using one), and although not a perfect implement, it is cheap and labour-saving, together with a small horse-hoe are all the extra implements required. The hoe should be used as long as the horse can walk between the rows.

The question will now arise, "If every one went into pea-growing, would not the price be nominal?" I do not think they will ever be lower than maize, and they are far preferable for feed, say 3s. per bushel. But remember you have this instead of bare fallow. Say 30 bushels at 3s., £4 10s., nearly as good as 26 bushels of wheat at 5s., and remember again your land (strangely) is in a state to bear another crop of wheat. But in case they should become a drug in the market, and thrown upon our hands, I will on a future occasion say a little about "what to do with the pea, as feed for farm use."

We have just stacked our pea crop, and I am very well pleased with the as yet apparent yield, not having thrashed yet. The portion of the field which had peas on last season, at the rate of 40 bushels per acre, was put into wheat this season side by side with farm-yard manure; the pea ground, without any manure, is much the best crop, in fact some of it has gone down.

E. H.

King River, Oxley.

AGRICULTURAL EXPERIMENTS.

TO THE EDITOR OF THE "CEYLON OBSERVER."

SIR,—In the "Journal of the Chemical Society" for February, among the extracts from foreign journals, there are a few that should interest an agricultural community.

"Experiments on the Manuring of Barley, by P. Wagner and W. John (Bied. Centr. 1879). The soil in which these experiments were carried out, was a sand containing 1½ per cent. of humus, the phosphate being applied in the following experiments one day before, and the nitrogen (in the form of Chili saltpetre) the day after sowing. The following table shows the quantities of manure applied per hectare and the yield obtained." I may mention that a hectare is equal to 2·47 acres and a kilogramme to 2·2lb.

		Corn. kilos.	Straw. kilos.
(1)	Unmanured	4120	3770
(2)	20 kilos nitrogen	5280	4890
(3)	50 ,, soluble phosphoric acid	4570	4490
(4)	50 ,, soluble phosphoric acid with 20 kilos nitrogen ...	5320	4920
(5)	50 kilos phosphoric acid in the form of freshly precipated phosphate of lime and 20 kilos nitrogen	5600	5110
(6)	50 kilos soluble with 43 kilos insolub'e phosphoric acid in form of phosphorite with 20 kilos nitrogen	5970	5370
(7)	35 kilos soluble and 30 kilos insoluble phosphoric acid as above, with 20 kilos nitrogen ...	5660	5350
(8)	50 kilos solable phosphoric acid in form of phosphate of potash with 20 kilos nitrogen ...	6170	6500

Turning to Johnstone and Cameron, we find that barley, the subject of the foregoing experiments, contains the following ash constituents per 100 parts :—

	Barley grain with husk.	Barley straw.
Potash	21·28	19·32
Lime	2·40	7·00
Phosphoric acid ...	33·17	4·83

Barley seed contains 1½ per cent. of nitrogen.

The abstractor goes on :—" It is evident from the above experiments that although the soluble phosphoric acid yielded poor results, the use of saltpetre proved very advantageous. The reason of this may be looked for in the fact that the soil was so very poor in lime, as not to be able to arrest the phosphoric acid during its percolation through the soil after rains, thus only a small quantity of it came into actual contact with the roots of the barley." In Ceylon soils, oxide of iron would arrest the phosphoric acid. "This of course was different in the cases of experiments (5), (6), and (7) where part at least of the phosphoric acid was applied in the insoluble form, and larger yields were the result.

With regard to experiment (8) the authors do not explain whether the remarkable yield obtained was the result of the way in which the phosphoric acid was combined or of the presence of potash," the latter I should think.

"Manuring Experiments with Oats. By C. Jenssen (Bied. Centr. 1879). A field was marked off into eleven plots of 975 square metres each; of these, two were not manured, the remaining nine being treated with quantities of manures of various sorts equal in value commercially. The table following shows the various manures used and the resulting produce :—

	Quantity applied per Hectare. Kilos.	Grains. Kilos.	Straw. Kilos.	Chaff. Kilos.
Chili Saltpetre	19	201	268	29
Unmanured	—	151	190	18
Bone-meal	25	181	227	21
Bone-meal Superphosphate	25	173	216	21
Ammoniacal Superphosphate	22	177	199	20
Peru Guano	16	181	209	17
Unmanured	—	168	191	16
Bone Guano Superphosphate	31	191	242	17
Animal Manure ...	17·5	172	213	18
Stable Dung	1100·	194	233	23
Majellon Guano Superphosphate	29·5	170	200	11

The above table shows that Chili saltpetre, and, next to it, stable dung and bone guano superphosphate, produced the best yields. Further researches are necessary to establish any conclusions from the above."

"Absorptive Power of Soil Constituents for Gases. By G. Ammon (Bied. Centr. 1879). The substances used in these experiments were sand, kaolin, carbonate of lime, hydrated oxide of iron, gypsum, clay, and humus, all powdered to various degrees of fineness. The author tried the effect of aqueous vapor and ammonia on these substances at various temperatures; his experiments shewing that the most favourable temperature for absorption lay between 0° and 10° c., and that the quantity absorbed varied directly with the fineness to which the substance had been powdered.

The following are the numbers obtained 100 cubic centimetres of each substance being used, and the water being calculated by volume in state of gas"

I only give the results of the experiments at the two highest temperatures, as these come nearest to the Ceylon temperatures.

Cubic centimetres of water vapour condensed by 100 c. c. of

At		Humus.	Hydrated oxide of iron.	Quartz.
20°c	(68°F)	26,780	98,990	277
30°c	(86°F)	16,497	54,753	99

Carbonate of Lime.	Kaolin.
962	1,541
233	1,335."

From these figures it is easy to see how valuable oxide of iron and humus must be in our Ceylon soils to enable them to resist drought.

"Of ammonia gas 0° c. the following quantities were absorbed :—

By humus.	By hydrated oxide of iron.	By quartz.
29,517	38,992	938

By Carbonate of lime.	By Kaolin
1,552	2,417"

The greater absorptive powers of oxide of iron and humus are again very marked; but the experiments having been made at the freezing temperature, the absorptive powers of all are of course greatly higher than at temperatures prevailing in Ceylon.

"To show the influence of oxide of iron on the absorption of nitrogen by the soil, the author made the following determinations, in which ferruginous sand and clay, and the same substances freed from iron are compared in their absorptive power for nitrogen,

100 c. c. of sand containing iron absorbed 217 c. c. nitrogen.
do. pure ,, 101 ,, ,
100 c. c. of kaolin containing iron, ,, 1687 ,, ,,
do. pure ,, 846 ,, ,,

In the absorption of oxygen, gypsum stands higher than oxide of iron, and next to it for the condensation of nitrogen.

I trust the foregoing may be of interest to some of your readers,

M. C.

Colombo, 8th March 1880.

The Indian Agriculturist.

CALCUTTA, APRIL 1st, 1880.

TEA BLIGHTS.

ON a recent occasion we devoted a few words to the consideration of the so-called leaf disease of the coffee plant, on this we propose making a few remarks on the blights that afflict the tea plant. We do not intend enlarging on them and treating each separately, as we hold the same opinion of them as of the coffee leaf disease, and consider them all as so many exemplifications of the same disease, that being not a leaf, but a root disease.

Let us go to the root of the matter, and instead of wasting time, imagining what will cure the leaf—let us endeavour to put the root right, when we may safely leave Nature to cure any irregularity in the leaf. We need not recapitulate then reasons we gave for holding this opinion, as those already given in the elaboration of our ideas on coffee leaf disease (Vol. IV. page 399), apply with even greater force with regard to tea. In regard to coffee, the method of treatment rendered necessary by the exigencies of commerce, does not amount to a positive thwarting of Nature, so much as to an effort to compel Nature to do more than she would, in the ordinary course of events. Nature, in her efforts to reproduce, does not as a rule exert herself to such an extent as to kill or even injure the plant, and while she is calling on the plant to make a vigorous effort towards this consummation, she takes care that this effort shall be made while the plant is at its best. Hence we find in all plant-life, that the plant is in the highest state of perfection at the ripening of the seed, and immediately thereafter, the season analagous to hybernation in certain animals sets in. The seed having ripened, the plant at once commences to rest—and the tea plant if undisturbed now, would show no signs of life from the end of October till the middle of February, a period of three-and-a-half months. In colder climates the recess would be longer, as in the Upper Provinces where it lasts from the end of October till the middle of March, when the first symptoms of fresh life show themselves, and what is our treatment of the bush during this time. Why we ruthlessly cut i. down to within 18 or 20 inches of the ground, we remove all the young leaves which the pluckers may have left, and leave the plant bleeding at a thousand pores, at a time when its energy is in abeyance. We are not objecting to winter pruning *per se*, but merely showing how it must tell on the vitality and vigour of the plant. Now the roots have to make a vigorous effort to repair this damage, and this at a time when plant-food, owing to the dryness of the season, is not available. However, the tea plant is peculiarly vigorous, and manages to recover itself in time to take advantage of the advent of spring, when it leaps into new life with an energy which is astonishing. The result of the heavy winter pruning, and of the plant's vigorous effort is at once apparent in an astonishing growth of young wood and tender shoots, clothed with the most delicate leaves and buds. This the planter calls the first spring flush, but which the plant, if it could speak, would call fresh lung-power to replace that ruthlessly removed during its hybernation. And how does the planter treat these new lungs, why by at once plucking them off. He has to make up his estimate, if he can, and he cannot afford to indulge in sentimental rubbish of this sort, even if he ever gave the matter a thought. We are not finding fault with the planter, he would not be faithful to his trust, if he neglected to pluck such flushes. We are only looking at how such treatment affects the plant itself, and in how far it militates against the chances of the plant maintaining a general good bill of health. Let us take another excursion into the planter's routine of work. We have said before, that Nature's great aim in all plant-life is reproduction. In the tea plant, then, we will naturally expect all her efforts tending to the strengthening and sustaining of the plant with the ultimate view of producing a crop of seed. Here the planter steps in, and says he does not want seed but leaf. All his pruning and general cultivation are aimed at this, and it is here that he most particularly makes an effort to thwart Nature. Nature's object being to produce seed, the planter's to prevent the growth of seed, at the same time he wishes to keep the plant abnormally healthy, as he wants more leaf than Nature would ordinarily give him. The tea plant is naturally of so vigorous a habit, that the planter can do all this with impunity for a time, but he must not forget that a time comes when the plant's vitality begins to show signs of waning. Before, however, treating of that we have one more peculiarity to speak of. Planters do not require to be told that the China variety is a bush in its habits, while the indigenous is a tree, the hybrid partaking of both, but more particularly of the latter. The natural result of growth, in ordinary cases, is the attainment of maturity. In the China tree we find by experience that being a bush, it will seldom grow over six or seven feet high, while the others will grow forty feet high, if let alone. This is exactly what the planter will not do, he will not let the growth alone, and every winter he carefully cuts the plant down to *his* ideal of what it ought to be, he of course looking at it from a leaf-producing point of view only. We can well understand that this must be detrimental to the plant's health. In the case of the China variety the damage done in this way may not be so great as *it* being only a bush in habit at the best, is not so much damaged by being kept down, but with the indigenous or the many varieties of hybrid, the case is vastly different. Here we have a plant naturally growing into a tree, compelled to remain a bush year after year. Hence we find that blights are usually confined to those districts where the indigenous *jât* and its hybrid varieties prevail. In fact we have not heard of blight attacking China plants so extensively. While the plant above ground is so treated, that under ground is of course not interfered with, and we have the anomaly of a tree under ground, and a bush above. We do not say that this should necessarily be fatal to the life, or even to the health of the plant, but we think we are warranted in assuming that this, and the other operations performed in cultivating the tea plant commercially, cannot fail to have a detrimental effect on it ultimately, because these operations are in very many instances carried on in direct opposition to the ordinary operations of Nature.

One more possible source of these blights. Mr. Cripps recently analysed the ash of the plant and found it as follows:—

Potash	39·22
Soda	·65
Magnesia	6·47
Lime	4·24
Oxide of iron	4·38
Protoxide of manganese	1·03
Phosphoric acid	14·55
Chlorine	·81
Sulphuric acid	trace
Silicate	4·55
Carbonic acid	24·30
	100·00

and on this he remarks:—

"The tea plant is one which extracts from the soil very large quantities of potash and phosphoric acid; and it is to replacing of the

these constituents that the attention of the grower should be directed. It would appear that phosphoric acid and potash are most necessary for the full development of the tea plant, and, unless stores are developed from the subsoil, or their constituents are applied, in the shape of manure, the soil will become exhausted, and disease of the plant a natural consequence of such exhaustion."

Have we done our duty in this connection. While stating, as we have previously done, that sulphur and lime cures, or in fact any other cures which aim at curing a leaf disease, must from these considerations fail, we do not for a moment undervalue efforts made in the proper direction for curing those diseases. Our contention is, that they are not leaf diseases at all, but root or radical diseases, due largely to our mode of cultivation, a mode necessitated by demands of the industry, and therefore unavoidable. Were they the results of ignorance in planting education, they could be remedied by the introduction of a little common sense, but being unavoidable from the very nature of the industry, we must look forward to a continuance of the causes leading to this unhealthy state of the plant, with a view to finding out a remedy to be applied in such a way, that the plant may be helped to overcome and neutralize those continual demands made on it, and how shall we set about this? If we meet with an accident, whereby, we will say, our arm suffers a wound, we at once set about curing the wound by outward application, such wound being purely a local and accidental affair, but if an eruption shews itself on any part of the body, the skilful physician is not content with the use of ointments and lotions, he knows that this is no local disease, but that there is something wrong internally, most probably in the blood, and his efforts are therefore directed towards putting that right, which effected, the local exemplification of the disease speedily disappears. When an athlete is in training for some exceptionally hard work, his trainers nourish him with such food as will best enable him to withstand the demands about to be made on his muscle-power, it may be. Such is the position of the tea-plant. Left to itself Nature will see to it, but if we, for our own purposes make demands on it which Nature never intended or provided for in its organization, we must in common justice so nourish it, that it may be materially helped to withstand those demands, without detriment to health. We have neglected this and an unhealthy habit is the result. A good deal of discussion took place sometime ago as to whether white ants ever attacked a living plant, some holding that they did, and based their opinion on personal observation. They had repeatedly seen living plants attacked by white ants. The other side affirmed that it was utterly impossible, because it was in direct opposition to the nature of the white ant to indulge in anything that partook of life. The truth was ultimately found to lie between the two opinions, and to be, that the white ant would never attack a healthy plant. Now this we consider to be the case with the tea plant. From incessant efforts to overcome the damage sustained by our mode of culture, the plant has ceased to be really healthy, it has become debilitated, and therefore open to the attacks of sundry parasites which would not otherwise touch it. If this line of reasoning be correct, one of two things is open to us. We must either give up tea as an industry, or we must adopt a more generous mode of treating the plant. It is clear that if we are to continue the industry, we must continue to inflict this damage on the plant, and therefore, we must concentrate our attention on the subject of supplying the plant with extra nourishment,—and this we can do in two ways, we must supply the proper constituents necessary to rehabilitate the plant, and we must improve our cultivation. We are not now concerned to recommend any particular manure. Each planter must be the judge of his own requirements in this respect, but that *some* more generous treatment is necessary, we think there can be no doubt. It is no answer that the industry will not stand it. It has stood it in China for centuries, and if we cannot afford to cultivate on sensible principles, we had better give it up altogether. We quite admit that as at present constituted, the industry would cease to exist, if burdened with the cost of this manuring, but we must not forget how often a manager excuses the deficiency in his estimate by a reference to the attacks of blight, and that this deficiency is often as much as two maunds per acre. If the generous treatment which we suggest removes the blight, the tea industry will be thoroughly able to bear the cost of the experiment, and if a pressure be experienced, a saving must be effected elsewhere in the cost, as *this* outlay we consider of vital importance, and absolutely necessary if the tea industry is to survive at all.

EDITORIAL NOTES.

THE recent memorandum on wheat in the North-Western Provinces and Oudh, by Mr. Wright, Magistrate of Cawnpore, does not in reality tell us much that we did not already know, but it places certain facts before us in a form fitted to impress on us the importance of the subject. There is one aspect of the case which does not, however, seem to have attracted the notice it deserves, and it is the relative value to the ryot of an increased outturn. In generalizing on the fluctuations in price of the articles at the point of production, he lays it down as an axiom that "an average rate of 40 lb. per rupee would pay the cultivator, the collecting agents, and the exporter, well." We are concerned here with the first only. Forty pounds, then, per rupee, pays the cultivator. That is to say, in round numbers, two rupees per maund of 3,200 tolahs. We are thus exact, as the maund varies so much in different localities. This supposition is based on the outturn of the district under notice. That outturn he makes out to be 700lb. on the average. Now, if this "pays the cultivator," we take this to mean that after he sells his crop at two rupees per maund, he has say, five rupees per acre left as clear profit, for we cannot suppose it could with justice be said that a crop "paid" the grower, unless it gave him a little profit over and above his actual outlay, and we hardly think Rs. 5 too much for this allowance. If, then, a crop of 700lb. per acre pays the cultivator, how would one of 1,600lb. do so? This latter is about the English average, and if, by improved modes of cultivation, we could increase the ryot's outturn, his profits would be increased in a much higher ratio. For instance, for every maund—valued at two rupees—which he produced over 700lb. per acre, we might safely say that the ryot's share would be at least one-and-a-half rupees, consequently an outturn of 15 maunds would leave him each year Rs. 10 per acre richer than if he only turned out 8½ maunds—his present average. The increased production might tend to lower prices, but on the whole he would benefit largely, by being enabled to improve his cultivation; and we are glad to find the Government are gradually becoming more alive to the great importance of this subject.

THE Government of Madras has we observe with satisfaction, agreed to Mr. Benson's proposal that the free distribution of seeds and models of implements of husbandry to "all who are anxious to experiment with them," should be continued as heretofore. This is very praiseworthy on the part of the Government.

A RECENT supplement to the *Calcutta Gazette* contains an important resolution bearing on the subject of the collection of manures, and the modes adopted by the cultivator with that object in view. The plan most thought of, is a system styled the cattle-box plan, and the co-operation of Government officials and of private individuals is sought to be enlisted in the attempt to obtain reliable information on the subject. We are pleased to notice that the Government of Bengal has been led to consider this subject from the perusal of a report of the Bangalore

Experimental Farm, and of an article in this journal, entitled *manures and their classification* which appeared in the September number of 1879, and which has been reprinted in the *Calcutta Gazette* for 3rd March.

WE observe with satisfaction that it is at last seriously proposed to utilize the Wards Estates for the introduction of agricultural improvements. It is astonishing that this was not done years ago. True, something *has* been done, but in such a manner that little good has resulted. Great results might be anticipated from this movement were the chances not so great that the Government will go the wrong way to work. We note that a beginning has been made by appointing a civilian officer in charge of a large estate of this sort to institute and superintend improvements in agriculture, with the ultimate view of showing what can be done by adopting improved methods. We are not informed where this district is or who the officer is; and it may be uncharitable to suspect that he has been appointed to this post, not because of any special qualifications he possesses, but because he is a "civilan officer." Yet this is the reason why so many Government schemes fail. The men are not selected for the posts, but the posts created for the men. And the result is disappointment to all concerned. It appears to us that it is our duty to do our utmost for the improvement of those estates, apart altogether from our very laudable desire to make them model farms. When a man undertakes a trust, he is bound to exercise the best knowledge and skill at his command in regard to it. Hitherto we have done little for these estates beyond economising their incomes. We have done nothing in the way of improving the condition of the people. Each estate ought to be really a model estate, from every point of view, and while we introduce an improved system—or what we consider an improved system—of land-laws, we should not neglect the improvement of the modes of tillage. When we read the administration reports, which are being issued so freely, we find five or six hundred pages devoted to the exemplification of our doings in a fiscal direction, and perhaps four pages on agriculture! This is not what ought to be in a country where agriculture is the stay of the people.

FROM the Administration Report of Assam for the year 1878-79, we learn very little that really interests the public. These reports may contain matter worthy of perusal by a few district officers, but we question the expediency of spending so much money on them, not to speak of the labour expended on them by officers who might be much better employed at other work. Is it not possible to tell us in these reports what is being done to open up the resources of the province? Here we have a report covering 300 pages, and all we are told of agriculture is contained in 8 pages, and is of the barest nature possible. The tea industry of Assam, which is of such vast importance, is disposed of in two-thirds of a page of information, which practically tells us nothing. We were anxious to learn what had been done in regard to minerals, about which so much has lately appeared in the daily press, but we look in vain; a couple of bald pages are all we find on a subject of absorbing interest: manufactures, too, take up two pages. Can nothing be done to make these reports more interesting? Under the heading of revenue, we are told something about the general progress of several branches of trade, but only in so far as the revenue is concerned: nothing whatever from a commercial point of view. From this one is almost forced to the conclusion that the Government do not concern themselves with material progress, so long as they manage to collect the revenue. We are not specially finding fault with this particular report, which is evidently compiled very carefully,—our objection lies against the system. All these reports are on the same model, and rightly too; but then, the model provided for the guidance of reporting officers should be a good one, otherwise all who follow its leading will continue to compile uninteresting and useless reports.

THE salient features of the Agri-Horticultural Society's show at Madras, were the local grown vegetables from Australian seed, the use of which deserves special attention; experience having already proved it superior to that imported from England for Indian cultivation. It is better adapted to the climate than European seed, it germinates more rapidly, and produces hardier plants.

MR. HARMAN, M.R.A.C.—This gentleman who it will be remembered, was Superintendent of the Mysore Government Experimental Farm at Bangalore, left for Madras *en route* to England for a few months' holiday. After this Mr Harman will we understand return to India having accepted employment under Messrs. Parry & Co., Madras, who we believe, will utilise Mr. Harman's valuable sevices in connection with their numerous coffee-estates in the Wynaad.—*Bangalore Spectator.*

EXPERIMENTS have for some years now been made by the Agricultural Department in selected parts of these provinces, with Australian and English wheat. These experiments have not been confined to ryot or zemindary estates, but have ever been tried in the Government forms and in villages of Court-of-Ward's Estates under the special supervision of special officers. The results of the several attempts to grow foreign wheat in these parts have tended to prove the superiority of the best wheats of these provinces—a fact which has led the local Government, on the recommendation of Mr. Buck, to decide "that the best course by which to secure improvement of wheat production in the N.-W. P. and Oudh, is to extend the distribution of the best provincial wheats, grown in a limited area, to other parts of the provinces rather than to import foreign seed.—*Indian Herald.*

THE *Pioneer* tells us that "a large portion of the district of Cawnpore has become infested with a plague of rats (*musa-gardi*, as the natives call it). The rats cut down the unripe corn, strip off the half-formed grains, and, curiously enough, in many instances, lay them symmetrically on the ground. So far the ravages can only be prompted by a pure instinct of mischief, for no crop is ripe enough for food. But the prospects of the future harvest are seriously affected by this pest, traces of which are plain enough in nearly every field, either in compact blocks or in paths intersecting the field in every direction. The damage so far has been estimated at about two annas in the rupee; but the rats have nearly a month before the harvest, in which to double their average. The cultivators seem helpless: the village pariah is not a good ratter; cats are not procurable; but the mongoose is in great demand. A simple form of rat-trap is used here and there; but, as a rule, the ryot folds his hands and looks upon this last burden as incurable and irremediable."

INDIGO TRADE.—The indigo trade in Madras is likely to assure large proportions since the Government have resolved to exempt that dye from export duty. To give one an idea of the trade it may be noted that, in the steamer *Poona* which left the roads on the 7th ultimo, 728 chests of indigo were shipped from Madras, the largest lot was sent to Suez. In the month of January 7,252 cwt of indigo were shipped from Madras of the value of Rs. 16,91,116. Of the total quantity exported 5,004 cwt. were sent to Great Britain, and 1,604 cwt. to Suez.—*Madras Standard.*

A CORRESPONDENT writing from Mauritius to the *Straits Times*, says:—"A new method of extracting the saccharine matter from the cane, so advantageous that its practical adoption seems almost an Utopia, has lately been projected here by one of our planters who has already secured his invention by a patent. No crushing rollers are used, but the canes are reduced to a pulp by a system of vertical and horizontal saws, and the whole of the saccharine matter is afterwards extracted from the mass. It is well known that great waste of sugar existed from the use of the cane crushing mills generally used, but no remedy could be found. The inventor of the new process promises an increase of 40 to 50 per cent. in future returns from the cane."

Two of the most important works undertaken by the Agricultural Department of N.-W. Provinces, have been the development of a plough calculated to meet the requirements of native cultivators, and the development of a cheap water lift for the same class of people. The Indian plough is an excellent supplement of its kind, but is, what is known to English farmers, as a grubber or sub-soil cultivator, and is not in English farm language a plough at all. Native cultivators have hitherto refused to accept English ploughs, or ploughs made in this country on English principles, on account of their excessive weight, draught, and cost, which are ordinarily about 60lb., 2 cwt, and Rs. 25 respectively. After several experiments, at the Cawnpore farm, the Agricultural

Department have succeeded in turning out a plough to which the native cultivators have taken very readily. The new plough weighs 30lb., has a draught of 1 cwt., and what is most satisfactory, it costs only Rs. 5. Three hundred and fifty of these ploughs have already been sold to ryots and zemindars, who have expressed considerable satisfaction at the manner in which they work, and the demand for the ploughs has so largely increased lately, that Government have ordered their manufacture on a very large scale. The "new cheap" water-lift, which has been introduced, can, we are told, be constructed in any native village for Rs. 15, and has been found so far more effective, at depths of 20 feet, that several ryots have abandoned their own lifts in favor of those of the Government pattern.

THE area under cultivation during 1878-79, in the Central Provinces, was 14,808,667 acres, while in the previous year the cultivation had reached 15¾ millions of acres, that is to say, the district returns gave 15¾ millions as the area sown during that year; there was, however, an error in the returns of the Shambalpur district, which the completion of the land revenue settlement in that district made it possible to correct. The aggregate discrepancy in the cultivated area between the two years compared, to the extent of 411,981 acres, is thus only nominal. It will be seen that the falling off under wheat and rice was in a measure made up by the wheat and rice lands being brought under cultivation of "other food grains," the result partly of rotation, and partly of the peculiar features of the season.—*Delhi Gazette.*

SELECTIONS.

AGRICULTURAL REFORM.

THE last *N.-W. P. Gazette* contains some interesting papers about the management of a certain property called the Awa Estate, now in the hands of the Court of Wards. The detailed account of what has been done is set forth in a note by Mr. Buck, but this enters too fully into the *minutiæ* of agricultural management to be acceptable to the general reader. We pass on, therefore, to certain remarks by Mr. A. O. Hume, the Junior Member of the Board of Revenue, on the general principles involved. Mr. Hume, after praising the contents of the note, says :—

It is no small additional merit, I may add, that it incidentally exhibits in the clearest light the *raison d' être* of the Agricultural Department of the North-Western Provinces, and quite unconsciously, though triumphantly, vindicates this from the thoughtless strictures to which it has in recent times not unfrequently been subjected.

No encomiums, however eloquent, could speak so highly for this as do the glimpses we are here afforded of the department *at work*, of the nature of the difficulties with which it is grappling, and of the spirit in which it encounters them.

Strange as it may appear at the present epoch, opinion, even amongst experienced officials, still seems to be far from unanimous as to the feasibility of effecting any appreciable improvement in Indian agriculture; and officers even in the highest positions are found, who not only express doubts as to the success of any possible attempts in this direction, but who actually, pre-judging the question, unhesitatingly condemn these as an unjustifiable waste of money !

On the other hand, there are many and indeed, I believe a daily increasing majority, who not only hold it to be our plain duty, alike to the people and to the State to make these attempts, but who entertain no shadow of doubt as to their inevitable ultimate success, if only they be guided by knowledge and conducted with sound judgment.

To me, therefore, it is most gratifying to have thus an opportunity of showing, as it were in practice, the kind of measures that we believe to be likely to prove beneficial, and the manner in which we think that these should be approached.

True, Awa is but a tiny spot, a scarcely perceptible speck on our vast empire; but it is none the less fairly typical, as regards soil, climate, population, and agricultural conditions generally, of more than half of the North-West Provinces (to say nothing of other parts of the country); and the tentative measures now (and hereafter, as experience is gained *to be*) proposed for Awa, will be equally applicable to enormous tracts yielding a land revenue of several millions sterling. Any successes here achieved will have been virtually established for this entire area; and as for the method, there can be only one true method; and if we are correct in this here, it is applicable to the whole empire.

It is true, Mr. Hume goes on to say, that—

We cannot *force* civilization, or any of her handmaids, on any people; but it is possible, by patience and tact, if we do ourselves possess the knowledge, so to put before all we deal with, good and evil in any matter, that many shall inevitably choose the good : and this is all that our supposed State intervention in agriculture has ever aimed at. We advocate no system of State agriculture, we do not propose to cultivate the people's land for them, but only by careful study of local conditions, and by the application, with suitable modifications, of methods thoroughly approved elsewhere, to evolve improvements in the indigenous practice; and so put these before all interested in such questions, that they may realize their full scope and verify them for themselves.

If this be not an appropriate and legitimate undertaking for the more enlightened rulers of a less enlightened nation, we must abandon all scientific conceptions of the functions of a Government thus situated.

As for those, if there be any such who honestly disbelieve the possibility of material improvement, and who are ignorant of the thoroughly verified fact that, with improved agriculture (using the word in its widest signification), the great bulk of the land can be made to (and *does* wherever it has been fairly tried) yield from 30 to 70 per cent. more than it now does, no *argument* (which postulates a knowledge of facts on both sides) is possible, and we can only urge them to acquire at least some rudimentary acquaintance with the subjects on which they pass judgment.

Now these proposals of Mr. Buck's appear to me on the whole to illustrate very happily not *only* the kind of measures which we may even now, despite our imperfect knowledge, take in hand cautiously, but also the manner and spirit in which they should be attempted, and the nature of inquires that should precede and accompany them, both as a security for the steps we are actually taking and as a means to future further progress.

In the first place, we have the Director of Agriculture working with and through the local civil officer and in perfect harmony—both (and I speak advisedly, having visited Awa, and having discussed all these questions with them on the spots) subordinating all other feelings to a desire to do good to the people. Joined with the civil officer, by the good offices of the Director, we have an accomplished engineer officer (to whom already the Department of Agriculture, to which Government has attached him, is no little indebted), thoroughly imbued with the Director's view and aims at co-operating in all the civil officer's plans for giving effect to these.

Then, we have a trained native agriculturist, a mere farm labourer a few years ago, now a well qualified practical teacher, who had elsewhere adopted, from conviction on his own land, the improvement he has now to set before the Awa ryots. Lastly, a native officer thoroughly *au fait* at this class of work, collecting amongst the people these multitudinous details of local usage, a knowledge of which is essential, if we are to advance (it may be slowly, but) surely.

No large crude projects are suggested, only the tentative introduction, on a scale sufficiently large to form a safe basis for future operations, of measures which either from their nature or from trials on a smaller scale elsewhere must, we know, unless (as is always possible) some special local conditions interfere, prove more or less a success.

As is right and necessary at this stage of the operations, the proposals refer almost more to inquiries that have to be carried on, and problems that have to be solved as a preliminary to future work, than to work that is to be carried out at once.

Compared with the huge rental of the estate, the expenditure proposed is moderate, and it is of such a nature that even though it may not effect all that is hoped for no material portion of it can be altogether lost; and, taking it as a whole, we may safely predicate that the State will have had the worth of its money either directly or indirectly through its tenants.

It is satisfactory to find that the local Government is heartily sympathetic with the good work thus reviewed. A Secretariat note, under cover of which the papers are now issued, says :—

As to the general question if there be any who doubt that the indigenous agriculture of this country is susceptible of vast improvement, or that to secure this improvement is one, at least, of the most important objects that any Government in India can set before it, Sir George Couper is not amongst the number. On the contrary, he attaches much importance to this work, and heartily endorses all that the Junior Member urges as to the value of the embryo Agricultural Department of these provinces and the energy and zeal of its Director, Mr. Buck. If either are anywhere misunderstood or depreciated it is not in these provinces where they are necessarily best known, nor by the Lieutenant-Governor who may be presumed to be at least as well placed as any one else for forming a correct opinion. Alike in their failures and in their incipient successes, his Honor believes that they have done excellent work, and in some at any rate of the right directions, and he has no doubt that most of what has been expended on and by them has been profitably spent, and will ultimately—in the results for which the way is being thus prepared—prove to have been wisely invested.

OSIER PLANTATIONS.

FROM their valuable economic properties, willow and osier plantation should form a very important feature in many districts, both at home and in the colonies, which are at present entirely neglected, or planted with much less remunerative crops. There are several varieties of willows or osier which, from their various properties, are deserving of more general attention than they at present receive. About 7,000 acres of land in England are devoted to the culture of willows for basket-making purposes, and, in addition to the produce of these plantations, over 5,000 tons of willow stems, valued at £10 a ton, are imported into this country, to be manufactured into baskets, besides ready-made baskets to an equal value. Land, comparatively valueless for grain or other crops, will produce a thriving crop of osiers, the principal care being that wet undrained land should be planted with those hard-wooded varieties, such as *Salix caprea*, *S. alba*, and *S. Humboldtiana*, which produce wood suitable for axe-handles, barrel-staves, &c.; while light dry soil should be devoted to the growth of the species more particularly adapted to basket-making purposes. In addition to this value of their produce, the different kinds of willow have

special qualities which render them of great importance in agricultural operations. The length of their roots enables them to bind together, in a remarkable manner, river banks, or shifting ground on banks and slopes, whether natural or artificial; they form also tall, thick, almost impenetrable and uninflammable screens—excellent protection for cattle, or for delicate shrubs; *S. purpurea* especially is available as a hedge for game preserves, the bitter flavour of the leaves preventing rabbits or cattle from eating it. The young shoots of other kinds, on the other hand, as *S. daphnoides* and *S. tetrasperma*, form excellent cattle fodder ; the flowers of *S. caprea* are eagerly sought after by bees, while *S. fragilis* and *S. alba* contain an abundance of tannin, excelling the oak in this respect, and, at the same time, are rich in salicine (a valuable anti-rheumatic substitute for quinine). This enumeration of some of the virtues of the osier should encourage its cultivation in the colonies, in most of which it will thrive exceedingly, as well as at home.

Osier willow for basket-making grows luxuriantly in Tasmania wherever the thrifty farmer fills up his waste corners with it.

We publish from Baron Mueller's excellent work " Select Plants Readily Eligible for Industrial Culture," a digested account of the various species of willow, which points out their special qualities :—

Salix alba (Linné). The Huntingdon or silky willow of Europe, originally probably from Middle Asia. Available for wet places not otherwise utilised. Height eighty feet, circumference of stem twenty feet ; wood light and elastic, available for carpenter's work and implements, bark for tanning. The golden osier *Salix vitellina* (L.), is a variety. The shoots are used for hoops and wickerwork. With other large willows and poplars one of the best scavengers for back yards, where drainage cannot readily be applied; highly valuable also for forming lines along narrow watercourses or valleys in forests, to stay bush-fires. The charcoal excellent for gunpowder. The wood in demand for matches.

Salix Babylonica (Tournefort). The weeping willow, indigenous in West Asia as far as Japan, sparingly wild, according to Stewart, in the Himalayas, probably also in Persia, Kurdisan, and China. One of the most grateful of all trees for the facility of its culture, rapidity of growth, and fitness for embellishments, also as one of the quickest growing and most easily reared of all shade-trees. Dr. C. Koch distinguishes another weeping willow as *S. elegantissima* from Japan. Important for consolidating river-banks.

Salix Capensis (Thunberg), *S. Gariepina* (Burchell), South Africa. This willow might be introduced on account of its resemblance to the ordinary weeping willow. *S. daphnoides* (Vill.) of Europe and Asia, *S. petiolaris* (Smith), *S. cordata* (Muehlenb.), *S. tristis* (Ait.), of North America, are among the best for binding sand. *S. longifolia* (Muehlenb.), also North American, is among those which form long flexible withes.

Salix caprea (Linné), Europe, North and Middle Asia. The British sallow or hedge willow ; grows also to a tree ; wood useful for handles and other implements, the shoots for hoops. It is largely employed for charcoal for gunpowder. Bark for tanning, particularly glove-leather. The flowers are eagerly sought by bees. It is the earliest flowering willow.

Salix cordata (Muehlenberg). One of the osiers of North America.

Salix daphnoides (Villars). Middle Europe and Northern Asia, as far as the Amoor, ascending to 15,000 feet in the Himalayas. A tree of sixty feet in height, of remarkable rapidity of growth, attaining twelve feet in four years. It is much chosen to fix the ground at railway embankments, on sandy ridges and slopes, for which purpose its long spreading and strong roots render it particularly fit. The twigs can be used for baskets and wickerwork and twigbridges (Stewart and Brandis). The foliage furnishes cattle fodder. The tree is comparatively rich in salicine, like *S. pentandra* (L.)

Salix fragilis (Linné). The crack willow. Indigenous in South-Western Asia. Height, ninety feet stem, to twenty feet in girth. A variety of this species is the Bedford willow, *Salix Russelliana* (Smith), which yields a light elastic tough timber, more tannin in its bark than oak, and more salicine than most congeners. One of the dwarf American willows perhaps *S. tristis* (Aiton), has been traced on the coast sands of California to send out root-like stems up to 120 feet length.

Salix Humboldtiana (Willdenow). Through a great part of South America. This willow is of pyramidal habit, attains a height of fifty feet and more. The wood is much in use for yokes and other implements. Many kinds of willow can be grown for consolidating shifting sand ridges.

Salix lucida (Muehlenberg). One of the osiers of North America.

Salix nigra (Marshall), *S. Purshiana* (Sprengel). The black willow of North America. It attains a height of twenty-five feet. The black willow is one used for basket-work, although it is surpassed in excellence by some other species, and is more important as a timber willow. Mr. W. Scaling, of Basford, includes it among the sorts, which he recommends in his valuable publication *The Willow* (London, 1871).

Salix purpurea (Linné). Of wide range in Europe and West Asia. One of the osiers. In deep moist soil, not readily otherwise utilised, it will yield annually four to five tons of the best of rods, qualified for the finest work. Impenetrable, not readily inflammable ; screens twenty-five feet high can be reared from it in five years. In localities exposed to storm willow-screens fully forty feet high can be raised. It is invaluable also for the reclamation of land along watercourses. Rich in salicine. From Mr. Scaling's treatise on *The Willow*, resting on unrivalled experience, it will be observed, that he anew urges the adoption of the bitter willow (also called the rose willow or the whipcord willow), *S. purpurea* (L.), for game-proof hedges, this species scarcely ever being touched by cattle, rabbits, and other herbivorous animals. Not only for this reason, but also for its very rapid growth and remunerative yield of the very best of basket material he recommends it for field hedges. Cuttings are planted only half-a-foot apart, and must be entirely pushed into the ground. The annual produce from such a hedge is worth 4*s*. to 5*s*. for the chain. For additional strength the shoots can be interwoven. In rich bottoms they will grow from seven feet to thirteen feet in a year. The supply of basket material from this species has fallen very far short of the demand in England. The plant grows vigorously on light soil or warp land, but not on clay. *S. rubra* (Huds.) is also admirably adapted for hedges. The real osier *S. viminalis* (L.), is distinguished by basket-makers as the soft-wooded willow, and is the best for rods requiring two years' age, and also the most eligible for hoops, but inferior to several other species for basket manufacture. *S. triandra* (L) is a prominent representative of the hard-wooded basket-willows, and comprises some of the finest varieties in use by the manufacturers. A crop in the third year after planting from an acre weighs about twelve tons, worth £3 for the ton. *S. fragilis* (L.) and *S. alba* (L.) are more important as timber willows, and for growing hoop shoots. Their rapidity of growth recommends them also for shelter plantations, to which advantage may be added their uninflammability and their easy propagation ; the latter quality they share with most willows. Mr. Scaling's renewed advocacy for the formation of willow plantations come with so much force, that his advice is here given though condensed in a few words. Osier plantations come into full bearing already in the third year ; they bear for ten years and then slowly decline. The raw produce from an acre in a year averages 6 tons to 7½ tons, ranging in price from £2 10*s*. to £3 10*s*. for the ton (unpeeled). Although 7,000 acres are devoted in Britain to the culture of basket willows (exclusive of spinneys and plantations for the farmers' own use), yet in 1866 there had to be imported from the continent 4,400 tons of willow branches, at a value of £44,000, while besides the value of the made baskets imported in that year was equal to the above sum. Land comparatively valueless for root or grain crops can be used very remuneratively for osier plantations. The soft-wooded willows like to grow in damper ground than the hard-wooded species. The best peeled willow branches fetch as much as £25 for the ton. Peeling is best effected by steam, by which means the material is also increased in durability. No basket willow will thrive in stagnant water. Osier plantations in humid places should therefore be drained. The cuttings are best taken from branches one or two years old, and are to be planted as close as one foot by one-and-a-half foot. No part of the cutting must remain uncovered, in order that only straight shoots may be obtained ; manuring and ploughing between the rows is thus also facilitated, after the crop has been gathered, and this, according to the approved Belgian method, must be done by cutting the shoots close to the ground after the fall of the leaves.

Salix rubra (Hudson). Throughout Europe, also in West Asia and North Africa , it is much chosen for osier beds. When cut down, it will make shoots eight feet long in a season. Porcher regards it as one of the most valuable species for work in which unpeeled rods are used.

Salix tetrasperma (Roxburgh). Mountains of India, from 2,000 to 7,000 feet. Height of tree forty feet. This thick-stemmed willow is worthy of a place on the banks of our watercourses. The twigs can be worked into baskets, the wood serves for gunpowder, the foliage for cattle food.

Salix triandra (Linné). *S. amygdalina* (Linné). The almond willow through nearly all Europe and extra-tropical Asia. Height of tree thirty feet. Shoots nine feet long, for hoops and white basket-work, being pliant and durable. The bark contains a good deal of salicine. *S. lanceolata* (Smith) is a hybrid between *S. triandra* and *S. viminalis*, according to Andersson.

Salix viminalis (Linné) The common osier of Europe and North and West Asia ; attains the height of thirty feet. One of the best for wicker-work and hoops ; when cut it shoots up to a length of twelve feet. It would lead too far to enumerate even all the more important willows on this occasion. Professor Andersson, of Stockholm, admits 158 species. Besides these, numerous hybrids exist. Many of the taller of these willows could, Baron Mueller considers, be grown to advantage in Victoria.—*Journal of Applied Science*.

THE MADRAS AGRICULTURAL DEPARTMENT.

THOSE, who are interested in the cause of agricultural reform in India, should carefully watch the working of the Agricultural Department in the Madras Presidency, under its able head, Mr. W. R. Robertson. That department consists of two branches—the Sydapet Experiment Farm and the School of Agriculture. Mr. Robertson's report on these instructions for the year ending 31st March 1878, is so interesting that we cannot resist the temptation of reviewing it, even though several months have elapsed since its publication. The report is one of the most important official documents we have for some time seen ; and it retains its interest quite unimpaired to this day. We will first notice the working of the Sydapet Experimental Farm during the year under review. The year was not, on the whole, a propitious one for agricultural experiments ; yet Mr. Robertson and his staff did their best to achieve successful results. Special experiments to test the value of rotation of crops were made ; and we are

told that another rotation will be tried. Mr. Robertson makes the following remarks on deep ploughing:—"Deep-ploughing, that is the inversion of the soil to a great depth, is in many cases injurious, and I would warn any one from rashly attempting the practice; it has in some cases been known to ruin good land for many years, owing to a raw subsoil, in which nothing would grow, being brought to the surface. Deep cultivation, on the other hand, has almost always most beneficial effects; it is not so much that the outturn is enhanced, but that the soil is not so easily affected by climatic disturbances, and affords a larger field for the roots of plants to search for food in thus maintaining the average of productive power for a much longer period. Unless more manure is used, no extra depth of cultivation can ever permanently maintain an increased outturn, the two things must go together. No doubt under exceptional circumstances, * * * * deep cultivation gives most astonishing results in the shape of increased outturn, but had it not been for the drought the benefits would not in that case have been so easily discoverable. *I can only reiterate an opinion I have long held, that deep cultivation can, if universally followed and efficiently performed, do perhaps more to avert famine in India than almost anything else. It would also, if adopted, greatly enchance the producing capacity of this country, for our surface soils cannot but be in a very reduced condition for the supply of the requisite plant food for our crops, and very much poorer than their subsoils.*" The italics are ours. The great value of deep culture in resisting the effects of drought was possibly brought out in the Sydapet Experimental Farm during the year under review; and those who doubt the efficacy of this operation should study Mr. Robertson's report. Deep ploughing may prove injurious in the deltaic districts of Lower Bengal; where in many places sowing has to be effected by throwing the seed broadcast, but the case is widely different with the other parts of this continent. As deep culture of the soil can resist the effect of drought which is of frequent occurrence in this country, and effectually avert the exhaustion of the soil, simply invaluable.

Equally important are Mr. Robertson's remarks on the use of manures. He—writes:—"Manuring is carried on either to enhance or preserve the natural fertility of the soil and the substances applied as manures all act either mechanically or chemically. It is well known that a crop grown on the land extracts from it certain mineral and nitrogenous substances required for its nutriment, and if the crop be permanently removed from the land, the amount of such substances contained in the produce is lost to it. The capacity of the soil for furnishing plant-food being limited, in the end, if cropping without returning any thing to the soil, as is usually practised on the unirrigated lands of this presidency, be continued, exhaustion must ensue. It has been abundantly proved however by Messrs. Lawes and Gilbert, at Rothstead, that, when a soil is left unmanured for some years and at the same time cropped, the annual productive power of it is reduced to so low a figure that ultimate exhaustion may be deferred for a very great length of time. The soil thus, as it were, possessed a power of protecting itself from the rapacious greed of the cultivator, for although it may contain abundance of the elements necessary for the support of plant life, these being in a presently unavailable condition, are only yielded up slowly in driblets as they become soluble." Important manuring experiments were made at the Sydapet Experimental Farm during the year under review, the results of which are fully recorded in Mr. Robertson's report before us. We notice that of all kinds of manures, saltpetre gave by far the best results; the lowest yield was given where castor-seed husks had been applied. The experiments, observes Mr. Robertson, require to be repeated and amplified before the full value of the results obtained during the year under report can be appreciated. Saltpetre has however been shewn to be a very valuable manure for cereals. In the Madras Presidency the practice of manuring is confined almost entirely to the garden land and this, we believe is more or less the case with the other provinces. The cultivator cannot afford to manure the ordinary crop as he must use for fuel the manurial substances at his command such as cattle dung, leaves of trees, &c., &c. The report before us deals at some length with exhaustion of the soil. "This," it is remarked, "is the natural sequence to the want of attention on the part of the ryot, either through ignorance or otherwise, to the laws of plant-life. It is, however, absurd to suppose that, except in the case of land newly brought under cultivation or which has not been arable for more than a few years, a short personal experience could note any signs of greatly decreased productive power. When soils are reduced to a certain rate of production, it has been found that the time of their ultimate exhaustion will be deferred for a great length of time, owing to the supplies of plant-food in them, when it has been cropped successively for some years without manure, not existing in an immediately available form, these matters are in fact inert, and are only brought into a form in which they can be made use of very slowly; and by the amount annually rendered available for the nourishment of the crops is the productive power of the soil limited. It must be remembered that land may become exhausted for profitable culture under a bad system of husbandry, and be unfitted for ordinary farming, until a large expenditure has been incurred, but still may be able to afford such scanty returns as those with which many ryots are contented. Soils when reduced to such a starving condition feel the difference of seasons, good and bad far more than those which are in a high state of fertility. These facts have been proved conclusively in England and elsewhere." The popular belief in the exhaustion of the soil, it is pointed out, is very strong in Madras; and we believe the same is the case throughout Behar and the Upper Provinces. The ryot in Madras gets 70 or 80 pounds of clean cotton per acre, whereas the American farmer is not contented unless he gets from 450 to 500 pounds per acre. The average yield of rice per acre in Madras is about 15 bushels per acre; but in America 70 bushels per acre is no unusual crop. In Madras a maize crop of 11 bushels an acre would be considered a good one, while in America the yield of this crop varies from 50 to 80 bushels and some times even amounts to 100 bushels per acre. This is the difference between a scientific and a non-scientific system of tillage. But as we have shewn in these columns in our review of Mr. Allan Hume's *Agricultural Reform in India*, the ordinary ryot cannot be expected to adopt a scientific system of agriculture, which must necessarily require the outlay of capital.—*Hindoo Patriot.*

THE WHEAT PRODUCTION AND TRADE OF INDIA.

IN our former paper, we but superficially dealt with this important trade. Reserving our remarks simply to the average yields of the different provinces. This time the subject embraces not only the aggregate yields of the entire empire; but we shall make some attempt to give particulars which without doubt, will be as entertaining as they are instructive.

In a former issue we detailed the outturn of the different wheat-producing tracts in their respective orders; omitting only those provinces where the outturn was of not sufficient importance to merit its being named. We have thus been enabled to form a general estimate of the wheat wealth of the entire Empire. And for the sake of easier reference, we enumerate the districts with their returns in round numbers.

Province.	Wheat area in acres.	Estimated outturn in quarters of 480lb. or 6 maunds.
Madras	22,000 ...	22,000
Mysore	12,500 ...	6,800
Bengal	1,100,000 ...	1,650,000
Central Provinces	3,515,800 ...	3,515,800
Berar	537,800 ...	273,400
Bombay	1,033,200 ...	781,500
Sind	340,800 ...	462,100
Ajmir	16,200 ...	19,700
N.-W. P. and Oudh... ...	6,081,400 ...	8,750,000
Punjab	6,070,200 ...	11,116,700
Total ...	19,329,200	26,548,000

In general terms 19⅓ millions of acres are under wheat and yield 26½ million quarters. Dr. Forbes Watson's estimate of 35 million quarters, exclusive of Native States "thus appears to be too high." The area under wheat cultivation in India, is about six times as great as that of England. In 1878 Great Britain had 3,218,417 acres under this crop. According to the same authority, India stands fourth in point of production. The United States, France, and Russia taking precedence. The Punjab, North-Western Provinces, and Oudh, Central Provinces, Bengal, and Bombay Presidency, including Sind produce most wheat. And it is in the above order, that the provinces stand in point of production. It is interesting to note that the further north wheat is cultivated the larger its yield in grain. In the Central Provinces, the North-Western Provinces and Oudh, and the Punjab, the accepted average yields per acre stands at 8 bushels, 11⅝ bushels, and 13¼ bushels respectively.

Latitude, however, has but little to do with the crop. More depends upon cultivation, the use of manure and irrigation. Irrigation is everything in India; yet it is extremely difficult to give an accurate estimate as to the yield of wheat on irrigated and unirrigated lands. The crop requires moisture, and on unirrigated lands is entirely dependent to the amount of rainfall. It would be idle to deny that irrigation does not improve the yield. For in Nasik, where the experiment was tried, showed that the yield was more than trebled; whilst in Surat it increased by only 50 per cent. There is very little wheat under canal irrigation in Bombay. About 4,957 acres out of a total of 24,536 acres. In Sind, where the yield is far higher, the wheat fields are moistened either by floods or percolation. This is accounted for by the cultivation being chiefly on the alluvial lands of the Indus.

The same conditions prevail in Bengal. In Orissa there is scarcely any wheat cultivation. Artificial irrigation is extremely rare in the Central Provinces. Though some attempt is made to preserve the rain water by embanking the fields. Canal irrigation in these provinces, as well as the Punjab, is in fact a *sine qua non.*

In the North-West Provinces during the year 1877-78, there was a total of 1,461,429 acres under canal irrigation, and of this amount wheat took up 415,793 acres.

And in the Punjab for the same year there were 1,318,026 acres under canal irrigation, of which 342,619 acres are perennial, and 105,195 inundation.*

* Perennial canals are those which are able to irrigate lands all the year round, whilst the inundation canals (which are numerous in Punjab and Sind) are flooded during the rains and can only then be made of use, as they are perfectly dry nine months out of the twelve.

So the average area for five years in the North-West is 453,842 acres, and in the Punjab, including the inundation canals, 881,556 acres. As a rough approximation it may be assumed that the yield per acre in the Punjab of unirrigated lands is between 7 and 8 maunds; of lands irrigated by canals 12 maunds, of land from wells 13 maunds, and of lands irrigated by other means, such as hill streams and natural drainage, 9 maunds. Accepting this classification as correct; we have the following statistics regarding wheat irrigation. It must be borne in mind that the Punjab is the only province for which such figures are available.

Wheat irrigated from	Acres.
" " wells	1,600,000
" " canals	381,000
" " other works not under Canal Department.	426,000
Wheat unirrigated.	4,262,413
Total ...	6,670,000

The yields abovementioned, do not give so high an average as 10 maunds per acre. It must be remembered that a fairly high rate is maintained where the sub-montane tracts have a good rainfall. Whilst in the Multan and Derajat divisions, wheat is, and only can be, cultivated on lands irrigated from canals, surface drainage and hill streams. In these provinces wherever it is possible, irrigation is resorted to; in Bundelkhund the presence of sufficient natural moisture renders it unnecessary. It is "remarked that the extension of canal irrigation has led to a wider cultivation of wheat without a corresponding increase in the manure supply."

It is in the Punjab that the question of irrigation is of such vital moment in connection with wheat cultivation. The total area of this province is 104,975 square miles, of which 35,377 only are cultivated, 30,981 culturable, and 38,617 unculturable waste. There are 9,182,313 acres of culturable waste, the property of Government.

It is not then surprising that under these conditions canal projects have been entertained, estimated to irrigate a million acres for the spring crop.

Owing to financial pressure these canals exist as yet only on paper. But two canals are now under construction—the Sirhind and Swat canals. The first will irrigate 783,000 acres; and the second 120,000 acres. Here the report indulges in a delicious vista of land actually flowing with corn and honey. For it argues that on perennial canals in the N.-W. P. and Punjab, wheat takes up about 40 per cent. of the breadth watered; why should not an additional area of wheat be given to the Sirhind canal of 313,200 acres; and only the Swat canal of 48,000 acres. And then not content, it asks might not a further addition "be made to the wheat area of at least 200,000 acres, or 561,200 acres altogether. At 12 maunds, the acre, the produce for the province, would thus be increased by 1,1.2,400 quarters."

We are now brought to consideration of the question, as to the likelihood of a trade ever springing up in this commodity. Up to the present, little or no hope is held out that the trade will assume any considerable proportions. "There may be some trade with Mediterranean ports; but it is the English demand which has hitherto been effectual." And this is owing to numerous circumstances. The prices of British wheat and food grains in India, the amount of English imports from Russia, the rate of exchange on India and other causes. In 1877, 305,247 tons of Indian wheat were imported to England, and the average price per quarter was 56*s.* 9*d.* in 1878, only 90,965 tons were imported and the price paid was 46*s.* 5*d.* On the whole Indian wheats are now fetching at the rate of about 39*s.* to 40*s.*

Australia and Canada have also taken the field; and if it pays these countries to export wheat to England, there is no reason why Indian wheat should not be able to compete in the home market. But a formidable competion has arisen both in the far west and in the Dominion of Canada; and it will be a long day before India will be able to produce as much wheat as the American virgin tracts are supposed to be capable of doing.—*Indian Herald.*

INDUSTRIES OF INDIA.

Cotton: Its Commercial History.

WE have shown in a former article how very early the Hindoos acquired the art of making cotton fabrics of various kinds from the cotton plant, its uses being well known to them, when other countries were quite in the dark even as to its very existence. Primitive, though their processes were, from the cleaning of the cotton to its conversion into those beautifully fine muslins described as "webs of woven wind," they were effectual, and for the results of their labours the Indian natives were justly celebrated all over the known world. They had no implements, with the exception of their hand-looms, worthy the name of machinery, and prior to the invention of these hand-looms for weaving, used only their fingers and the spinning wheel. Yarn they spun on the distaff, and the patient and practised Indian spinner by the wonderful and careful manipulation of finger and thumb in the formation of the thread, which acquired just the proper degree of moisture by passing through his hands, produced fabrics of surpassing fineness, unequalled indeed, until quite recently, by any machine-aided efforts.

An Indian loom consists of merely a few sticks and reeds, which stock-in-trade the humble possessor carries with him from place to place, so that he is ready at any time to fix it up and begin to work. He chooses usually a shady tree under which he can sit, digs a hole deep enough to hold his legs, and the lower part of the *gear*; the balances being fastened to the branches of the tree above his head; underneath the frame he makes loops into which he places his great toes (the natives are quite as clever with their feet as with their hands); these serve as treadles, and his shuttle, which is merely an enlarged netting needle, he uses as a *batoon.* A loom of this sort has no beam, and the warp is laid out on the ground the whole length of the cloth. The very finest Indian muslins come from Dacca, Santipoor, Sonurga, and Vicrampoor; the price of a single piece of this very fine muslin, which takes an Indian weaver four months to produce, will sometimes amount to Rs. 400 or 500. The striped and flowered muslins of Dacca were formerly considered inimitable, and were so very much thought of and sought for by the higher classes in India, that the demand was greater than the supply. The great skill attained by Indian weavers is not difficult to account for. Weaving is an hereditary art, the same trade going down from father to son for generations. The father teaches his son while young the mysteries of his employment, and the weaver, beginning to practise his trade at an early age, soon becomes a proficient in the art, and with the most simple appliances turns out the very finest work. We write of years gone by: now, the excellence of our machinery, brought as it is to the highest perfection, has not only enabled us to complete with native hand-workmanship but to outstrip it. England has long ceased to depend on India for her fine muslins, and instead of importing such piece-goods from thence, exports them thither.

The art of manufacturing these extra fine materials has therefore languished of late years; still neither English nor Bombay mills have, so far, entirely displaced those hand-made goods which once were so famous. Formerly, Arabia, Syria, Persia, Egypt, Abyssinia, the eastern parts of Africa, besides Europe, were all supplied with muslins from India, the chief marts being Surat and Calicut on the west coasts, and Masulapatam, Madras, and St. Thome on the east coast. Now, the natives confine themselves chiefly to supplying the home market they mostly make their own clothing, common muslins being manufactured still in most of the villages. Cloth goods are also made from their home-grown produce, and the art of weaving, has by no means, died out amongst the people, though not practised to the extent it once was. Those villages removed furthest from the line of rail do the briskest trade in muslins, cloth, calicoes, and printed goods, because European competition is not so much felt in them. The natives dye their cloths red, blue, green, brown, yellow, and intermediate shades of these colours, and also decorate their cotton goods with bands of colour around the borders. Dhawar, Poona, Ahmedabad, Malligaum, Yeola, Ahmednuggur, are all famed for their cotton goods; Surat and Ahmedabad for their 'kincobs,' which are the richest description of goods, having gold and silver threads woven into the fabric, and silk also. Long cloths and pullicats are chiefly made in the Madras Presidency; coarse spun goods and pullicats in Surat; the finest calicoes in Masulipatam; cloths resembling diaper and dimities, as well as the finest muslins, in Dacca; plain and flowered muslins in Benares; 'Baftas' are manufactured in the south-east of Bengal; 'Khasahs' to the north of the Ganges; 'Sunaes' are the chief fabric of Orissa; 'Gurraes come from Birbhoom, and the still coarser cloth, such as 'Gezis' and 'Gezinas,' are woven in most districts, more especially in the Doab of the Ganges and Jumna. The N. Circar long-cloth is made of Berar cotton. Patna is the chief seat of the chintz manufactures, and this original art of the Indian natives is brought by them to very great perfection.

So numerous were the various fabrics produced in India, that as early as 1700, a great outcry was raised by the manufacturers of this country, who, seeing with alarm the rapidity increasing Indian export trade in piece-goods, clamoured for a check to be placed on it, as they fancied that the cheapness and quantity would undermine their own trade. In 1701, therefore, an Act of Parliament was passed to forbid Indian silks and printed calicoes for domestic use, being imported either for wearing apparel or furniture, and very heavy penalties—in some cases as much as £200—were, we learn, imposed on seller or wearer, "to avert the ruin of English manufacturers and revive their prosperity." In those days such an alarm being raised seems to us rather astonishing, for even taking into consideration the extreme cheapness of Indian labour, and the beauty and fineness of their cotton and muslin piece-goods, without mills—for there were none in India then—the Indian natives could not have stood competition with English firms, who backed up as they were by wealth and power could afford to buy up Indian cotton *raw*, ship it thousands of miles to manufacture, mix it with cotton from other countries—notably American cotton—and then send it back in piece-goods to the very country from which it originally came. In these days, however, when Indian cotton mills have increased to such an extent, and protected as their productions have been by the duties, against which so much has lately been said and written, there is far more reasonable cause for alarm; but to this subject we intend to refer later on.

Royle tells us that "cotton was first imported into England, in 1783, when about 114,133lb. were received." But as early as 1684, considerable attention was paid to the exportation of the raw material, and attempts were even then made to save the cost of freight by compressing the cotton into bales by machinery. Many and great improvements have been made in the cotton screw since that date, and such immense pressure is now brought to bear that 392lb. can be compressed into one full bale. Much of the cotton exported in the very early days of the trade was shipped not

to England, but to China. We gather from Maclean that in 1805, the exports of cotton to China were worth 64 79,689 sicca rupees (the sicca rupee being then worth 2s. 6d.), while the London exports only reached 5,88,725 sicca rupees. This trade with China was not of long duration, though, and has fallen now to less than 5 million lb., from 80 million, which it reached in the zenith of the trade.

In the first year of the Free Trade with India (1814) the raw cotton exports, to us, began to increase very considerably, and to a great extent killed the Indian export trade in piece-goods, which had caused so much alarm to British manufacturers. Each year the Indian natives became more willing to export their raw material to England, taking it back again when mixed with American produce in the form of piece-goods, differing from the fabrics they themselves produced in texture and in price. In 1793 American cotton began to be in good request, and as the exports from that country rapidly increased, the demand for East Indian cotton to mix with, is increased also. Between the years 1814 and 1846 various fluctuations both in prices and quality of exported raw material, took place in both India and America; failures in Calcutta in 1820, increase in the prices of American upland cotton in 1836, the Chinese war in 1839, the distress in the home manufacturing districts in 1840 continuing through 1841, the peace with China in 1842, and the increasing prosperity at home in 1845, all contributed to cause these ups and downs in the trade.

The lowering of the price of American cotton caused the marked falling off in the East Indian cotton exports in 1843; they, however, revived in the following year when American produce fell short; and when the American war broke out in 1861, and between that year and 1865, when our supply from America was cut off, then indeed were halcyon days for Indian exporters, and Maclean puts the average value of the cotton exports for those five years at a yearly average of £21,582,847 for Bombay alone. Then began those speculations which ended so disastrously in the "Bombay panic." Companies of all sorts and kinds were formed, joint stock, banks, financial associations, and land companies. But when the American war ended, then came the total collapse of those Bombay speculators who had "plunged" so wildly. By the end of 1866 the financial associations had failed or gone into liquidation, the banks, with one or two honourable exceptions, were blotted out of existence, the land companies became insolvent, and there was one general crash. Maclean has in his "Guide to Bombay" a very interesting account of that city during this season of panic and confusion. As Bombay had had the chief benefit of the wonderful increase of the cotton export trade during the years mentioned, by which some seventy-five millions sterling came into her coffers and gave her the speculation fever, so was she the chief loser by those suicidal undertakings into which the sudden accession of such a vast sum had hurried her.

This panic did not, however, affect her permanently, for in 1874-75 her cotton exports had increased from 34 to 50 million pounds, and the monetary value from 9¼ to 12½ millions sterling.

The cotton mills of Bombay, the first of which was started in 1854, have made, since that date, very rapid progress. We find no less than 41 spinning and weaving mills in the Bombay Presidency at work, and more in the course of erection, while in Calcutta there are 5, 2 in Madras, 2 at Cawnpore, 1 at Nagpore, 1 at Indore, and 1 at Hyderabad in the Deccan, or 53 in all India. These mills give work to 10,533 looms and 1,289,706 spindles, and are nearly all conducted under skilled European supervision. There is to each mill a manager, weaving master, spinning and carding master, and an engineer. The mills are further managed by a Chairman and Board of Directors, with the assistance of a Secretary, there also being an agent. The latter's work is most important; he purchases the cotton, the coal for working the engines, the stores needed, and all other necessaries, arranging moreover the sale of the cloth and yarns. Skilled English labour commands a high price, from Rs. 200 to 400 per month, sometimes running as high as Rs. 500. In some few mills the managers are natives, and before long this will be the case in many more instances, for young natives are now very frequently found serving an apprenticeship in large cotton mills, with a view to qualifying themselves for the posts of managers at some future period. Indian labour is however, as yet far inferior to English, the rate of pay is lower, and therefore the work is done more cheaply, but a native's *physique* is far below an Englishman's, and he is not equal to the same amount of sustained work.

The following extract from "Maclean's Guide to Bombay" will be found of interest:—"A middle-sized mill, say of fifteen lakhs, having 30,000 spindles and 600 looms, employs on an average 1,000 people; whereof 100 or thereabouts are boys and girls, 100 women, and 800 male adults. The hours of work are from 6 A.M. to 6 P.M., with an hour for recess in the middle of the day for meals and smoking. Nearly every mill has a smoking-shed. Fresh Vehar-water is freely supplied to all operatives, and generlly they are all well cared for, much better than work-people employed in other industries in Bombay. The average wages earned by the various mill operatives are as follows:—

For each boy or girl	... ...	5 rupees per month.
„ „ female	... ...	8 „ „
„ „ male ...	... ...	16 „ „

The head jobbers earn as much as Rs. 70 and 80 a month. On an average a mill of the description named above, that is, one having 30,000 spindles and 600 looms, would consume per month—cotton, 238,000 lb; coal, 286 tons; stores and other articles worth Rs. 8,000 and would pay wages to labourers amounting in round numbers to Rs. 12,000. It would produce 20,000 lb of yarn, and 309,000 lbs. of cloth per month.

The treatment of the Indian operatives in cotton mills has recently been brought before the public. Certainly the factory rules and regulations in India stand in need of much amendment, the hours being too long particularly for women and children, and the latter being employed to work in mills at too early an age. This, however, is scarcely a question to be dwelt on here, when the commercial history of the Indian cotton trade is the subject of consideration; we must therefore leave it in the hands of those who have agitated, we hope with success, for the amendment of the Factory Acts in India, and considering that some 40,000 natives are employed in Indian factories, it is none too early to investigate more thoroughly, and strive as far as possible, to ameliorate their present condition by regulating their hours of labour and of recreation, and restricting the age for children commencing work to eight: instances having been given in which mere infants of the tender age of *five* years were set to labour hours at a time in cotton mills.

Bringing the exports of cotton down to date we find that for the last five years the exports of raw cotton have been as follows:—

		Cwts.		Rupees.
1873-74	.. ...	4,499,698	... ...	13,21,22,409
1874-75	... ...	5,600,086	... ...	15,25,73,416
1875-76	... ...	5 0 9,783	... ...	13,27,89,635
1876-77	... ...	4,557,914	... ...	11,74,61,836
1877-78	... ...	3,459,077	... ...	9,38,35,340

The above figures, which are taken from Mr. O' Connor's "Review of the Trade of British India for the official year 1877-78," show plainly the downward course of the last three years. The quantity shipped to the United Kingdom has been ever since 1871-72 falling off each year, England being no longer so large a customer for Indian cotton as she once was. Austria, France, Germany, and Italy are, however, maintaining a fair demand for the article, and their yearly consumption of the Indian raw material is increasing slowly but surely, while the China trade is again looking up, she having taken some 209,000 cwt. in the year.

With regard to manufactured cotton, the following figures, taken from the same source, represent the value of cotton twist and piece-goods exported by India to foreign countries during the last five years:—

		Rupees
1873-74	... ...	52,26,298
1874-75	... ...	51,23,742
1875-76	... ...	66,34,236
1876-77	... ...	81,28,822
1877-78	... ...	1,14,27,323

"At first sight," Mr. O'Connor says, "these figures, as showing that the trade has doubled itself in five years, would be taken as a gratifying indication of the flourishing condition of the cotton, spinning, and weaving industry in India." He goes on to show that such, however, is not the case, the Indian cotton mills having had in recent years much to contend against. Over-production in Lancashire, which glutted the Indian market with Manchester stock, and the failure of crops, which was caused by drought, impairing the purchasing power of the people, are the two chief causes of the trade being unfavourable to the Indian mills; the increase noticeable in the exports being accounted for by the fact that the mills having accumulated large stocks, were obliged to get rid of them at considerable loss in point of value, the exports being increased really by sacrifice of goods.

This increased export is, however, again exercising the alarms of British manufacturers. The *raison d'être* of these renewed fears on the score of Indian competition must be reserved for future consideration.—*British Mercantile Gazette.*

VISIT OF DR. KING TO JAVA.

No 96C, dated Royal Botanical Garden, Howrah, the 22nd November 1879.

From—GEORGE KING, ESQ., M. B., Superintendent, Royal Botanical Garden, Calcutta, and in charge of Cinchona Cultivation in Bengal,

To—The Secretary to the Government of Bengal, Revenue Department.

IN accordance with the orders of Government, marginally noted, I proceeded in August last to Java to inspect the cinchona plantations of the Dutch. Government is aware that, although it is from the species known as calisaya that the most valuable of all the medicinal cinchona barks are obtained, the cultivation of this sort has not hitherto been so successfully prosecuted in British Sikkim as has that of cinchona succirubra. Cinchona calisaya is found to be in Sikkim (as has been explained in several of my annual reports) a very variable species, and its variations are not confined to the form of leaves and flowers, but extend also to the chemical constitution of the bark, that of some of the varieties grown in Sikkim containing nearly eight per cent., of pure quinine, while the bark of others yields very little of quinine, or of any other useful alkaloid. But the differences in external form and of richness in alkaloid are not related to each other in any very definite way, and trees of which the leaves and flowers are so much alike as to be undistin-

Government of Bengal, Financial Department, Agriculture docket No. 39 dated 19th February 1879, forwarding copy of Government of India, Department of Revenue, Agriculture, and Commerce, No. 47, dated 10th February 1879.

guishable from dried specimens have been found to yield bark of quite different chemical composition. It had for some time been known from the official reports on their plantations in Java, that the Dutch have in cultivation there, a variety of calisaya, the bark of which is richer in quinine than any bark ever imported from South America; some of the Dutch samples having yielded on analysis the extraordinary amount of 13·7 per cent. of quinine. The object of my visit was to see exactly what this variety is, and by spending some time in the plantation, to learn what the conditions are under which it has been so successfully cultivated. Before leaving India I was furnished with a letter of introduction from his Excellency the Viceroy, to the Governor-General of Netherlands India, and I have to acknowledge the courtesy and kindness which I received from the Dutch authorities by whom every facility was afforded to me for travelling in Java and for inspecting the Government plantations.

2. The cinchona plantations of the Dutch Government do not, as in Sikkim, form a compact belt, but consist of seven distinct and separate estate scattered over a range of volcanic hills in the centre of the island. These estates range in altitude between 4,000 and 6,400 feet above the sea-level. In all of them the soil is of a dark-brown colour, light and friable, very pervious to water, and almost free from stones. The surface soil is uniform and in general deep (in some places it reaches a depth of 12 to 14 feet), and is rich in vegetable matter. The sub-soil is lighter in colour from the absence of humus, but has similar physical properties. Both surface and sub-soil have as their basis decomposed trachytic rock rich in potash, and they were recognised by Hochstetter (an eminent German geologist familiar with the volcanic regions of the Andes and who recently visited Java) as almost identical with the Andesite formation of the Cordillera on which cinchona is indigenous. The slopes of the hills, on which the plantations stand are so very gentle that washing of soil is very slight and landslips are almost unknown. The drainage water finds its way underground to the larger streams which separate the ridges. The absence of small superficial drainage channels is quite a feature in the country and illustrates well the great permeability of the strata. The natural vegetation in these hills is very like that at a slightly lower elevation in Sikkim. The climate is, however, greatly different from that of Sikkim. At Tjinirœan (5,100 feet above the sea) the temperature at 6 A.M., all the year round ranges from 50° to 59° Fahrenheit, except during the two dry months when it occasionally falls as low as 44° Fahrenheit. The highest temperature during the day is 73·5° Fahrenheit. The mean average over the whole year is 53·5° Fahrenheit, while the constant temperature of the soil at five feet from the surface stands all the year round at 64·04° Fahrenheit. The rainfall for the year varies at the different estates from 120 to 140 inches. The rainy season *par excellence* extends from November to June. Of the remaining four months, August and September are the driest. But there are very few days absolutely without a shower in the afternoon. The rain falls at all times very gently, and violent storms and floods are very rare. It is only during the early part of the rainy season that rain falls during the early part of the day; at other times it falls chiefly in the afternoon. The climate is a remarkably even one, and the weather for the day can be predicted every morning from the temperature about sunrise. Experience at Tjinirœan (the chief Government plantation) has shown that if the thermometer at 6 o'clock A.M. stands at or below 54·6° Fahrenheit, no rain will fall during the day. If it stands at 55·4° Fahrenheit, rain in the afternoon is probable; if at 57° Fahrenheit, rain in the afternoon is certain; while if it stands at 60·8° Fahrenheit rain will surely fall before noon.

3. All this forms a strong contrast to the state of matters in Sikkim. There the basis of the soil is decayed primitive rock (gneiss and mica schist) poor in potash; the surface soil, although rich in vegetable matter, is very irregular in depth, is occasionally very stony, and is everywhere ploughed, up into small channels for the transmission of superficial drainage. The sub-soil is stiff, cold, and little permeable to water. In Sikkim the contract between the temperature of day and night and of summer and winter is great, and the rainfall, although about of the same volume as in Java, is so distributed over the year, that while for seven months everything is saturated with moisture, during the other five hardly a shower falls from the clouds.

4. The fertility of volcanic soils is proverbial, and the partiality of the medicinal cinchonas for such soils, as well as for a cool equable climate where the rainfall is well distributed over the year, has been testified to by all the collectors who have explored the regions of the Andes where they naturally grow. It might be anticipated, therefore, that in Java cinchona would thrive well and especially so as the Dutch are known to be excellent cultivators; and their success has as a fact been great. I have no hesitation in saying that all the species of cinchona are to be found in greater perfection in Java than in Sikkim or the Nilgiris, and (judging from what I saw of their cultivation in that island some years ago) I believe I may also say than in Ceylon.

5. In Sikkim we have, however, the advantage of much cheaper labour than in Java. The expenditure on the Dutch plantations for the year 1877 (the latest for which returns have been published) was fifty-seven thousand guilders (a guilder is of about the same value as a rupee, and in 1876 it was forty-five thousand, the number of plants, including nursery stock, being 2,150,000. In Sikkim, on the other hand, the plantation consisted in 1878-79, of 4,881,055 plants nursery stock being included, and the outlay for the year was Rs. 61,000.

6. The cinchona trees, of which the bark has yielded the Dutch such a high percentage of quinine, have all been raised from a parcel of seed purchased in 1866 by the Dutch Government from an English collector named Ledger after our own India Office had declined to buy them. These seeds were got by Mr. Ledger from a half-caste collector, who would not tell where he collected them, and who was murdered soon after. The exact locality in Bolivia where they were gathered therefore remains unknown. Mr. Ledger's seed produced 6,300 trees which have in late years been largely propagated from. Although these trees differ considerably among themselves in shape and size of leaf, in colour of midribs, nerves, and under surface, and although the bark of individual trees (in so far as it has been analysed) varies as to the amount of quinine contained, the majority agree in being much richer in that alkaloid than any other known variety or species of cinchona. The name ledgeriana was orginally given by the Dutch as a plantation name, to distinguish the produce of Ledger's seed from that of the seed collected by others; but as the points of agreement, both anatomical and chemical, between individual trees so originating is greater than their points of difference, it is quite warrantable to retain the name as that of a very distinct variety of calisaya, if not indeed of a distinct species of cinchona.

7. The 6,300 plants raised from Ledger's seed (which are now thirteen years old) all agree in being rather shabby-looking trees, averaging in height 25 feet, and girthing at 6 feet from the ground twenty-seven (27) inches. They have tall stems and rather small, lax, conical heads, the branches of which are more or less distinctly arranged in tiers. The leaves of the majority are long and narrow, for the most part green, but very often with a tinge of red in the footstalk, midribs, and nerves; while those of a few are of an uniform deep purple colour on their lower surface. The mature leaves of all agree in being quite free from hairs. These trees flower much later in life than the other cinchonas; the flower panicles are small; the flowers which are very sweet-smelling are more or less drooping, of a yellowish-white colour, with a tinge of green in the tube, which is short, wide, and inflated at the base. In the majority of the trees there is a total absence of red in the flower; one, however, of the very richest quinine-yielders has its flowers slightly tinged with pink. The seed-vessels are small, short, and almost globular in shape.

8. The Dutch mode of cultivation is similar to our own. The only method which they adopt, and which we have not hitherto tried, is that of grafting ledgeriana on succirubra stocks, and this plan I shall at once ask Mr. Gammie to try. The Dutch have devised a new way of taking the bark crop which they are very hopeful about. It consists in shaving off the greater part of the bark of a living tree to a height of eight or ten feet from the ground, taking care to leave everywhere a sufficiency to cover the wood. It is found that in Java a tree so treated gradually renews its bark, so that in the course of from twelve to twenty months the renewed bark is as thick as the original. This method is far less likely to injure the health of the trees than Mr. McIvor's plan of stripping and mossing which, after extended trials, has been finally abandoned by the Dutch. The conditions are so different in Sikkim, the lives of individual trees being much less certain than in Java, that I am not sure that the shaving plan can be very advantageously worked in our plantations; but I shall ask Mr. Gammie to give it a trial during the present barking season.

9. I have already stated (paragraph 1) that the trees of calisaya in the Sikkim plantation, present great variety in form of leaf and flower. The barks of all these varieties were submitted to Mr. Wood for report, and his analyses showed that while some of them were very poor in quinine, others contained as much as six and seven per cent. of that alkaloid. The calisaya trees in our plantation were obtained at different times, and from various sources. A few of them were raised from a pinch of Ledger's seed obtained at second hand from the Nilgiris. And I have much satisfaction in informing you that after seeing the Java *ledgeriana*, I have no doubt whatever that our three or four best kinds of calisaya are precisely the same as some of the forms of ledgeriana cultivated by the Dutch. It is true that none of the calisaya barks grown in Sikkim contain so much quinine as the best forms of ledgeriana grown in Java, but this I believe to be an affair of climate and soil. All the Java cinchonas are richer in alkaloid than those of Sikkim, and this will, I believe, always be the case, the physical conditions being so much more favourable in that island.

10. Ever since Mr. Wood's analyses showed the excellence of some of our forms of calisaya, every effort has been made to propagate these artificially, experience having shown that they do not come true to seed. Now that I am satisfied that we have in Sikkim the true Ledger calisaya, I am more strongly than ever of opinion that we should go on increasing the cultivation of it as much as possible. I do not anticipate that we shall be able to grow it quite so cheaply as succirubra, or that we shall be able to produce bark of such high quality as the Dutch. But the object of the Indian Government is not to grow a very fine bark for the European market (which is the object of the Dutch), but from the yield of its plantation to produce a good and cheap cure for fever. And even in Sikkim, where the climate and soil are not so suitable as could be desired, I believe we might grow a bark rich enough in quinine to enable us to turn out pure quinine at probably two or two-and a-half rupees per ounce which is less than the price of the London quinetum (a preparation made in imitation of the Government cinchona febrifuge) and greatly below the market price of quinine.

11. I have no doubt that a more suitable locality for cinchona cultivation than Sikkim could be found further south. The cinchonas in South America are never found further north than 0° nor further south than 29°. Favourable spots might be discovered in Burmah, perhaps in the Andaman Islands, and possibly in the Khasia hills. Such spots should be searched for. In the meantime the conditions in Sikkim appear to me to be sufficiently favourable to promise a moderate success and to warrant considerable extensions of our plantations of yellow bark there. To carry out these it may be necessary to ask for a slight increase in the annual grant for the present plantation. But as that is now being worked to a considerable profit, I hope, when necessary, an additional grant may be allowed.

12. The Dutch Government has hitherto manufactured neither quinine nor cinchona febrifuge from its bark, but has consigned the annual crop to Amsterdam for sale. Of late a few pounds of febrifuge have been made as an experiment at the Medical Depôt in Batavia,—the process followed being that of Mr. Wood, and the product being undistinguishable from his.

13. I may mention that during may recent tour, I have taken every opportunity of collecting living plants for the Botanical Garden and dried specimens for the Herbarium, and that I have brought safely to Calcutta twenty (20) large cases of the former and three (3) of the latter.

THE JADE OF OUR ARYAN FATHERS.

THERE is a good deal of significance in the discussion which has been caused by the discovery of some jade tools in Swiss lake-dwellings. That these tools should be at once recognized as the property of those well-known wanderers, the Aryan race, and that the Aryan race should be supposed to have carried the tools, as they carried their language from their "cradle in Central Asia" to Switzerland, is a remarkable proof of the alacrity of science. The facts as we gather them from a letter published by Professor Max Müller in the *Times* of last Thursday, and from other letters in the same journal, seem to be much as follows. Jade is a mineral which Europe does not produce, and implements of jade have been found in the lake-dwellings of Switzerland. As the mineral is not a European production, and as no one suspects the Aztecs or New Zealanders of having sold it to the lake-dwellers, its original source must be looked for in Asia. How then does the jade come from Asia to Switzerland? Professor Müller has been told, and the information makes him "feel a little giddy," "that the identical scraper was the property of one of the first discoverers of Europe." This is the singular conclusion to which some scientific person has bounded with alacrity. "It was chiefly in order to remove that feeling of giddiness," writes Professor Müller, "that I wished to call attention to another class of tools equally ancient possibly even more ancient, which were likewise brought into Europe from Asia by our earliest ancestors, and which we use every day without feeling the least surprise." Professor Müller alludes to the "Aryan dialects" and his argument seem to be that people who could bring a language with them from a distant home could also bring a jade scraper. And so no doubt, they could; but there does not seem any necessity for supposing that the Aryans carried jade scrapers with them as well as parts of speech.

The *Times*, in a leading article, is naturally much more sure about the matter than Professor Müller. The mind of Professor Müller is slightly staggered by the idea that the scrapers are heir-looms of our Aryan ancestors; but the *Times* proves it to demonstration:—"By a species of exhaustive process of argument the mind is forced to one particular inference. Britons of Brittany, Celts of Ireland lake-dwellers under the shadow of Mont Blanc, must have conveyed with them their jade ornaments and utensils from the far-away home of themselves and jade in Central Asia, for the simple reason that they could have found the material nowhere in their own country. The reason is very simple indeed rather too simple. Let us suppose that, four thousand years hence, a bit of Derbyshire pottery is found in a grave in Merv. A writer in the *Times* of the period will feel justified in saying that, by a species of exhaustric process of argument, the mind is forced to one particular inference. The people of Merv must have conveyed their crown Derby tea-cup from the far away home of themselves and crown Derby in central England, for the simple reason that they could have found the material for Derby ware nowhere in their own country. Then some sceptic of the future will ask weather the people of Merv might not have got the tea-cup by way of commerce. And that theory is not excluded in the case of the jade tool in the lake-dwelling by the "exhaustive process of argument" which forces the *Times* to the inference that the lake-dwellers brought the implement from Central Asia.

In anything like a scientific argument it would be necessary to know among what other deposits the jade scraper was found. Were there none but stone and bone relics in its neighbourhood, or were there weapons of bronze or of other metals? The Swiss lake dwellings are of very different dates. Settlements like them still exist on the coast of New Guinea. Plenty of them survived in the time of Herodotus who describes them. If a Sheffield knife is found in the lake-dwellings of New Guinea, we do not suppose that even the *Times* will urge that the islanders necessarily carried it to their new country from the ancient home of themselves and whittles in Sheffield. There is a simple explanation, which applies just as well to the jade implements in Switzerland. They reached Europe in the course of trade, just as the earlier bronze implements probably reached the lake-dwellers. There is no tin in Switzerland; bronze is found in many of the lacustrine homes, and bronze cannot exist without tin. Perhaps some enthusiasts will maintain that the tin was brought by a new wave of emigration from the east or west. On the other hand if M. F. Lenormant is justified in saying that lake-dwellings continued to exist in Switzerland long after the foundation of Massilia and other Greek towns on the coast of Southern Gaul, it seems quite as probable that bronze filtered through from them to the lake-dwellers as that Sheffield knives reach New Guinea. In the same way the stone instruments, which are found in great numbers in the Isle of Elba are made of a silex which does not exist in the island. They probably were brought over by mariners to barter for some of the produce of Elba.

The antiquity and activity of commerce are facts which the theorists about the Aryan introduction of jade leave entirely out of sight. Why should jade have been brought into Europe by the first discoverers of Europe, where the prehistoric trade routes are well marked and of unknown antiquity? Jade is precisely one of the curious exotic articles which would be in demand when a simple people came in contact with foreign merchantmen. Even in countries where the mineral is common, even among Aztecs and New Zealanders, it is fashioned into relics and held in a certain religious reverence. It is probably, of all stones, the best substitute for metal, and would be hardly less valued than metal when offered in barter. We believe that the whole theory of the introduction of jade by emigrants from Asia is founded on ignorance or forgetfulness of the existence of primæval overland commerce. Whence came the amber which is rudely worked into the necklaces which we find in the earliest Greek tombs? Were the necklaces brought into the Greek islands by Finnish or Scandinavian emigrants from the Baltic coasts? It is well known on the other hand that the Phœnicians got the amber from dealers at the mouths of the Eridanus or Po, and that these dealers were supplied by natives merchants who crossed Germany by a mysterious route, and who carried back into the North the produce of Greek and Etruscan industries. Another trade route from the Euxine sea along the feet of the Carpathians, across Silesia and Pesan to Pomerania and Jutland is marked by the distribution of ancient Greek coins in the soil much as the road of Hop o' my Thumb was marked by the white stones which he dropped as he went. It was from the trade of this route according to some speculators that bronze weapons reached the lake-dwellers of Switzerland. Meanwhile Phœnican commerce had its stations from the Spanish shores where the savage natives worked mines with hammers of stone to the Red Sea and thence to the Indian Ocean. By the Phœnicians all the produce of different nations was distributed as freely as beads and the muskets called "park-palings" are scattered by our adventurers. There is nothing in a state of low civilization, nothing even in the savage state, to make commerce impossible. Articles of barter (women among others) are safely carried across the continent of Australia, through all the hostile or suspicious tribes, by a sort of commercial natives who have the privileges and immunities of mediœval heralds. In Africa, among races still more hostile, there is a constant ebb and flow of exchanges, and European articles filter into the most remote districts of the interior. Our conclusion is, therefore, that the presence of jade implements in the Swiss lake-dwellings is as easily explained as the presence of English beads in African villages where no Englishman has set foot. In the same way we would propose to account for the recent discovery of an Indian money-cowry in a barrow in Cornwall. The cowry came as the beads came, or as that mysterious object of unknown nature, an ostrich shell set in silver, reached the treasury of an early Scottish king. The worthy monarch's records describe the strange possessions, but cannot account for its existence. It was chiefly valued because it was odd, and we may not irrationally believe that the money-cowry and the jade scrapers were prized by primitive collectors for much the same reason. If the lacustrine owner of the jade scraper did not know how to use it as the *Times* supposes, that is only a stronger proof of the fact that he "picked it up" from a merchant-store as a curiosity. This seem rather more likely than the opposite hypothesis, that the Aryan ancestors of the lake-dweller had vapour baths and stone strigils, and that their degenerate descendant while he kept the strigil, forgot the vapour baths.

Our explanation, we feel, is grossly prosaic. It reduces this wondrous jade to the level of the glass bead of commerce. The belief in the virtues of jade as an amulet is to be explained in the same way as the belief in the virtues of countless other fetish stones is explained. We lose sight of "the tempest-buffeted Aryan recovering from his swoon of bewilderment at the strange land on which his feet at length were resting." We have only to offer the sober picture of a lake-dweller, Aryan or not Aryan, swapping some of his produce for the curious smooth stone of some other capitalist. Of course it is impossible to prove that the Aryan (always more or less in a swoon, poor fellow), did not bring the jade, with his grammar and vocabulary, from no one knows where in Switzerland But on the whole, the more sober hypothesis seems quite as probable. We may admit with Professor Müller that he jade "originally came from well-defined areas in Asia" but we see no reason at all to suppose that "it was the property of one of the first discoverers of Europe." Thus for the moment we escape the disagreeable "feeling of giddiness" which besets friends of the Aryan theory. That whole theory is based on a hypothesis that foreign materials could only be introduced to Europe by the first discoverers of Europe.—*Saturday Review*.

CONSUMPTION OF TEA AND COFFEE IN THE UNITED STATES.

THE following figures are taken from the *New York Grocer* :—

Quantities and values of imported tea and coffee retained in the United States for consumption, and the estimated consumption per capital of population, during the years 1830, 1840, and from 1850 to 1878 inclusive :—

Year ended	TEA — Retained for home consumption.	Consumption per capita of population.	
September 30.	lb.	Dollars.	lb.
1830 ...	... 6,878,091	1,582,211	0·53
1840 ...	... 16,888,099	4,067,144	0·99
June 30.			
1850 ...	... 28,199,591	8,982,054	1·22
1851 ...	... 18,504,774	8,452,496	0·57
1852 ...	... 25,587,688	5,927,143	1·03
1853 ...	... 19,291,884	7,024,526	0·75
1854 ...	... 19,236,113	4,938,553	0·78
1855 ...	... 19,763,593	4,937,610	0·72
1856 ...	... 18,181,470	5,250,603	0 64
1857 ...	... 16,500,285	4,344,963	0 57
1858 ...	... 28,766,577	5,877,387	0·97
1859 ...	... 23,119,289	4,927,178	0·76
1860 ...	... 26,326,928	6,980,124	0·84
1861 ...	... 21,016,667	5,424,653	0·66
1862 ...	... 28,208,839	5,906,748	0 71
1863 ...	... 27,021,040	6,981,049	0·80
1864 ...	... 35,851,022	9,977,924	1·04
1865 ...	... 16,849,189	3,043,938	0·49
1866 ...	... 41,511,448	10,510,296	1·17
1867 ...	... 34,135,216	10,839,327	0 91
1868 ...	... 37,658,656	11,918,112	1·02
1869 ...	... 39,141,756	12,889,383	1·04
1870 ...	... 40,812,189	12,386,973	1·06
1871 ...	... 46,972,788	14,274,489	1·19
1872 ...	... 84,224,494	10,710,167	0·84
1873 ...	... 106,423,570	38,088,769	2·55
1874 ...	... 54,410,055	21,050,244	1 27
1875 ...	... 64,708,079	22,641 841	1 47
1876 ...	.. 62,744,429	19,563,885	1·48
1877 ...	... 58 941,178	16,089,241	1 26
1878 ...	... 65,366,449	15,665,742	1 36

Year ended	COFFEE — Retained for home consumption.	Consumption per capita of population.	
September 30.	lb.	Dollars.	lb.
1830 ...	... 38,868,087	3,180,479	3 0
1840 ...	... 86,297,761	7,645,824	5 05
June 30.			
1850 ...	... 129,791,466	9 918,472	5·55
1851 ...	... 148,992,505	12,489,671	6·2
1852 ...	... 180,712,687	13,372,124	7·3
1853 ...	... 185,999,248	14,330,383	7·3
1854 ...	... 150,246,403	13,877,972	5·7
1855 ...	... 175,150,440	15,486,423	6·1
1856 ...	... 223,638,479	20,324,142	7·9
1857 ...	... 216,655,977	19,809 854	7·5
1858 ...	... 174,497,161	16,779,870	5 9
1859 ...	... 246,820.941	23,262,270	8·1
1860 ...	... 182,049,527	19,615,106	5 8
1861 ...	... 177,910,452	16,790,812	5·5
1862 ...	... 113,013,678	12,810,125	3·4
1863 ...	... 74,808,769	9,314,398	2·2
1864 ...	... 127,848,953	15,350,826	3 7
1865 ...	... 84,316,045	5,525,653	2·4
1866 ...	... 175,794,888	19 629,927	5·0
1867 ...	... 172,741.783	19,250,604	4·8
1868 ...	... 212,379,267	22,315.816	5 8
1869 ...	... 280,814,377	22,779,574	6·1
1870 ...	... 218,571,665	25,680,715	6·6
1871 ...	... 294,930,949	39,428,638	7·5
1872 ...	... 289,735,830	26,140,849	5·9
1873 ...	... 401,715.241	5?,651,714	9·6
1874 ...	... 285.569,219	55,034,302	6·7
1875 ...	... 317,017,810	50,448 852	7·2
1876 ..	... 338,548,996	56,825.513	7·5
1877 ...	... 332,004,637	53,684,199	7.1
1878 ...	... 309,956,493	51,914,622	6.5

NOTE.—The consumption of tea and coffee in the United States for each year, from 1830 to 1866 inclusive, is estimated by subtracting the amount exported from the amount imported. For the years 1867 to 1878 inclusive, the amounts of the respective articles entered for consumption at the Custom-houses is taken as the consumption. The population is estimated for years other than the census years 1830, 1840, 1850, 1860, and 1870.

CONSUMPTION OF TEA, COFFEE, COCOA.

THE subjoined table shows the home consumption of coffee cocoa, and tea in the United Kingdom, during each of the past three years :—

		1879.	1878.	1877.
Coffee ...	lb.	34,696,256	33,393,248	32,880.224
Cocoa ...	„	10,111,526	9,930,162	10,060,637
Tea ...	„	160,652,187	157,691,762	151,257,287

PROPORTION PER HEAD OF THE POPULATION.

		1879.	1878.	1877.
Coffee ...	lb.	1·01	·98	·98
Cocoa ...	„	·29	·29	·30
Tea ...	„	4 70	4·66	4·52

Against these figures it is interesting to compare the French home consumption of the same articles, showing the insignificant quantity of tea consumed in France, where, in the small country town, it is sold by chemists as a semi-medicine, or "tisane" for colds, &c., and customers are recommended to take a little rum with the tea.

HOME CONSUMPTION OF COFFEE, COCOA, AND TEA IN FRANCE.

		1879.	1878.	1877.
Coffee ...	lb.	125,037,000	119,031,000	105,162,200
Cocoa ...	„	21,661,200	21,650,200	20,895,600
Tea ...	„	902,000	789,800	805,200

PROPORTION PER HEAD OF THE POPULATION.

		1879.	1878.	1877.
Coffee ...	lb.	3·38	3·22	2·84
Cocoa ...	„	·58	·58	·56
Tea ...	„	·021	·021	·021

PLANTING IN JOHORE.

THE *Ceylon Observer* says :—

Mr. W. W. Bailey, a Ceylon planter, who left for Johore in in December last, favours us with the following account of his "first impressions."

"I have only been to see two ranges, Gunong Panti and Gunong Pulai. I have been nearly all over Gunong Panti, and the jungle and soil certainly compare favourably with any I have seen in Ceylon ; the jungle is, if anything, larger, and the soil very free, and I am sure will grow coffee well. Most of the available land now being opened is less than 2,000 feet elevation, but at that height here one requires two blankets. I am now living in the rest-house at the foot of this range which joins two other (Muntaha and Blumut) much higher, though they have not yet been surveyed, as most men who have been here think that coffee will do better about the elevation of the plantations now being opened. This rest-house is only 300 feet above sea level, and I never feel it too hot. As I write, 5 o'clock P.M., the thermometer reads 72°, and the other day at No. 2 camp, about 1,600 feet elevation, it was down to 63°, early in the morning. Of course I cannot yet give any opinion about the rainfall ; but from all I hear it is very like Uva. I certainly like this range better than anything I have seen, though Gunong Pulai has the advantage of being all opened up at once and of being four hours' nearer Johore Bahru ; but we are quite as near Singapore (about 50 miles), and a large steamer can come from there up the Johore river, to within five miles of this rest-house, to which point a road is to be cut at once by H. H. the Maharajah (there is only a path at present), who is doing everything in his power for the planters and the opening up of his country. Besides this we are to have the Nuwara Eliya of the Straits on a large flat on the top of the mountain. One great pull we have over Ceylon is that there appears to be little or no wind—so much so that I imagine it will be hard to get a good burn. In the last *Observer* I was very sorry to see a letter about coolies having been crimped from Ceylon for Johore. I do not think the coolies were crimped, nor do I think that any of the late Ceylon men now in Johore would crimp coolies belonging to friends they *ought* to have been sorry to leave, but surely the same friends would not grudge us a few Ramasamies to teach the Heathen Chinee how to plant coffee, if got in a legitimate way. The Malays are first-rate men for feeling and talking, but will not work with the mamoty. They are rather like the Sinhalese in many ways; though I do not think they would be complimented by the comparison.

"If we can once get the Chinese to take to coffee planting, there will be no necessity to get coolies from Ceylon or elsewhere, as there is an unlimited supply of the former in Singapore and thousands of them in Johore ; but most of those in the latter are squatters.

"I can see Mr. Mackenzie's first clearing from where I am writing. The filling of 100 acres will be finished in a few days. By all accounts there are plenty of tigers and other wild animals

knocking about. A rhinoceros came to within a few yards of Mr. Garland's camp a short time ago; but the animal wouldn't wait to be surveyed, so I cannot give you the dimensions. I believe there were no shots fired at it."

From the letter of a Straits official to a relative in Ceylon, we have been permitted to quote as follows:—

"I am told that Mr. Deane has many inquiries regarding land in Perak, and many are looking to this country for facilities to embark in coffee cultivation here. Mr. Deane has had experience, in Ceylon and must known what he is talking about, and doubtless the land here is good. If any one applies to you or mentions the subject to you, you may say that from what you have heard the Government will give every assistance, and that the country is one well worth trying. I wrote you that I was afraid perhaps of the seasons being not sufficiently defined, but I have since been told that in the hill districts this is not the case. Anyhow if a man intends embarking his capital in a new country, he will take all this into proper consideration and satisfy himself that he has all he wants before he begins operations. I am led to send you these lines because I learn that there is suitable land in my district for coffee. I hope there may never be occasion for you to come into the wilderness as a pioneer; my experience of this class of men is that they do the rough-and-tumble work and do not reap the proper results. Nor is the life a taking one. I speak from my own experience, and when I look back on what I had to go through as a pioneer, I should be very sorry to see you in such a fix. Labour will be a difficulty here I am afraid as it will all have to be imported. This will come right in time, but the pioneers will have this to face, and the capitalist who will appear latter on the scene will have his path made easy for him. Still I have no doubt that Perak will be a great country some day. I cannot help thinking that this country has an opening for coffee planters, and that it is really worth while for men to come round and see things for themselves."

INTERESTING NEWS FROM JAVA.

(From the *Straits Times*, 19th Feb.)

NETHERLANDS INDIAN NEWS.

"STEAM PLOUGH.—By the steamer *Hendrik* there has arrived, and been landed at Batavia a steam plough that is to be used on the Chikaudie Udek estate in Bantam which as is known, belongs to Mr. Fraser, and is under the management of Mr. Kimball. The plough is manufactured by the firm of John Flower & Co. at Leeds, and is of 8-horse power nominally but of 20 actually. The said firm has sent a skilled workman along with it who had already introduced steam ploughs in to Cuba and elsewhere. We hope, fervently, and on the strength of satisfactory trials anticipate that steam ploughs may succeed here. At present, especially owing to the scarcity of draught cattle, this machine may be of incalculable service."—*Java Bode*, 20th January.

Should this machine—as we have no doubt it will—give in practice equal satisfaction on the rice fields, agriculture in Java, especially during the present scarcity of draught cattle from disease, will possess a powerful assistant, and may become further developed in future. It is estimated that ploughing a *bouw* of land with this machine may cost 10 guilders, and its enterprising proprietor thinks that the purchase money and expenses together (22,000 guilders) may be covered *in one year* by the work done."—*Java Bode*, 30th January.

From the *Dagblad's* report of the trial the following is taken:—

"In flat country the steam plough spares enormously much labour and time. On land in Bantam where draught cattle are now so scarce the machine will be a deliverance. We understand that already many possessors of rice fields have eagerly accepted the offer to plough their fields at 10 guilders per *douw*, because otherwise they have to pay 25 guilders for the same. The *galangans*, however, after the use of the steam plough, which does not stop on their account, must be repaired again which is no small labour. It deserves to be acknowledged that the result of trial by Mr. Kimball, who along with Mr. Forbes, has taken upon himself the sole agency for Netherlands India of Fowler's steam agricultural machinery, is awaited with great interest. Should it succeed, which is scarcely doubtful, people say that the Government intend to order out several of these machines on their account in order to meet the want of draught cattle. Also on the part of several sugar planters attention is being paid to the machine now here, which may play a great part in the approaching crisis of the transition from the contract system to free sugar culture. During the experimental trip with the steam engine this morning, many gentlemen present from the Kalie Besaar were struck with the idea that it might be an interesting festivity for natives and Europeans, if, on the king's birthday the first steam plough in Java could be set to work on the king's plain. Mr. Kimball, the owner of the machine, answered with great disinterestedness that should the Government intimate to him their desire to borrow the plough from him for that purpose on the said day he would willingly for the benefit of the public defer its departure for his estate until the 19th February."

EXPERIMENTS WITH PHOSPHATIC MANURES.

WE are indebted to Mr. Brown for the following report of interesting experiments conducted by him last season:—Having been much interested in the various experiments carried out under the auspices of the Aberdeen Agricultural Association, as also by a number of private individuals, as to the value of certain manures when applied to our turnip crops, but finding that these experiments had been generally confined to plots, and carried out under circumstances and treatment such as could not be practised in ordinary field culture. I, at the beginning of the present season, determined to try the different phosphates, &c., and gave the same treatment as other manures receive in our usual farm practice. Accordingly, when swede sowing had been begun one afternoon, the manure having already been prepared, it was substituted for our ordinary manure. These experiments have not yet been proved; and mention them because, when they had been completed, I wrote to Mr. Jamieson, the well-known chemist of Aberdeenshire, who very kindly replied, and suggested the following should be tried with yellows:—

1. The ground selected to be as uniform in character and condition as possible.
2. The size of each experimental plot to be one-fourth of an acre, and width of drill 27 inches.
3. The application of a general measure containing all the mineral ingredients of plant food other than those experimented with.
4. A nothing plot.
5. Duplicate of each experiment.

The field chosen by me was one of 30 acres, the soil being a good loam, pretty uniform in character; but to reduce any variation to a minimum, each experiment consisited of four drills 40 yards in length, all of which received a fair and regular dressing of about 12 tons farmyard manure—no difference being made from the other parts of the field. The general manure was not applied, as this field lately received a dressing of lime, which would liberate sufficient potash for the wants of the crop, the magnesia being present in the lime; and our Caithness soils are not considered deficient in salt, owing to our vicinity to the sea.

The nothing plot was omitted, as I considered that just conclusions might be arrived at without one; but find out, when too late, my mistake. The quantities of phosphates applied were regulated so that the same amount of phosphoric acid would be applied in each experiment, and represent a rate of 5 cwt. per acre of bones and ground coprolites, extra weight being allowed for the sulphuric acid in the others, with the exception of the last experiment, with consisted of the same kind of manure as was applied to the other parts of the field. The manures applied were all of the best quality, and show first-rate analyses, which might be here given, but refrain, as I am of Mr. Bowie's opinion, that the plainer and more readable such reports as these are made, the better. I may state, however, that the analyses are at the service of any one who may wish them.

The turnips were topped, tailed, and weighed, when the following were the results:—

Manure	Price per acre.			Weight per acre of crop. Tons.	cwt.	qrs.	lb.
1. Coprolites	£1	7	6	12	10	1	14
2. Bone-meal	2	2	4	15	6	3	17
3. Dissolved bones ...	2	16	0	16	2	1	16
4. Superphosphates (mineral)	2	2	0	15	1	0	0
5. Dissolved bones and bone-meal ...	2	9	2	16	8	2	16
6. Superphosphates and ground coprolites .	1	13	9	16	1	0	0
*7. Usual manure ...	2	11	0	20	8	1	6

* Equal parts of Peruvian guano, dissolved bones, and bone-meal applied at the rate of 5 cwt. per imperial acre.

REMARKS.

Coprolites.—Came away very irregularly, and made little progress for a long time; but after the middle of September made fair progress.

Bone-meal.—Did not come to hoe regularly, and were in consequence like the preceding, blanky. Were behind during summer; but in autumn made good progress.

Superphosphates.—Came away well, and took the lead all summer; but fell away towards autumn, and did no good after October.

Dissolved bones and bone-meal started well, and came in second until toward the middle of September, when they passed the superphosphates, and kept a good first.

Ground coprolites and superphosphates made good progress, but not equal to the preceding.

The last upon the list was not an experiment, but have given the result so that the produce of the other parts of the field may be compared with the results of the experiments. The crop was twice proved, so as to have reliable results; for this object, the weight given being that of the lowest proof.

CONCLUSIONS.

From the foregoing, coupled with observations made during the season, have been led to arrive at the following conclusi ons :—1st. That coprolites require a considerable time before they become available as plant food, and in consequence the crop came away irregularly, which results in a weakly plant. This deficiency of soluble plant food is more easily detected during the earlier stages of the growth of the plant than at any other time. No doubt the absence of heat, and the presence of a superab undance of moisture, increased this effect. The thought has also struck me, that although coprolites be the tribasic phosphate of lime, may it not have undergone at some time, by the action of heat, a process akin to marble, though in a less degree? We know chalk and marble to be the carbonates of lime, yet the one is less soluble than the other, owing to its crystallization. True it may be urged that there is no intermediate stage; still the chemistry of creation is a most wonderful problem, and more intricate things than this may occur in nature.

Bone-meal became more quickly available, this no doubt owing to the decomposition of its cartilage, by which ammonia was evolved, and the solvent action of the roots of the plants. Notwithstanding, I have come to the conclusion that this manure and the preceding cannot be relied upon to give a regular braird and carry the plant through the vicissitudes of the earlier period of its growth, and must therefore be mixed with a more readily available food.

Dissolved bones and superphosphates both give equally good results as to braird and early progress; but the growth does not continue, or the progress does not go on evenly. This may be, perhaps, caused by the manure being washed out of the soil by the continued rainfall of this most exceptional season. I am aware that Mr. Dyer is of opinion that soluble or monobasic phosphates become tribasic phosphate of lime again when they come into contact with lime. If so, this change must not take place instantaneously, as it must allow a sufficient time to elapse so that the soluble phosphates will reach the subsoil, and are thus out of the reach of the plant, as no other reason can be assigned for the stoppage of growth towards the end of the season. Again, it occurs to me that if such a change takes place at once, how do we not hear more about 'reduced phosphates?' the more especially when much of it has been kept over for a year. It may be said that all the lime has combined with the sulphuric acid and that, it being the stronger acid, it won't give place to the weaker phosphoric. But then we must consider the drying agents employed, which consist of cheaper commodities, viz., chalk, &c., which would present a base ready for combination.

Nos. 5 and 6 compare favourably with each other; and were it not for this most extraordinary year, I am convinced more favourable results would have been arrived at. In fact, these two experiments confirm all that I have previously set down, and have impressed upon me the necessity of applying a quick acting phosphate in combination with the slower coprolites and bone-meal. As it is, one would be inclined to experiment further in this direction.

No. 7 comes out with better results than either of the others, chiefly owing to the manure applied. The application of guano, by its ammonia, gives an early, equal, and strong plant; dissolved bones giving the guano a leg up, and, when these are in measure exhausted, the bone-meal takes up the running. We thus secure an abundant supply of plant food in proper proport on, and in an available form; thereby reducing the liability of its being blighted by inclement weather or destroyed by the depredation of insects or birds.

These conclusions are given with every deference to the opinions of others and are in nowise set down as incontrovertible; but simply thrown out, so that others interested in this subject may give their views upon it.

Since this report was written, I have received from Mr. Jamieson the undernoted comments upon the results of these experiments:—'The possibility of your soil being deficient in potash, magnesia, and sulphuric acid, renders all experiments performed to test the other mineral ingredients of plant life doubtful, and it may be often misleading. Of this tendency almost every agricultural paper affords some evidence. That coprolites will get a serious and unfair check this year I anticipate. What we have found in regard to it is—(1) A soil deficient in phosphate only is rendered fertile by finely ground coprolites. In other words, such a soil would alone give little or no crop, while coprolite would largely increase the crop.

'(2) Its action is decidedly slow, and it should always, therefore, be mixed with a little quick acting phosphate—either superphosphate or steamed bone flour. We illustrate the outcome of our inferences by manuring, according to usual practice, a plot with—

Dung	12 tons.	
Bones	3 cwt.	costing 40s.
Dissolved bones	1½ "	

'against a plot with—

Dung	12 tons.	
Coprolites	2 cwt.	costing 28s.
Steamed bone flour	2 "	

'Now it is quite evident that coprolites used alone will have a very unfavourable appearance even in a fairly good year, and that being a slowly acting substance in an abnormal season, such as we have passed through, such a method of testing it will give misleading results to the great mass who will not inquire closely into the matter.'

The preceding remarks led me to test the swede experiments, but before giving results I must explain that, owing to the inconvenient manner our manure merchant has of rendering his accounts, I could not learn the price of ground coprolites and superphosphates, and therefore had to take an approximate value, which turned out to be much lower than the price paid for the manure, thus the experiments, which were intended to be of equal money value have been completely upset. Still, I fancy lessons may be learned from the results, so they are given, as undernoted :—

Manure.	Quantity. cwt.	qr.	lb.		Price per Acre.	Weight per Acre. tons	cwt.	qr.	lb.
I.									
Guano ...	4	2	0		£2 16	3—18	2	2	0
II.									
Superphosphate ...	12	0	0		2 17	6—16	18	1	0
III.									
Grd. Coprolites ...	15	0	0		4 2	6—14	10	0	0
IV.									
Guano ...	2	1	0	£1 8 2					
Superphosphate ...	6	0	0	1 8 9					
					2 16	11—17	10	2	0
V.									
Guano ...	2	1	0	1 8 2					
Grd. Coprolites ...	7	2	0	2 1 3					
					3 9	5—16	8	0	0
VI.									
Grd. Coprolites ...	7	2	0	£2 1 3					
Superphosphate ...	6	0	0	1 8 9					
					3 9	11—16	6	1	18
VII.									
Guano ...	1	2	0	£0 18 9					
Superphosphate ...	4	0	0	0 19 2					
Grd. Coprolites ...	5	0	0	1 7 6					
					3 5	5—16	18	2	7
VIII.									
Guano ...	1	2	18	£0 19 7					
Dissolved Bones ...	1	2	18	0 12 10					
Bone-meal ...	1	2	13	0 14 1					
					2 6	6—18	14	2	10

These results, in a measure, confirm my previous conclusions; and have only to add that I feel quite satisfied that if only half the quantities of coprolites and superphosphates had been applied, equally good results would have been obtained.

Apologizing for occupying so much of your space, and the manner in which the matter has been set down, but time will not permit of its re-arrangment GEO. BROWN, Jun.

Watten Mains, Caithness, N.B.

A VALUABLE PLANT.

THE sunflower is turned to extraordinary account in Lithania. The seeds yield at first pressure excellent salad oil, and the residue forms excellent oil cake for cattle, who are also fond of the leaves and stalks chopped up. The flowers a little short of bloom are, when cooked, nearly as good as artichokes, and are in the garden very attractive to bees. The leaf, well dried, is used as tobacco. The seed receptacles are made into blotting paper, and the inner part of the stalk is made into a fine writing paper. The more woody portions of the plant which attains great size, are used for fuel. The best is obtained in the Crimea. As an anti-malarial agent the sunflower is most valuable.—*Field and Farm.*

SALT ON WHEAT.

A CANADA paper says:—"In an interesting series of experiments recently made on the farm of the Royal Agricultural Society of England, the manure value of salt was unmistakably indicated. An acre of wheat dressed with 300 pounds of common salt, yielded thirty-nine bushels of grain, with its proportionate amount of straw, while an adjoining acre left unmanured, produced only twenty-nine bushels per acre, with the straw imperfectly developed. The entire cost of the crop is not stated, but this experiment shows an additional ten bushels resulting from the salt were produced at the cost of thirty cents. each. In another case a piece of ground intended for wheat was ploughed the preceding fall and again in May, when it was sowed with salt and afterward ploughed before seeding. On the 1st and 2nd of September wheat was sown at the rate of two bushels to the acre. The crop, when harvested, yielded, according to the estimate of the owner, Mr. John Park, not less than forty bushels to the acre, with a luxurious growth of straw. From these and many similar cases, the inference seems to be that salt is a specific for the wheat crop, imparting solidity to the grain and firmness to the straw. But it must be concluded that equally good results will always follow the application of salt."

THE STRENGTH OF MILK.

HAVING to supply a public institution with milk of a specified strength, according to the lactometer; and if by rich feeding my cows yield milk considerably richer than required by my bargain, would it be right and proper to reduce the milk by adding water? Would this be the same as reducing the quality and increasing the quantity by poorer and more sloppy food?

An answer will oblige.—A. B.—[It would be difficult to guide you without seeing the exact terms of the contract. Such usually binds the seller to 'milk new from the cow and all the cream on,' as well as to supply it with the given proportion. If the latter only applies, then you might remove the extra proportion which you seem to have; but in the spring months you will find that the percentage of cream decreases, and you will most likely be saved the trouble of lowering it to the standard. The application of water would bring you within the lines of the Adulteration Act, unless a special exclusion is part of your contract. Linseed, cotton cake, and bean meal give a high percentage of cream; bran, oats, and Indian meal a low one; but it is a fact that the former also give most milk, and are, for cows in milk, cheaper than the others at the general run of relative market prices. If you give plenty of salt, to induce the cows to drink water largely, and also give all your food in a sloppy state, you will, unless your specified percentage is a very low one, meet the difficulty of your case.—DAIRY CONTRIBUTOR.]—*N. B. Agriculturist.*

SOLUBLE *versus* INSOLUBLE PHOSPHATES.

MR. YOOL, Coulard Bank, Morayshire, sends us the following notes of an experiment carried out by him last season as to the comparative value of soluble and insoluble phosphates:—

The soil on which the experiment was carried out consists of a medium loam, naturally good turnip land. It had been the previous year in oats after two years' grass. The variety of turnips was Fosterton Hybrid, which were sown on 18th June 1879. The experimental plots got farmyard dung at the rate of twenty-two loads per acre, along with the rest of the field. The manures applied per acre consisted of—

Plot 1.	6 cwt. finely ground coprolites.
Plot 2.	6 cwt. superphosphate of lime.
Plot 3.	3 cwt. superphosphate of lime. 3 cwt. bone meal (finely ground).

Plot 2 and 3 came away more quickly, and all through the season had larger and more growthy-looking tops, and covered the ground better than Plot 1. They were topped and tailed, and the bulbs weighed, about the beginning of January, with the following results:—

		T.	C.	Q.	LBS.
Plot 1.	6 cwt. ground coprolites	15	13	0	0
Plot 2.	6 cwt. superphosphate	18	1	3	5
Plot 3.	3 cwt. superphosphate 3 cwt. bone meal	19	1	3	2

These results show very decidedly in favour of soluble over insoluble phosphates, in so far at least as mere weight of crop is concerned. To the eye there was no perceptible difference in the quality of the several plots, although, of course, it is quite possible that a chemical examination of the bulbs might have shown that those grown with soluble phosphates contained a greater proportion of water than those grown with insoluble phosphates, as seems to have been the case in some other instances. The bone meal was in a fine state of division, and, besides, had been slightly heated, thus rendering both its phosphates and ammonia more readily available, to the latter of which is probably owing the increase of one ton per acre of turnips over the superphosphates alone.

The manures were all good of their kinds, and I can give the analysis of them to any one interested.—*N. B. Agriculturist.*

RHEA FIBRE.

THE Rhea or China grass trials at Saharanpur closed on the 22nd of September, and fibres have been despatched to England for valuation by competent authorities. The result is not expected before January, when the Government of India will declare who has not the £5,000 and the Rs. 10,000. The future production of the Rhea fibre will be one of the most lucrative speculations that capitalists can enter into. A plant to turn out 400 tons of fibre from 300 acres would not cost over from Rs. 45,000 to 50,000 at a total cost of production not exceeding £10 for cultivation and £10 for conversion into clean fibre worth in England from £45 to £60 per ton. The whole outlay would be returned in one year, as in favourable districts the Rhea will give four crops per annum.

Messrs. Van Maanen & Moorrees, of Salatiga, Java, state that after years of experimenting at heavy expense, they have failed to prepare rameh in the manner desired by the British Indian Government when promising a reward of 50,000 guilders for a method of separating from damp rameh the fibres in a clean and white condition, and free from gummy and woody constituent parts. The result is thus described:—

"Notwithstanding every effort they could not fully attain the object in view. They could, indeed, approach it by stamping and beating for a long time the fibre separated by machinery, but with an eye to the market price too much hand labour was required. To effect this portion of the preparation by machinery a fresh series of experiments would be necessary which the state of their finances did not admit of. Even chemically they could not succeed in removing from the bark the viscid matter, which soon becomes hard, without doing damage to the strength of the fibre."

On the other hand, their experiments have shown that the separation of fibre from dried rameh is easier and more profitable than that from the green rameh plant. The only objections to the dry method are that the resulting fibres are not completely white, and that artificial drying would be required during the greater part of the year, but European manufacturers do not consider the former of much consequence, and the cost of the latter is trifling, because the woody portions of the rameh could be used as fuel. Their own funds being inadequate, Messrs. Van Maanen & Moorrees invite the aid of the mercantile community to enable them to alter their rameh mills for the dry method of preparation. Accompanying the circular are samples of rameh so prepared. These showed conclusively that the dry method is the only method by which a pratical result could be obtained.

THE RYOT'S PLOUGH.

MANY are the ploughs which have been either invented in this country or imported from abroad for the benefit of that conservative individual, the Indian ryot, but he has hitherto taken kindly to none of them. Too great weight for his draught cattle, and too great an outlay to start with have been hitherto insuperable objections in the ryot's eyes, and no doubt he has not been far wrong. So inventors are beginning to see that as the ryot will not take to their ploughs they must adapt their improvement as much as possible to the ryot's ideas of what ought to be. That the plough must be light enough for him to carry over his shoulder to the field, and also short enough to enable him to indulge in this favorite pastime of twisting his bullocks' tails, are essential in his eyes, and in this latter respect especially all foreign-made ploughs are deficient. We have lately, however, seen a plough invented and patented by Mr. G. Sibbald Jones, which comes very near to the ryot's idea, whilst it enables him to drive a much deeper furrow.

The shoe, or sole, or body of the plough is made of wood, having a mortice cut in it, at a suitable angle for the reception of the pole or beam to which the bullocks are yoked, and it is fitted with two wedges (one above and one below the beam) so as to adjust the height of the beam to suit the size of bullocks and fix it in the block or body. A handle of any suitable wood and form is attached to the rear of the plough for the convenience of grinding it when at work. The mould board is made of sheet iron, and is moulded to any pitch that may be required (light soil requiring quite a different pitch to that necessary for clay, &c.,) so as to divide, turn once and aside, the furrow in the act of plouging. The tip or shoe is of steel (it may be made of wrought iron or chilled cast iron), and can be either riveted or bolted to the mould board with a fish plate joint, or be welded to it made either with a pointed, round or square shape to suit the requirements or tastes of the users. The plough may be yoked in the manner common to the country, *viz.*, fixing the beam to the "Jawat" or yoke. The draught is greatly lessened by the use of the coulter, which is of iron, fixed to the beam.

If the ryot is ever to be persuaded to adopt an improved plough, this, we should say, ought to fetch him.—*The Asian.*

NITRATE OF SODA A CURE FOR WHITE GRUB: "TRY IT."

A PROPRIETOR of plantations in Ceylon, resident in the old country, favours us with the following bit of experience, which he thinks may be of service to planters troubled with grub:—

I had a kitchen garden two acres in extent, and I was told that it was impossible to grow carrots in it, on account of the "wire-worm." I tried to grow them in different parts of it, but failed; as soon as the carrots formed roots, they were perforated and of course died. I tried many remedies, such as quantities of salt, 'hot' lime from the kiln, &c., but all in vain; at last I was compelled to grow my house carrots in the field with the other

roots, such as mangolds, turnips, &c. Some years afterwards I was told that nitrate of soda would banish the wire-worm, I therefore tried it on half an acre, ploughing and harrowing the ground and sowing on it by hand broadcast three-quarters of a cwt. of the nitrate of soda. Three weeks after, I sowed the carrots in drills with manure and I had a splendid crop, *not one of them touched by the wire-worm.* Nitrate of soda is a *good manure* and cost me about 17s. per cwt. I believe it may be got cheaper now!

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The Annual General Meeting was held on Thursday, the 26th February 1880. THE HON'BLE LOUIS S. JACKSON, C.I.E., *President, in the Chair.*

THE proceedings of the last (December) Meeting were read and confirmed.

The Report from Council was submitted and adopted. The Report enters first into the internal economy of the Society, shewing that after deducting deaths, resignations, and departures from the country, and allowing for elections during 1879, the total real number on the books is 643, which includes Honorary, Associate, Corresponding, and Life-Members. The Report states that there is not much to notice in respect to the financial position; the expenditure and receipts having been almost the same as in the previous year. "There is, however, one item of Rs. 366 for law charges. Such an item has never previously appeared in the books of the Society. It has occurred in consequence of a complaint brought against a native nurseryman, Boomun Mohun Roy, of Chetla (which is within a short distance of the Society's Garden), in whose possession certain rare plants were discovered which were found to be the property of the Society, and accordingly restored. The Deputy Magistrate who tried the case, however, did not consider it proved that the receiver had purchased with a guilty knowledge, and he was consequently acquitted."

The Report then proceeds as follows:—

The annual exhibition of vegetables, fruits, and flowers, was held in the garden in the early part of the year. It was on a more extended scale than that of 1878, which consisted of flowers only. The attendance was fair—probably about one thousand—both of members and the general public. The expenditure for contingent ordinary items exceeded somewhat the amount received by sale of tickets to non-members. The Judges reported favourably of the show in general.

The usual annual importations of vegetables, flowers, and field seeds from England, America, and Australia, were received and widely distributed. With exception of some of the smaller packets from America, the result seems to have been satisfactory. An assortment of acclimatized flower seeds from the Lucknow Horticultural Garden, of the kinds usually grown in our gardens, was also received. These seeds have been indented for the last three years on the recommendation of a former President. They have generally germinated freely; but a complaint having been recently preferred by a resident member as to their worthlessness, inquiries have been made of a few non-resident members who are known to be good gardeners, and the result has proved most favorable.

The demand by members for plants from the garden has been rather greater than in the previous year. The returns of delivery orders amount to 240, but in addition thereto, about 70 supplementary orders have been issued, which is also greater than heretofore; 8,300 ornamental plants have been distributed to members in part return of their subscription. There has also been a sale to members and the public of 2,000 economic plants and 2,900 fruit grafts, besides many cuttings of plants. Among other general ordinary work there has been an unusually large propagation of plants, in order that the stock for distribution during 1880 may more adequately meet the requirements of members; though several kinds noted in the catalogue have been worn out or entirely lost by drought and other causes. Various large show plants of Araucarias, Cirons, and Palms, which had become too large, for pots, have been placed in the garden grounds in substitution of other more ordinary plants for which the demand is now very limited. The roads throughout a portion of the Garden, the roughness of which has been a subject of complaint, have been improved by the removal of metal which was originally put down of too great a size and in too large quantities. The drainage has also been carefully attended to, whereby a larger quantity of water will flow into the tanks. There is, however, still room for improvement in this respect, so as to obtain the *desideratum*, as abundant a supply of water as possible for the continual requirement of the large and annually increasing stock of pot plants. A consignment of ornamental plants, from Mr. Bull of Chelsea, was received in excellent condition during the rainy season. These will in time constitute a valuable addition to the general stock for distribution to members. There has been a fair demand for economic plants—notably mahogany and coffee—both the Arabian and Liberian varieties of the latter. Attempts to raise the latter by cuttings have been but partially successful, while the seeds take a much longer time to ripen and to germinate than the ordinary kinds. The stock of sugarcanes of better kinds having been exhausted, an application has been made to Mauritius for another supply, as there is a constant demand for them.

The thanks of the Council are due to several contributors of plants and seeds—among them the Queensland Acclimatisation Society, Mauritius Botanic Garden, Calcutta Botanic Garden, Baron Ferdinand von Mueller, Rajah Suttyanund Ghosal, Bahadoor, V.P., Messrs. C. K. Hudson, T. M. Francis, and E. H. Man. 'The latter gentleman has most obligingly sent ten consignments of plants and seeds from the Andamans and Nicobars, of which the palms are especially acceptable.

Applications for seeds of economic plants have continued throughout the year, especially for tobacco, Carolina paddy, flax, maize, cereals, mahogany, Guinea, and other fodder grasses; also for Pithecolobium Saman and Euch'ana luxurians. For the latter useful grass the demand has been very great, and has been fully met in the shape of seeds and plants.

It was stated in the last Report that the Society had been reluctantly compelled to abandon altogether, for want of support on the part of those most interested, a scheme towards a full inquiry for the investigation of various blights affecting the tea plant. The several applications made to the Society during the past year, for information in connection with insect, pests of various kinds, and the serious ravages, greater than ever, committed during 1879, and consequent decrease of produce, on gardens both in Assam and Cachar shew still more forcibly the necessity for close and careful investigation. The question of a proposed remedy for the ravages of the coffee blight (Hemileia vastatrix) as probably applicable to tea blights, was moved at a recent monthly meeting; but it seems doubtful, on further investigation and trials, whether the external application of sulphur "is likely to be effective in curing, or in even mitigating to any very satisfactory extent the ravages of the [coffee] leaf disease."

From the monthly proceedings of the past year it will be seen that among other matters, reports have been furnished on sundry specimens of field produce including tobacco, cotton, and fibres of sorts; further that notices have been introduced respecting the development of the wild silk industry of India and Indian wheats, subjects which in past years engaged considerably the attention of the Society. It is satisfactory to find that the former is now likely to be fully utilised in a variety of ways, and that the export trade of the latter is annually becoming more important.

Only one number of the journal was published during the year, Vol. VI., Part 1. Part 2 is now in the press, and will be distributed to members in the early part of 1880.

The election of officers and Council was next entered on, with the following result:—

President.—The Hon'ble Louis S. Jackson, C.I.E.

Vice-Presidents.—Mr. W. H. Cogswell, Mr. W. Stalkartt, Rajah Suttyanund Ghosal, Bahadoor, and Baboo Peary Chand Mittra.

Secretary.—Mr. A. H. Blechynden.

Council.—Mr. J. W. O'Keefe, Mr. R. Blechynden, Dr. S. Lynch, Mr. W. Waterfield, Baboo Protapa Chunder Ghose, Mr. J. E. MacLachlan, Dr. Geo. King, Dr. J. B. Barry, Mr. S. H. Robinson, Mr. H. J. Leitch, Mr. John Martin, and Mr. G. L. Kemp.

Mr. Kemp's name has been added to the Garden Committee.

The following gentlemen were elected members:—

Dr. W. H. Gregg, Sheik Atta Hosen, Messrs. James F. Smart and G. E. Keith.

The names of the following gentlemen were submitted for membership:—

His Highness the Maharajah of Burdwan,—proposed by the President seconded by Baboo P. C. Mittra.

Dr. R. F. Swaine, Civil Surgeon, Ranchi,—proposed by Captain L. J. H. Grey, seconded by the Secretary.

H Pratt, Esq., Manager Messrs. Osler & Co.,—proposed by the Secretary, seconded by Mr. R B West.

L G. Middleton, Esq., Proprietor, Maheton Tea Estate, Ranchi,—proposed by Capt. Grey, seconded by the Secretary

James Hutchinson, Esq., M.A., Old Saloua, Kabsoin, Assam,—proposed by Mr. G. L. Kemp, seconded by Mr. H. J. Leitch.

Edwin Kock, Esq., Advocate, Supreme Court, Singapore,—proposed by the Secretary, seconded by Mr. W. Stalkartt.

Harry Morison, Esq, Managing Proprietor, Koleapanie Tea Estate, Jorehaut,—proposed by the Secretary, seconded by Mr. R. Blechynden.

PRESENTATIONS.

The following presentations were announced:—

1. Further supplies of seeds and plants from the Nicobars. From E. H. Man, Esq.
2. A Geranium plant from Dundee. From A. J. Millner, Esq.
3. Spanish Melon seed of a superior kind. From J. D. Ward, Esq.
4. A bag of imported mahogany seed. From Dr. Thwaites, Director, Royal Botanic Garden, Ceylon.
5. Three kinds of Cupressus seeds. From J. F. Duthie, Esq., Superintendent, Botanical Garden, Saharunpore.
6. A few seeds from the "indigenous tea plant," referred to in a previous communication. From G. F. Pinny, Esq, Rungajaun, Assam. These have been recognised by Dr. King, as the produce of *Camellia drupifera.*
7. Six Brinjalls or Egg plants (*Solanum melongena*) of 3 kinds; 2 of each, of an unusually large size. From H. W. Stevens, Esq.

Mr. Stevens states that these are the produce of acclimatised English seed, imported three years ago, and the largest specimens selected for seed. Less than one acre of ground has yielded 366 maunds of this vegetable at Durbhunga, Tirhoot.

8. A basket of Buist's early acme Tomatos raised from seed distributed by the Society. From Mr. R. B. West.

These have been grown by the side of Vick's Criterion and Carter's Greengage, and have been found good in every respect.

9. A small plant, in flower, of "Geranium, Cannell's New Life." From Mr. West.

Mr. West exhibits this not so much for the striking novelty of its flower, as for the fact that this plant, with eleven other Geraniums, arrived here only six weeks since from England by overland parcel post, ten out of which are now alive and growing well. They were despatched at end of November, when the plants were nearly in a dormant state, all the stems were carefully bound with moss, and the plants packed with the same."

Hyacinths.—Mr. John Martin exhibited two plants in flower—blue and white—"Grand Lilas" and "Mont Blanc."

Mr. F. A. Lazarus also shewed two in flower—'Grand Lilas" and "Charles Dickens;" and one came from the Society's Garden (red flower) named "Lord Derby."

The Rajah Suttyanund Ghosal placed on the table seeds of a creeper known as "Shah Possum." Baboo Peary Chand Mittra observed that this seed in a powdered state is said to have cured leprosy. He had ascertained this from Pundit Eshwan Chunder Vidyasagur, and Professor Rajkrishna Banerjee, who had, moreover, told him that the number of applications for this seed was so great that they could not meet the demand. These gentlemen had promised him a statement which when received, would be submitted to the Society.

HORTI-FLORICULTURAL EXHIBITIONS.

The following reports of the Judges on the show of vegetable and fruits held in the Town Hall on the 29th January, and of Flowers held in the Society's Garden on the 16th February, were submitted:—

HORTICULTURAL.—*Judges*:—Messrs. W. H. Cogswell, W. Stalkartt, S. H. Robinson, and Baboo Peary Chand Mittra.

The show was perhaps the largest, or one of the largest held during the last 40 years, or since such exhibitions were commenced. About 80 market gardeners besides a few private gardeners were in attendance; a few bringing as many as 20 baskets, others 16, and others 12, some only 1 or 2; but the average was about 10 equal to 800 baskets in all, containing 24 or 25 kinds of European vegetables, a few native vegetables and a fair collection of fruits. The tables in four lines arranged for their reception, two baskets in each row, occupied some 600 feet and extended nearly the whole length of the hall. Notwithstanding this accommodation, it was found necessary to place many baskets—about 200 feet in length—on the floor. Had so large a display been anticipated, additional tables would have been provided.

Among the European vegetables—Cauliflowers, Cabbages, Knole-Kole, Turnips, Beet, Carrots, and Onions, were most largely displayed, and among them were some very well grown specimens. The Celery was fair, and Peas also. There were several baskets of Artichokes and Asparagus, though too early in the season for a fair display. Among the native vegetables, there were several baskets of well grown specimens of Beans, Chillies, pot herbs, and Indian Corn. In the Fruit Department—Bails, Limes, Citrons, Sapotas, and long plums were conspicuous; there were also Pummelows, Guavas, Pineapples, and Custard Apples, though out of season.

A list of the prizes, amounting to Rs. 281, is hereto annexed.

The thanks of the Society are due to the Chairman of the Municipality for the free use of the basement story of the Town Hall and tables belonging thereto. Also to the Manager, Great Eastern Hotel Co., for the free use of tables.

FLORICULTURAL.—*Judges*:—Dr. G. King, Messrs. W. Waterfield, G. L. Kemp, and W. Pigott.

The collection of plants rather exceeded that at last year's show. The competition was about the same. The produce of some twenty gardens was placed under the tents. The display of handsome foliage plants, such as Dracænas, Begonias, Palms, Crotons, &c., was tolerably good. The assortment of Roses in pots was limited, it being rather late in the season; but the boxes of cut specimens were excellent, especially those submitted by Colonel May, from Chupra, and the Belvedere Garden. The collection of annuals was considerably in excess of last year (when the show was held a fort-night earlier) consisting, among others, of Asters, Pinks, Pansies, Phloxes, Snapdragon, Tropœalum, Portulacas, and Petunias. The Asters, Pinks, and Heartsease were especially good Verbenas, also were well represented.

Among novelties were plants of Azaleas, Fuchsias, Eucalyptus citriodora, and a Tree Fern. There were more specimens of Camellias than heretofore. For orchids in flower the season was too early; but there were a few good specimens from Baboo Prosonno Coomar Bannerjee's garden, and a fine example of Vanda gigantea from the garden of Rajah Suttyanund Ghosal, Bahadoor.

The Royal Botanic Garden contributed some fine grown plants to add to the interest of the show. These were not in competition for prizes. Among these sent from the Botanical Garden may be mentioned:—Phalaenopsis amabilis, Saccolabium Harrisonianum, Cypripedium venustum; several new introductions from Java, Mauritius, and elsewhere, such as Pinanga maculata Areca cridita a new variegated Tradescantia a number of Cacti, not previously exhibited in Calcutta, and some pretty new ferns from South America.

The Belvedere Garden collections were the largest, and many prizes were awarded for them. The cut specimens of Roses, as already remarked, were excellent. Crotons, Dracænas, Palms, and Begonias were most prominent; also a large collection of annuals.

The Eden Garden likewise contributed largely and gained several prizes. They shewed especially in Crotons, Palms, Dracænas, Begonias, and annuals; also Cactus plants.

The President's prizes, for rare and well grown plants not included in the general list, were completed for by Mr. E. G. Keith for a Tree Fern, for Fuchsias and Eucalyptus citriodora; by Mr. H. C. Rostan, for Azaleas; by Baboo Prosonno Coomar Bannerjee, for a collection of Orchids; by Rajah Sutyanund Ghosal, for an excellent example of Vanda gigantea, and by Mr. D. Low, for a collection of 12 Ferns.

Mr. Low gained the first prize for the best collection (12) Crotons, and Moulvee Ahmed for the second best. Baboo S. P. Chatterjee for the best collection of Crotons of recent introduction, and the Belvedere Garden for the second best. Mr. Low also exhibited a glazed stand containing a fine example of Adiantum Farleyense, and a stand covered with Adiantum, Capellus, Veneris, and other Ferns plants, 46 in all, to which prizes were awarded.

From Mr. Pigott's garden came seven new varieties of Coleus, fine specimens of Dracæna Gouldieana, Davidsonia pruriens and Macrozamia plumosa, a new Cycadaceous plant. These gained the first prize for new and rare plants.

Mr. R. B. West gained the first prize for the best collection of Dracænas of recent introduction.

There was a large attendance of visitors, probably one thousand, including children. The show was opened at 4, and lasted till dusk.

The best thanks of the Society are due to Colonel Rogers, V.C., and Officers of H. M.'s 90th Regiment, for the attendance of their fine band.

The sum of Rs. 309 was awarded in prizes, of which a list in detail is annexed.

The Judges would suggest that a clause be introduced in the conditions, rendering it imperative on exhibitors to allow their plants to be properly arranged by the Society's Gardener, that is to say, each kind to be separately staged together, so as in future to save the Judges unnecessary trouble in awarding prizes.

FIBRE FROM KUMAON.

The Secretary drew the attention of members to a communication in the proceedings of the last meeting from Mr. J. G. Bellairs of Chowkooree Tea Factory, Almora, Kumaon, respecting sample of a fibre procured from plants growing on his estate, and of cloth made therefrom; also to the report of the Fibre Committee thereon. He had since received a specimen of the plant from Mr. Bellairs, which Dr. King has recognized as *Maoutia puza*, *Wedd-Bœhmeria frutescens*, Ham. and Don. The Secretary further called attention to the fact that so long ago as 1847, Dr. A. Campbell, then Superintendent of Darjeeling, brought this fibre to the notice of the Society and gave a short description of it, its habit at, when used, how prepared, &c. A favourable report on the fibre was made by the Committee who valued it at Rs. 12 per maund, and were of opinion that "if properly prepared and dressed, the *Pooah* is capable of being converted into fibers much finer than either sale cloth or sewing twine." (All these particulars will be found in the journal Vol. VI., old series).

COMMUNICATION ON VARIOUS SUBJECTS.

1. From Capt. J. F. Pogson, Koteghur, on the subject of *Sorghum saccharatum*, as a new food grain for the hill people.
2. From H. James Rainy, Esq., Khoolna,—a paper on the Field Rat of Bengal.
3. From T. M. Francis, Esq., particulars of trials made of upside-down cuttings of plants.
4. From Capt. Pogson, details regarding the propagation of the Singhara nut in reply to inquiries by Mr. L. Bernays of Queensland. The above four papers were transferred for publication in the journal.
5. From E. Buck, Esq., on the subject of certain of the S. African *Euphorbiaceæ*, whose juice is stated to be a preservative for iron. (*See* Col. Lee's letter read at last meeting.)

The Secretary mentioned he had, previously to the receipt of Mr. Buck's letter, addressed the Superintendent of the Cape of Good Hope, Botanic Garden, on the subject.

6. From the same, in respect to seed of the Argan tree of Morocco. Seed daily expected from the Society's seedsmen at Erfurt, Messrs. Haage and Schmidt.
7. From Messrs. Williamson Magor & Co., in respect to a certain communication from Mr. Grote, regarding tea pests on the Munguldye Tea Company's Estate, to which the manager's particular attention is requested.

In connection with the above, the Secretary submitted further correspondence on the coffee leaf disease, with which he had been favoured by Dr. Thwaites, the Director, Royal Botanic Garden, Ceylon, which shows a great difference of opinion in respect to the proposed sulphur remedy.

8. From the Hon'ble H. T. Prinsep, Chairman, Economic Museum returning thanks for the specimen of first manufacture of Andaman raised tea.
9. From the Director, Smithsonian Institution, Washington, returning thanks for copies of this Society's publications.

MINERALOGY.

THE very considerable speculative success which has attended the issue of the South Indian Gold Company, is having its natural effect in bringing to market other projects of a similar nature, and the last mail brought the prospectus of the South-East Wynaad Estates and Gold Mining Company, the capital being £100,000, in shares of £2 each, of which 12,500 shares are taken by the vendor, and the remainder are offered to the public. The Company is formed to acquire, cultivate, and develop several estates in the south-east Wynaad, and to extract the gold from the numerous quartz reefs which traverse them. Included in the various properties is Needle Rock, consisting of 771 acres, of which 147 acres are planted with coffee and 20,000 cinchona plants. Two valuable gold quartz reefs run quite through this property, and are named Buckingham and Chandos, after his Grace the Governor of Madras, who visited and inspected the reefs, when gold was washed in his presence. The other properties, which are of a like character, extend over 700 acres. Mr. Brough Smyth's unqualified opinion of the gold-bearing value of these properties is substantiated by documents bearing his signature, and his report is not only corroborated by the many eminent mining engineers, who have visited the district, but by assays made by London expert. Four boxes of stone by Mr. C. R. Dawson, from the estates now offered, yielded an average of 2,285 oz. per ton; and, in addition to this, one of the samples showed 3,947 oz. of silver to the ton of quartz. This result was obtained from surface stone only, selected by planters who knew nothing of mining or the selection of stone, and no gold was visible in the specimens which were the subject of those assays.

MR. EASTWICK has an idea that the "Havilah where there is gold," to which reference is made in Genesis, is synonymous with Devalah in the Wynaad, where gold certainly exists. There are already fourteen mines at or near the Devalah, and there can be no reasonable doubt that large quantities of gold were in olden times obtained from that locality. In fact before the discovery of the gold fields in Australia and California, India would seem to have been the country whence the world drew the bulk of its gold supply. So recent as the eleventh century if the inscriptions on the Tanjore temple which have been deciphered by Dr. Burnell may be relied upon, "gold was the most common precious metal in India, and stupendous quantities of it are mentioned hear;" whereas silver was hardly known in India until the 16th century when the Portuguese brought it to India with them. Parts of the Wynaad and Mysore are honeycombed with ancient mines; and the contention is that the miners with their rude appliances only tapped the shell of the Indian *El Dorado*. Those ancient miners were "in the habit of making their shaft in a triangular form, they lighted fires in two of them to calcine and break up the rocks, and by the third which also gave the draught of air necessary for the fires, they ascended until the shafts in which the fires were had cooled." Nothing could well be more primitive. But now quartz-crushing machines of the newest types, and skilled engineers and miners are hurrying to India to dive far deeper into the bowels of the earth than their predecessors in ancient times ever dreamt of men penetrating; and should they come up smiling with quartz much impregnated with gold in their hands, we may have to record a great change for the better in the condition of this Presidency and Mysore in general, and of the coffee lands of Wynaad in particular.

GOLD PROSPECTING IN WYNAAD.

MR. J. W. MINCHIN, Secretary, Wynaad Prospecting Company (Limited), has requested that a mining lease may be granted to the Wynaad Prospecting Company (Limited), for 50 acres of land within the boundaries originally granted for prospecting operations. "The result of our workings," writes Mr. Minchin, "has enabled us to make arrangements for the further prosecution of mining work which will now be carried on with vigour." He further requests that a grant for prospecting operations may be given to the Wynaad Prospecting Company (Limited), on another portion of 100 acres within the boundaries originally applied for, to be followed hereafter by a mining lease for such portion as may be permitted under the rules about to be framed. Both plots are in the Cherankod Amshon, and adjacent to one another between Devala and Cherambadi. The Government in their order state:—"The Commissioner will request Mr. Minchin to demarcate clearly the two blocks of land he applies for, and to submit sketch-plans of them, showing approximately their position and boundaries. Meanwhile Mr. Minchin's application will be registered, and on the sketch being received, the blocks will be surveyed at Mr. Minchin's expense. Possession of the block of 100 acres may then be made over to him for twelve months for *prospecting* purposes, on the distinct understanding that unless within that period he selects a block of land within the limits of the 100 acres, not exceeding 30 acres in extent, and applies for a *mining* lease for it, the right of prospecting shall lapse, and the possession of the land shall be given up to Government. As regards the block of 50 acres, for which a *mining* lease is now asked for, Mr. Minchin should be informed that no gold-mining lease for an area, in excess of 30 acres is likely to be granted, nor can any lease be granted at all till the terms on which they are to be granted have been settled by the Secretary of State."

GARDEN.

MANGO GRAFTING.

THE following is an account of Mango Grafting, practised with some success as regards numbers of grafts and cheapness at Allahabad, by the Superintendent of the Government Botanical Gardens:—

"*Process of Grafting Mangoes on the Tree.*—The process by which this is accomplished is very simple. In the first place the seedling with seed attached thereto, when it is about 6 or 8 inches high and three weeks old, is carefully lifted with a small ball of earth. The roots, with the earth intact, are then wrapped up in a little grass, and the young seedling plant tied to the tender branch of the tree required to be grafted from, care being taken that the young seedling tree and the branch to be grafted should lie pointing in the same direction, and be of the same age, *i.e.*, both seedling and graft should be of that year's growth. When grafted the joint should be covered with grafting clay to exclude the air.

"2. The roots of the seedlings, suspended as above described, when grafted must be kept moist by watering, either by hand or with a garden syringe in case there be not sufficient rain.

"3. The process of grafting should be commenced in the beginning of the rainy season, as soon as the young mango seedlings are procurable. The plant should be ready for cutting, *i.e.*, the graft should have taken well within a month; but I have succeeded in cutting them so soon as thirteen days after grafting, and the plants so removed are now in good growth in the nursery. In fact, plants thus grafted in this season are now growing strongly and ready for sale. The plants grafted in this way on young wood, where the junction is so complete, will, in all probability, be much stronger than those grafted on two or three years' old plants where the wood being hard between the grafts, such a complete union is impossible, from which cause a great number of plants die or are broken down by the wind.

"4. The following is the actual cost incurred in raising 2,000 grafted mango trees by the above method:—

	Rs.	A.	P.
To digging bed and growing seed	1	0	0
" lifting and tying up plants for grafting ...	4	4	0
" grafting 2,200 plants	5	0	0
" bhisti watering, one month ... —	4	8	0
" cutting and planting the young grafted trees in bed	2	8	0
" twine for tying plants to trees	2	2	0
Total ... Rs.	19	6	0

Total say Rs. 20, equal to less than 2 pie per plant; add watering in the nursery for one year, Rs. 10; the plants when ready for sale would thus cost about 3 pie per plant. Plants raised at such a trifling cost, and in such numbers, and which promise to be so hardy, should soon take the place of the common seedling mango trees on roadsides, canal banks, topes, &c."—*Planters' Gazette.*

ON THE FUCHSIA.

THE present being a good time for starting the fuchsia into growth either for the purpose of propagation or for shaking out and repotting specimen plants, a few remarks on the general management and culture of this popular greenhouse plant will now be seasonable. The fuchsia delights in very liberal culture, not only as regards the pabulum supplied to its roots, but also in regard to the management of the atmosphere. Supposing the cultivator to be in possession of old flowering plants—that is, plants of last year's propagation or older, which have been kept during the winter, it may be under the greenhouse stage, or in any other cool place, stinted for water, but not kept dust dry—let them be brought out and placed in a temperature of 55 degs. at night, with a rise of 10 degs. during the day, giving them a thorough soaking of water to moisten the ball through and through. Thus treated, they will soon break their buds and rapidly push shoots. If it is only intended that these old plants should furnish as many cuttings as may be required for stock and be then destroyed, they should not be shaken out, but be encouraged with liquid manure to make healthy, vigorous growth briskly. On the other hand, if the old plants are to be grown again into flowering specimens, let them be shaken out and repotted as soon as the shoots have advanced to about an inch in length. This shaking out should be done very thoroughly—so thoroughly that the plants may be potted in the same or smaller sized pots, in a compost almost wholly new, for very little of the old soil should be allowed to remain attached to the roots. The compost should be concentratedly rich, the bulk being formed of rich loam roughly broken up, so as not to break up the fibre too fine. To two parts of this loam add one part old cow manure, well matured and dried, so that it will rub through the fingers without clogging them, and one part rough partially decomposed leaf mould, from which all sticks and woody fruits, such as beech-nuts, have been carefully picked in the process of turning over. Add a spadeful of roughish bone-meal and two spadesful of sharp sand to every bushel of this compost and turn and mix altogether in such a way as to incorporate them thoroughly, when it will be ready for use. Use clean pots only in repotting. If they are not new, let them at least be washed clean.

Drain them well. This is an important point, for although the fuchsia requires very liberal allowances of water during the growing season, it is very impatient of stagnation. After being repotted, the plants will be returned to their place. A moist atmosphere must be maintained for them, and for a few days, till they have begun to strike root into the new soil, let them be shaded from bright sunlight. They must be sparingly watered till they are observed to be making some progress in growth; but they may be moistened twice or thrice daily with the syringe, to keep the foliage plump and healthy. As they advance in growth, the supply of water must be increased; and when they have filled the pots with roots, they should be shifted into others a size or two sizes larger, using the same compost as that detailed above. When the plants have filled these second pots with roots, it must be considered whether they will attain to the desired dimensions in such pots. And here it must be observed, that although the fuchsia will take almost any practicable allowance of pot room, it may be grown to almost any size in comparatively small pots. If the compost is as rich as it ought to be, and yet porous and freely permeable to water, gigantic specimens may be grown to perfection in small pots. It is no unusual thing to see plants seven or more

feet high, with proportionate width, perfect pyramids, in fact laden with richest profusion of flowers, yet growing in ten or twelve inch pots. Such perfection in such small pots can only be attained by means of patient care and much judicious and skilful application of practical experience in the matter of watering. Such bulk of foliage and flowers cannot be developed but by means of frequent and skilfully adapted applications of stimulating liquids to the soil. But for the inexperienced amateur, or for such cultivators as cannot give the requisite time and attention to plants of large growth like these, it is better that they should take the more safe method of allowing plenty of pot room for their plants, taking especial care that the pots are well drained.

Cuttings of the fuchsia are, as even the most inexperienced window-gardener knows well, easily rooted with very ordinary facilities for propagation. Cuttings are rooted in many a cottage window throughout the land, with no better facilities than the surface of the parent pot; a slip being taken from the parent plant, in many a case, and having a cracked or sound tumbler, as the case may be, inverted over it, and in the crude ill-conditioned soil in which the parent plant grows, quickly roots and establishes itself. And these simple means meet all the requirements of the window-gardener, supplying sufficient for his own stock, and to gratify his neighbourly and generous instincts of presenting to, or exchanging with, his friends. But these are not the kind of the conditions we have in view, although we do not despise them, but rather rejoice that the humble craft and patient care of the cottage window-gardener throughout the land can produce such excellent results. But for the majority of the readers of the *Agriculturist*, something superior will be rightly considered within their reach. A one-light frame, at least, that can be converted into a hot-bed at will, may be looked upon as perfectly practicable and within reach. With a well managed hot-bed frame, excellent work may be done. In fact, if well attended to, there is nothing better in the whole range of modern appliances for propagating purposes. The cuttings should be taken while they are quite young and growthy. To leave them till they become partially matured is certain to result in failure. Starting with a fresh young cutting, the tissues of which are soft and prone to grow, there is not the least likelihood of failure if checks be avoided; and this is the most important point to bear in mind in fuchsia growing. Once the growth of the plant is checked, little more good may be done during the current season with it. We shall leave the treatment of the cuttings and subsequent treatment of the young plants as subjects for another paper.—*N. B. Agriculturist.*

TEA.

We are glad to see that the Kumaon correspondent of the Agra paper says "a number of contracts are already being entered into for green tea of next season, for export to Bokhara and Northern Afghanistan." This is the right sort of aggression on Central Asia; and if half as much pains had been taken by the Government of India in that way as in the export of bullets and shells we need have had no Afghan war. So much for the green tea. As to black tea, which Britons affect, we learn from one of the principal proprietors of the Kangra Valley estates that several considerable orders have already been given in London for teas from those northern gardens in anticipation of the crop that will not be ready for two months to come.

We hear that the Government have decided on sending an expert to the tea districts to study the various blights, and we think that the selection of their agent could not well have been better. At the same time we think that much good would have resulted had this gentleman been accompanied by a practical tea-planter, as we understand he is ignorant of the habits of the plant, his experience, which is of the best, having been altogether in the insect line. As we understand he proceeds shortly on his mission, it may not be too late yet to send a companion with him, who would always be at hand to keep him right on the more purely agricultural part of the subject. We trust that he will not be hurried, and that he will be allowed to see the plant in all seasons, that his examination will not be a superficial one, and that no preconceived theories will be attempted to be forced upon him, as the best intentioned efforts may be entirely nullified by endeavouring to compel observations to tally with a preconceived theory instead of working out a theory from those observations.

In addition to the movement at present on foot to send a Commissioner to the Melbourne Exhibition to represent the tea interest in India, we observe that private efforts are being made, having the extension of business as their main object. Three of the largest tea agencies in Calcutta have we observe, appointed an agent in Sydney, who seems to be pushing their interests in a manner calculated to forward the object in view. This agent is busy making the tea up into small attractive packets of half and whole pounds each, and these he is selling, and in some cases distributing *gratis*. A large number of pamphlets have been printed for gratuitous distribution, and these efforts cannot fail to have a good effect. The pamphlet consists of a short history of the plant, and of the modes of growth and manufacture of Indian, as compared with China teas. It has evidently been got up rather hurriedly, and a second edition may correct a few slips made by the writer, which, although of no material importance, had better be put right, as absolute correctness would leave no room for fault-finding. We are sorry that the agent recommends a "blend" for Australia. Such a mode of proceeding will infallibly hinder the growth of a taste for Indian teas. Buyers using a "blend" will never know to which section of the blend they are indebted for any particular flavour. Let the Indian tea be invariably sold pure, and the consumer can, if so disposed, easily blend it with any proportion of China tea he desires. If, on the other hand, he proposes a "blend" of the different classes of Indian teas, we are at one with him, although in passing, we may be permitted to point out here, that this craving for a blend of Indian teas, which is growing at home and elsewhere, is simply a protest against the system now in vogue on many gardens, of dividing and sub-dividing the crop into innumerable classes, which had better be all left together.

We have on more than one occasion spoken of the necessity for great efforts in the direction of making Indian tea by some cheaper method. It seems evident that the present low prices at home are not, as has been supposed, abnormal prices, but the ordinary prices which the very materially increased production has brought about. So long as this increase was followed by a corresponding increase in consumption, prices did not suffer, but now that it is evident that consumption has failed to keep pace with production, we must meet the depreciation in price, either by reducing our exports to the United Kingdom, or by so reducing our producing expenses that we shall be able to accept, without loss, the very much lower rates now obtaining for our teas. Regarding the former alternative, there seem to be two important markets which we have neglected, Australia and America; and it is only by finding new markets that we can hope to reduce our exports to Great Britain. A movement has been all but consummated here, having for its object the opening up of Australia as a market for our teas. The present consumption in the Australian colonies is about 16 million pounds, and the half of this secured to India would relieve the London market, materially reduce stocks, and tend largely towards an increase in value. This consumption in a few years will rise to 20 million pounds, or half the production of India, and as all this large supply is at present drawn from China, there is no reason why our teas should not try to compete with China teas. Now we come to the United States of America which derive nearly all their supplies from Japan. Their, consumption of Japanese teas is at present 32 millions, and of Indian teas almost *nil*. There seems no reason why the Americans should not be induced to try our growths. There remains the cheapening of production. As we have repeatedly said, no tea should cost more than eight annas per pound, and whether the normal selling price of tea stands as at present, or rises to the rate at which it stood a few years ago, shareholders should all the same insist on having their tea made at eight annas per pound. In fixing this rate we have not forgotten the labour difficulty in Assam, but have made allowance for it. In districts where this difficulty does not exist, the tea should not cost so much as eight annas per pound. In the Upper Provinces, for instance, where labour is plentiful and cheap, tea need not cost over seven annas per pound, laid down in Calcutta. A letter in the *Statesman* of the 19th, speaks of a Company paying its Calcutta Agents an agency fee equal to 12 per cent. on the gross proceeds of last season. It is too much, in these days, to expect that a tea business could stand such a charge. It behoves shareholders to take a warmer interest than they have hitherto done in their own concerns, and they will doubtless find that there are many items of expenditure on which the pruning knife might be used with advantage. While we sympathise with "An Unfortunate Scrip-holder," who signs the letter referred to, we cannot help remarking that the cause of those excessive charges is due very largely to the apathy shewn by scrip-holders in general.

BAD TEA.

"A GREAT many letters," says the *Times*, "have lately reached us drawing attention to the present demoralised state of the tea market. It would appear that the rise which took place in the latter part of last year in the price of common teas has caused the shipment from China of large quantities, some say as much as 100,000,000lb. of rubbish utterly unfit for human food. Dressed up and passed as sound tea, this rubbish is now finding its way into consumption here without apparently any interference on the part of the Custom-house authorities. The abuse ought to be looked into before further mischief is done."

Messrs. William Stewart & Co., of Great Tower-street, call attention to this matter as follows. They say:—"A rise of 4*d.* per pound on good common Congou took place on the London tea market in October last, the news of which was telegraphed to China, with the result that nearly 10 million pounds (not 100 million, as stated in the *Times* of 31st ultimo) of unpalatable rubbish were 'got up' and shipped to this country, and are now being offered to consumers as dust, good fannings, and leafy Congou. We have subjected most of these teas to careful tasting, and are strongly of opinion that they are unfit for human consumption, and are surprised that the Government Inspectors have allowed them to pass into the hands of the wholesale dealers; further, we have no hesitation in affirming that teas of a similar description would have been seized and condemned when the Adulteration Act came first into operation."—*Home and Colonial Mail.*

INDIAN TEA AND THE AUSTRALIAN MARKET.

IT is not, we think, unreasonable to expect that the extremely moderate range of prices for all teas of Indian growth which now prevails should, as a natural consequence, lead to a great increase in the consumption, not only in the United Kingdom, but in new markets. We are curious to hear how far the demand for Indian tea is affected in Australia by the low value of the produce offered. It is estimated that a market for fifteen million pounds of tea might be looked for in Australia if Indian teas were fairly introduced and appreciated. Unfortunately, the character of the Indian crop of 1879-80 has not been by any means up to the average, as even those most disposed (from their own interest in the produce) to take a favourable view of its merits have been compelled to admit the inferiority of the past season's manufacture; so that the conditions under which Indian teas have been introduced to the notice of the market in Australia have not been of the most favourable kind. This is to be regretted, as, with the growing figures representing the output of tea in India it is very desirable that new markets should be found for it, especially when it is borne in mind that the present yield of tea from the 200,000 acres of land estimated to be actually under cultivation, is not much more than 2 maunds of tea per acre of cultivation, and that a crop of 40 million of pounds, if that is reached next season, would only represent the moderate return of 200 lb. (or 2½ maunds) per acre all round. If, however, as we have a right to expect, Indian teas only keep up their well-earned repute, an appreciative market will always be found for them.—*Ibid.*

THE NATURE OF THE PRESENT DEMAND FOR INDIAN TEA.

NOT the least remarkable feature in the present state of the Indian tea market is the depression in the value of the higher classes of the produce. We doubt if such a state of things has ever before occurred in the history of tea, when ordinary Souchong was worth within 2*d.* or 3*d.* a pound of well-made Pekoe, full of tip, as it is at present. The great bulk of Souchong sold within the last fortnight has realised from 1*s.* 1*d.* to 1*s.* 3*d.* a pound, while Pekoes for the most part, during the same period have ranged from 1*s.* 3*d.* to 1*s.* 6*d.* a pound, such well-known marks as Assam Co. and Bishnath Co. being on a par with the rest in this respect. Good-looking Pekoe of these marks, wiry well made and full of tip, brings now only 1*s.* 5½*d.* and 1*s.* 5½*d.* a pound, while plain Souchong fetches 1*s.* 3*d.*

The explanation of the relatively low value of the higher class tea is asserted to be the little demand for this sort, owing to the widely extended sale of cheap tea. The retailer cannot afford to use so much of the better sort of tea, and, in search of a profit is obliged to make the bulk up with the cheapest kinds, using less of the better grades. Hence the standard of the tea offered for retail sale is lower, and, as a consequence, Pekoes are in less demand in Mincing-lane. Souchongs and all the lower grades are benefited by the demand for them, while the commonest varieties of tea bring good prices now-a-days. The usual order received by the dealer from his country customers now is:—"Buy me as cheap a tea as you can get for bulk, with a little of the best kind that is to be had for money to flavour the rest with." This being the case it would seem as if the usual care hitherto taken in the sorting of the crop into several classes would be unnecessary in future, and that fewer sorts would be a better policy, not only for small concerns, where less division means larger breaks, but even for larger concerns. The public having become accustomed to low priced tea, is not likely, we think, to return very soon to high prices; and the manufacturer must study to meet the demand on the part of the public for "cheap tea," by striving to put as good quality in the shape of Souchong and Pekoe Souchong, into the market as he possibly can, relying for profit more on economy in working, and less on the price to be brought for a few samples of high-class Pekoe.—*Ibid.*

INDIAN TEA.

APROPOS of the remarks on the keeping qualities of Indian tea in our last issue, we may observe that we opened a 10-pound box of very ordinary Pekoe Souchong the other day. The tea had been made at the very beginning of the manufacturing season of 1878, so that the contents of the box had been hermetically closed for about a year and eleven months. The tea had been manufactured in the ordinary way, and had been rolled and sorted by machinery, and it had not been panned. The tea was simply delicious for drinking, and to our taste had mellowed and improved by keeping, in fact we have frequently dark tea at 4*s.* per pound at home which would not approach this Pekoe Souchong in flavour. Pekoe Souchong of the same break as the tea we are alluding to probably fetched 11 annas (if so much) in the Calcutta market in 1878. If Indian tea will keep, and improve by keeping, for close on two years, it seems to us that the same article if fairly treated ought to remain fresh and continue improving for several years more.—*Darjeeling News.*

INDIAN TEA IN AUSTRALIA.

THE following extracts, taken from a letter written by a gentleman at Sydney to a large Calcutta firm on the subject of tea at the exhibition, will doubtless be read with much interest just now.

"We have not been idle, sales are going on. P and S seeing that nothing was to be got from C, owing to the unfortunate relations between him and the Executive Commissioner of the exhibition determined to see him ourselves. He fell into our views at once and heartily. We have got a splendid show now on the basement, right under the dome and in front of the Ceylon Court. We made a very strong semi-circular table out of old packing cases and covered it neatly with green baize Then P made up a multitude of sample packets of 1lb. each stylishly got up with a printed label, and we are selling a good deal daily. The whole expense is very trifling as we did most of the work ourselves. * * * * We are now printing 500 pamphlets to cost about £25 and will distribute these. You will not have to pay all this as T and I will be content with a bare commission, and we well try to remit you as near your invoice price as possible. We have got a young woman, the wife of the attendant in the Indian Court, to sell the tea on a commission of 3*d.* a packet. Many inquiries are now being made about the tea and it is coming into favour. My friend Mr. C. Moore, Director of the Botanical Gardens has placed his museum at my disposal, and if we see fit we may invite the best of the people here to an afternoon Indian tea there, before the exhibition closes. This only if sales should not come up to our expectations. One of our fellow judges, a Mr. Cooke, of Bathurst, a wealthy retired miller and grain merchant, is enamoured of our scheme, and is willing to put down £1,000 if we can get two others with £500 each. He would make P manager and give him one share. Start with good premises, a delivery man, and advertise well."

THE CUSTOMS AUTHORITIES AND BAD TEA.

THE Customs authorities are at length waking up to their duties with reference to the bogus tea which has been foisted on the London market lately. Some thousands of pounds of this stuff have been seized and condemned. The Board of Customs are charged with the examination of all teas arriving in this country, and its officers have the power to open packages in bond, and to carry off for analysis samples of any tea they may suspect. Either tea is sent to this country in a very pure state as a rule, or else these officers are not very zealous; for only 47 samples were reported to the authorities as bad or doubtful last year, although about a million packages of tea pass through the bonded warehouses of the London and St. Katherine's Dock Company alone, to say nothing of the other bonded warehouses. Of these 47 packages six only were condemned as unfit for food. Such a high state of commercial morality is apt to excise apprehension lest some of the many parcels which have been passed as sound may have been defective. It is satisfactory, therefore, to find that the officers are opening their eyes wider.

CHINA TEA.

MR. HERBERT TOWNEND of 16, Mincing-lane, writing to a contemporary, says:—"I am not surprised, from past experience, that the idea should be pretty general in this country and on the Continent that our present quotation for common Congou (11½*d.*) is due to speculation, and will soon collapse. If it had been simply caused by, and depended upon, speculation, I should decidedly be of the same opinion; and although it is true that tea advanced in price at the commencement of September last, at the time that a speculative mania in all produce, &c., seized the community at large, yet for the position of tea it certainly would have risen in value a month or two

later had no such rise in other things commenced; in fact, buying common Congou in China at 9*d*. (when the price here was 8*d*.) on speculation, commenced a month before our market rose at all, as it was evident to importers there that the time at last had come when demand for this class in England had quite outstripped the supply. This being the position of common Congou, I think that it will not only keep its present price, but may advance, unless something unforseen occurs to stop its consumption, and I would almost venture to predict that it will be pence higher before its supplies can be increased to meet its present enormous consumption.

"Now, the facts that bring me to this conclusion are, in the first place—the Chinese must keep it up. It is well-known that last year they had determined to put a stop to the losses they had been incurring the last few years in selling the bulk of their crop of tea under 1*s*. per lb. The commercial Chinese are not like a good many of the English trading community, who care nothing about their own ruin if they can only bring down those who are doing well with them. Thus, if A is doing well, and advertises good tea at 1*s*. 8*d*., B advertises it at 1*s*. 6*d*., till at last the retail canister is brought down to such a price that no honest trader could pretend to offer for sale the qualities described by these advertisers of tea at "merchants' prices." But the Chinese are very different, and to use a common saying, they "knock their heads together and make a price;" and if foreigners won't give the price they can't have the tea. Until within the last few years foreigners did give the price; and when at last, through repeated losses, they refused longer to do so, they (the Chinese) began to reduce supplies of the class that lost the most to producers. Now, here is the whole secret of the present price and scarcity of clean common Congou. Consumption has increased enormously on this class in this country and in Russia, through economy and other causes being at work, till we find to-day that to every twenty chests of good and fine tea we sell 100 chests of common. It will be seen by this, as regards this class of tea, we are "burning the candle at both ends"—*viz*., short supplies, with an increased consumption.

"What about the future? I believe common Congou will rule high, and good and fine grades of Congou will only just keep their head above the quotation for such, and the relative value will alter materially unless the public give more, which, I believe, they will be very slow to do. Under these circumstances, I quite agree with you in advising the retail trade to lay up in store good, sweet, common tea (all grades and descriptions) under 1*s*. 2*d*., as circumstances not only justify at present, but point to much higher prices for this class. There has been a great demand for sweet Congou tea "for price" through the whole of this season, which has cleared off every chop out of importers' hands directly upon arrival of ships, showing that importers held no stock. And again, we have no old seasons, as in former years, to help our supplies; and it is well known that speculators hold very little of this description, as the rush by them was upon good to fine teas, which sorts will be kept firm by the steady advance of common grades. We have also another very serious element to contend with, *viz*., shipping demand. Shippers have refrained from buying the last five months, and stocks are very low all over the Continent, and they must buy in the spring at the latest. From whence are they to draw their supplies for common Congou? Competition is not so keen on the Continent as in England, profits are larger, and sixpence advance would not be a great advance for them to pay. We have also speculators who, having during the last few months made money upon produce, will eagerly watch tea and all produce for an opportunity to join again, and as we all know common Congou is considered the "Consols" of the tea market. Under these circumstances I would certainly, with you, advise all who can not to let outside men have all the profits, as they certainly will, unless the trade steal a march upon them by laying in stocks.

"Before I close I would like to say one word upon the foolish reports about tea arriving unfit for human consumption. As a large buyer of tea, and consequently having the opportunity of seeing almost every chop of tea that arrives from China, I can confidently state that I believe there has scarcely been a single parcel of Cactus, Maloo, or any description of "lie" tea arrive in this country since the Government appointed an "Inspector of Tea;" and I believe the reports that are spread about tea arriving unfit for consumption are false, and that the public need fear no harm from any tea that is now offered for sale—so far as being injurious to health. It is true that very common grades of ordinary Congou, Caper, &c., are more like physic than anything else to drink, and cannot do the grocer any good in selling them, as people like a refreshing beverage, not a nauseous medicinal-flavoured drink. I would strongly advise the retail trade to avoid buying altogether such low-class tea, the flavour of which no blending can kill, and thus prevent its importation."

THE COST OF TEA.

IN these days of low averages for all sorts of Indian grown teas (the exception of one or two remarkably fine flavoured lots of Darjeeling growth, which have brought extreme prices, only serves to prove the rule) it is becoming a matter of more and more consequence to study the question how to produce the crop at the lowest possible cost.

The cost of production varies naturally, not only according to the district in which the cultivated area is situated, but also according to the precise position of the estate in the district in question.

Some tea districts of India, notably Darjeeling and Kangra, are much better placed for procuring labour than the districts of Assam and some parts of Cachar; while other parts of Cachar and Sylhet again have the advantage in this respect over most parts of Assam.

As a rule, in every district nearness to bazaars, villages, roads, and rivers makes an important difference in the facility with which labour is obtained and kept on the estate, and, therefore, in the cost of producing the crop of tea. It has become necessary to consider the question whether the present system of offering a high bonus, or, indeed, any bonus at all, to a well-paid cooly to induce him to accept a fair day's pay for a fair day's work is not radically wrong; and if it can be stopped by general agreement—as we think it might be—one heavy tax on the tea industry would be removed.

It will then have to be considered whether, as a rule, a slight addition might not, without any hardship, be made to the present daily task of the cooly; for of course it will be seen at once that where a body of men is concerned, any extra work performed by each would, in the aggregate, make a considerable difference both in the cost as well as in the time of getting through a specified job.

In Darjeeling, we believe, no such thing as bonus payments to coolies has ever been made, and, although there is every year a greater demand for labour—rates have not been much enhanced on the tea gardens, although the contractors for the Steam Tramway Company have, as is usually the case in their urgent demand for cooly work, been compelled to pay much higher rates than those which prevail in the tea gardens. Assam is, with good reason, generally considered the most expensive district so far as cooly labour is concerned, owing, not only to the long river journey which coolies have to make to arrive there, but also to the unusually high rates and cost of all the necessaries of existence. Coolies are, too, more unwilling to remain and settle down, we believe, in Assam than in Cachar and Sylhet, which are, so to speak, nearer home for them. In Assam, however, owing to the larger yield per acre in some cases, and to the attention paid to economy in others, we understand that some concerns are able to place their crop of tea in the Calcutta market at the average rate of seven annas a pound, inclusive of all charges for freight and agency; while we have heard of some London companies who lay down their teas in this market, inclusive of every item of cost, at the rate of one shilling a pound. If these things are done now by a few concerns, the time is probably coming when what is now the exception may become the rule; and we do not doubt that our readers will find it well to consider how far it is possible in their case to work, so as to lay down their tea in London at a shilling a pound after defraying all charges.

In the event of the hoped-for improvement taking place in the price of tea, their position would be none the worse; while, if the present low rate continue in force, the result of working on the scale to which we have directed attention, would be the avoidance of some disappointment and loss.—*Home and Colonial Mail.*

COFFEE.

THE Imports of Coffee into Spain in 1878 were 3,092 tons, an increase of 797 tons over 1877. The imports of cocoa were 4,937 tons, or considerably more than those of coffee, but both figures are trifling for so large a popualtion as that of Spain.

THE Liberian coffee in the Soldier Gardens continues to thrive, and Colonel Hawkes, the indefatigable Honorary Superintendent, hopes in his next annual report to give some estimate of the probable economic value of this description. The plants in the Agri-Horticultural Gardens are also in a satisfactory condition. Considering the high prices charged for coffee in Burmah, even if it cannot be successfully grown for exportation, we might surely be able to raise enough to supply local wants. The price in our bazaars is usually higher than the English retail price, although we are so close to the Ceylon and Neilgherry plantations.

CURING AND SHIPMENT OF COFFEE.—The various mercantile firms in Madras, and some of the principal agencies in the mofussil, are now very busy curing and shipping the large consignment of coffee that are being received daily from the European and native planters on the Shevaroys, Pulneys, and Neilgherry Hills. The outturn of crops this year is unprecedently large in comparison with the quantity realized in former years, for some of the estates, especially in Coorg, have as much as seventeen or eighteen hundred tons ready for despatch to the various coffee works in the presidency.

THE visit of Dr. King to Java, has led to the discovery among other important facts, that the Java planters have been very careful in the selection of their cinchona seed, and that the superiority of their bark is to a large extent due to the fact that they grow good varieties more extensively than we do. This is a point in planting which is frequently lost sight of; we go in for the cheapest seed, forgetting that what is a little more expensive at first may prove most profitable ultimately. The same was done in many of the tea districts. In the North-West, where the Government tried experiments

at a very early date, we find nothing but the very commonest of China plants. This was of course brought about by another cause. The Assam variety was practically unknown at the time these properties were opened out, and seed being consequently purchased in China, it was natural that the Chinese should not be disposed to give their best varieties. Now, however, the case is vastly different and in extending and refilling in, in all gardens, whether tea, coffee, cacao, or cinchona, the greatest care should be had to the seed, and only that quality should be planted which experience has taught us will give the best results. In the larger gardens of Debra Doon where an all-round outturn of 464lb., per acre was obtained in 1878, the price realised was only 9½ annas per lb. Now, the advantages which those gardens enjoy in the matter of labour, are such that this tea was produced at a cost of six annas per lb., and had the quality been Assam Hybrid, the average value would have been much higher, with only the initial cost of seed to add to the expenses. Now, that we know the best quality of bark to grow (*C. Calisaya*), planters should go largely in for it, and not waste their time in planting land with inferior varieties, whose only qualifications are that the seed costs less, while the produce is immensely inferior as to quality.

DATE COFFEE.

A COMPANY has been formed in London, with a capital of £50,000 in £5 shares. In the language of the prospectus, to " purchase and work the English patent for the purpose of manufacturing abroad, from the date fruit, a substitute for coffee." This document goes on to say that " the vendor assigns his English patent for £2,000 in cash or shares, at the Directors' option, and 1*d.* per lb. royalty, the Directors having power to purchase the royalty. A mixture of three-fourths of date coffee with one-fourth of coffee makes a purer and more delicate drink than if made entirely of coffee, and it effects a saving of two-thirds ; whilst even if no coffee is used, a much more refreshing beverage is produced from date coffee than from common or ordinary coffee. An ounce of date coffee and a quarter of an ounce of ordinary coffee, without any chicory are sufficient to make four 8-oz , (or ordinary breakfast) cups of coffee. Intending shareholders are invited to call at the Company's offices and taste this beverage before investing. Upwards of 100 persons are stated to have done so, and they are unanimous in their opinion as to its superiority. Letters have also been received from persons resident in the country ; amongst others, one from Mrs. Blackall, copy of which is below.

The letter from Mrs. Blackall is as follows :—

Copy.

6, Sussex Terrace, Southend, Essex,

31st January 1880.

DEAR SIR,—I have to thank you for the sample of date coffee you kindly sent me as requested. My husband, Colonel Blackall, and I tried it as directed, and pronounce it very good ; we can safely recommend it in every way. How wonderfully it will reduce the price of coffee, so that the public will be greatly indebted to you.—Wishing you every success, I am, yours truly,

(Sd.) FLORA BLACKALL.

P.S.—You may make any use of this you please.

The calculations of profit made are comparatively simple. " Mr Henley's estimate," says the prospectus, which is annexed, shows that if only twenty tons of dates are to be treated per week, it will leave an annual profit of £18,500. By manufacturing sixty tons per week the profit would amount to about £50,000 a year, or 100 per cent. per. annum, even supposing the whole amount of capital were called up."

All this looks so rosy that coffee planters will no doubt feel somewhat startled. They need not become seriously alarmed, however. It is astonishing how clear everything appears on paper, especially in the prospectus of a new company. There have been several substitutes for coffee introduced at various times, but the famous berry still holds its own. We notice that under the head "Directors," the name of the Chairman only appears. This gentleman is Mr. Henry Hayman, formerly of the Don Pedro North Del Rey Gold Mining Company, and it is mentioned that this mining company, paid for several years a dividend of 100 per cent. The analogy between gold mining and making a substitute for coffee from dates is not sufficiently apparent to prove effective.

HOW COFFEE WAS DISCOVERED.

WE read a quaint story concerning the discovery of this favorite beverage. Toward the middle of the fifteenth century, a poor Arab was travelling in Abyssinia, and finding himself weak and weary from fatigue, he stopped near a grove. Then, being in want of fuel to cook his rice, he cut down a tree which happened to be full of dead berries. His meal being cooked and eaten, the traveller discovered that the half-burned berries were very fragrant. Collecting a number of these, and crushing them with a stone, he found that their aroma had increased to a great extent. While wondering at this, he accidentally let fall the substance into a can which contained his scant supply of water. Lo, what a miracle! The almost putrid liquid was instantly purified. He brought it to his lips ; it was fresh, agreeable, and in a moment after the traveller had so far recovered his strength and energy as to be able to resume his journey. The lucky Arab gathered as many berries as he could, and having arrived at Arden, in Arabia, he informed the Mufti of his discovery. That worthy divine was an inveterate opium smoker, who had been suffering for years from the effects of that poisonous drug. He tried an infusion of the roasted berries, and was so delighted at the recovery of his own vigor that, in gratitude to the tree, he called it *cabuah*, which in Arabic signifies force. And that is the way in which coffee was discovered.

THE TRAVACORE COFFEE CROP OF 1880 .—We have received the following assuring intelligence from an esteemed correspondent in South Travancore :—" We are having splendid rain in these parts, and I hope the bumper year is at hand. Places look remarkably well, and now that the seasons have changed, I hope a new era has commenced, and that the future of coffee will be as bright as the prospects of this coming season." To this we have to add the information which we are receiving on all sides to the effect that in the most backward estates all over South Travancore the blossom has set in in a manner and with a freshness and fulness, which promises golden returns, if only one or two more timely showers fall within the next fortnight. We sincerely trust our correspondents' prognostications will prove true.—*Western Star.*

MAHOGANY PLANTS IN BURMAH.—Great success has attended the experiment of planting mahogany in the Government gardens here. Colonel Hawkes, the Superintendent, says, of 112 plants raised from seed sown in September 1878, not one has failed. Some that were measured when exactly a year old were from 6 to 8 feet in height with a girth of over three inches, a rate of growth altogether unprecedented even in the case of indigenous trees. In addition to its rapid growth, the mahogany tree appears to be very hardy, thriving in the poorest soil and promising to bear with impunity the extremes of heat and moisture, characteristic of the Burmese climate. It seems strange with Forest Department in the province, and a host of highly paid professional foresters, we should get this information about mahogany from an army Colonel who only interests himself about the soldiers' gardens in Rangoon. Liberian coffee is also thriving here, both in the Government gardens under Colonel Hawkes and the agri-horticultural gardens in town. The heavy rainfall on the 1st and 2nd November, when eleven inches were registered, destroyed the early operations in the vegetable garden, and so retarded subsequent planting as to make the outturn small and inferior. The vegetable season here is particularly short, being limited to about three months from November for the English descriptions, although the Chinese with manuring plentifully manage to raise them a little longer.—*Rangoon Correspondent of the Statesman.*

FURTHER correspondence on the Coffee Leaf Disease has recently been issued, and includes communications from a number of persons official and unofficial. We do not propose to discuss the subject at present, but we would point out two impressions left on us by a perusal of this correspondence. They are—1st, the failure of the sulphur cure, and 2nd, the fact that all efforts seem to be confined to seeking a "cure." There can be doubt but that the sulphur cure has no effect. One expert, Mr. Wm. Cameron, says pointedly :—" The result is most conclusive, that sulphur is of no practical use." In a few of the letters we are told of various successes achieved by the sulphur and lime cure advocated by Mr. Morris, but they all end in agreeing that the benefit is exceedingly transitory, and that the disease seems to come back with greater force than ever.

In considering the second impression, we are partially in a position to throw some light on the first. A great deal of time, attention, and money has been bestowed on the consideration of a cure, but little or nothing appears to have been done towards investigating the cause. Hence it seems to us that the many curative agents suggested have all proved more or less transitory in their effects. If we wish to eradicate a disease, we do not content ourselves with outward remedies, calculated to reduce the pain. While not under-rating the importance of that, we at the same time endeavour to ascertain how Nature's immutable laws have been infringed and the disease brought on ; because disease is the result of a breach of Nature's law either voluntary or involuntary on our part. And in the case of this leaf disease, both in regard to coffee and to tea—for they are more analogous than appears at first sight—the first thing we ought to inquire is, Does our mode of cultivating interfere with, or thwart in any way, Nature's ordinary mode of growing the plant ?—and we think few intelligent planters will fail to find that we do not grow those plants as Nature does. If, then, the exigencies of the trade require this peculiar treatment, should we not do something by way of assisting the plant to bear up against the unnatural treatment ? Here we altogether fail, and confine our attention to endeavouring to mitigate the evil results of our neglect. What we ought to do is to strengthen the plant by nourishing the root, and, by a very much improved mode of cultivation, assist the outraged plant by neutralizing the effects of our peculiar treatment.

COFFEE PLANTING IN SUMATRA.

AROUND the bases of the mountains, and on other elevated land are considerable coffee plantations, the quality of whose productions is undeniably high, and compares favourably with that of other countries. The highlands of Sumatra are eminently suited for the cultivation of coffee, and the land is as fat as it well can be; so that, notwithstanding that some traces the leaf disease, which has of late years caused such disaster in Ceylon, have recently made their appearance, they have a great future in store. At present there are very few private European growers, the principal planting being done by natives; and although there is anything but energy visible in the country, very considerable quantities of coffee find their way to foreign markets, which are principally American. Only recently a ship left Padang for New York, with a single shipment of nearly one million pounds on board. Whilst the extensive highlands of Peraks, in the Malay Peninsula (recently inspected, by the way by a well-known coffee planter from Ceylon, in search of new ground), are still uncultivated, it is hardly to be expected that English planters will take refuge under a foreign flag; but there is undoubtedly a splendid opening for capital in Sumatra, be it Dutch, English, or of any other nationality. The Government is favourable to the interests of improvers of its colonies; but I fear a great blow has been dealt in the wrong direction by the recent introduction of heavy taxes and duties. I cannot speak for other years, but this season I have seen coffee trees subjected to anything but superlatively close attention, with their branches loaded with berries to repletion. On private plantations the wages range, from forty to fifty cents. (of a guilder)—*i.e.*, eightpence to tenpence—per day—which is higher than the general Ceylon average, but private planters are very few in number. The great bulk of the coffee produced is known as Government coffee, which is the result of a compulsory cultivation on the part of the natives. Each native of fifteen years and over residing in the highlands, is bound to plant and cultivate each year fifty coffee trees, and he is also compelled to sell the produce to the Government, and to no other person, at the upshot price of 14fl. (23*s.* 4*d.*) per picul (133⅓lb. English), delivered at the Government coffee pack-houses, as they are called. As the coffee fetches at public auction 60fl. (90*s*) on an average the profit is something considerable.

At the first blush it seems very hard to first take a man's country against his wish, then make him grow a plant he does not want to, and finally compel him to sell the produce thereof at a quarter of its value. But a very short residence amongst the Malays will reconcile anyone to such a condition of affairs. Into the question of right to take another man's country because he cannot help himself, I will not enter, leaving it to deeper thinkers than myself to decide whether the proceeding is justified by the defection of the uncivilised in not attempting to employ the benefits Nature has so bountifully placed in their grasp. I only know that, left to themselves, the natives, of those particular regions, would never cultivate a single pound of rice beyond what they required for filling their own mouths, whilst coffee they would never cultivate at all; their own ideas of agriculture never reach beyond a clump of plantains here, a few cocoanuts there, and a patch or two of rice. Here it is no great hardship to have to grow coffee. If a man requires land, he has only to go outside his door to find as much as he wants, whilst the suitability of ground is such that the least amount of attention is repaid a hundredfold. Besides this, the natives are exempt from taxation of every description unless compulsory labour known as "Heerendienst," the non-fulfilment of which entails a fine, can be so classed. "Heerendienst" is compulsory labour on the roads, when such require repair; but no man can be made to work for more than one day in each week. This also I cannot but regard as a salutary antidote against the innate laziness of the Malays, the effects of which are nowhere more apparent than on such ways as they themselves use for private purposes. Paths into the woods are deviously conducted round insignificant stones and fallen timber, the removal of which would not occupy an hour, but, although dozens of persons pass during the day, no one can find sufficient energy to remove the obstruction.—*The Field.*

COFFEE IN COLOMBIA.

IN the Consular Report for Panama (Colombia), in 1878, the following occurs:—"In the Department of Chiriqui, in the interior of this State, coffee planting has been recently introduced by one or two enterprising persons, with every prospect of the most gratifying results. As yet, only a small portion of land has been cultivated with this valuable product. One gentleman planted 70,000 coffee trees three years ago, from which he will get his first crop in the ensuing year. The fine rich lands lying along the slopes of the mountain ranges in that portion of the State are most admirably adapted for coffee culture on an extended scale. The climate is cool and very healthy, and the land can be obtained for nothing. There is also steam communication from Panama by coast and river to the heart of the district—the distance being about 300 miles—by which the produce can be readily and cheaply conveyed to this port. To young men in over-crowded England who can command a capital of from £2,000 to £3,000, and who are not afraid of a little roughing it at first, coffee planting in the district of Chiriqui offers a fine field of enterprise, which could not fail to produce to the investor, in three or four years, a most lucrative and yearly increasing return. The life is a healthy and enjoyable one, and sufficient labour is obtainable at reasonable rates. David, a good town of some 3,000 inhabitants, is situated in the centre of this district, about forty miles up the river of that name, to which place good steamers run from Panama every fortnight. Large herds of fine cattle are also bred on the extensive savannahs, which stretch away for miles around the town, considerable numbers of which are brought by steamer to Panama, to supply the city and shipping."—*Home and Colonial Mail.*

CINCHONA.

THE ENCOURAGEMENT OF CINCHONA CULTIVATION.

A MORE malarious country than India, we suppose does not exist on the face of the globe. European sojourners in sunny Ind have been laid low in thousands by fever, and it has thinned the ranks of our armies more completely than all the engagements those armies took part in since the British set foot in the country. For years past the most distinguished physicians have been employed in discovering some sure and cheap febrifuge. We remember the time, not so very long either, when "cupping" was the popular remedy resorted to in fever cases, and we shudder to think how many fell victims to the ignorance of the faculty. Quinine or Peruvian bark as it used to be called, soon however asserted its valuable properties as a febrifuge, and ever since, the quantity of quinine used in the Civil and Military Hospitals in India has been very considerable. But America was the only cinchona-growing country, and the importation of the bark proved very expensive. Botanists were of opinion that Cinchona could be cultivated with success on certain of the hilly ranges in India, and the Home Government decided to attempt the naturalisation of the famous bark tree. This was not quite so easy a matter, as the event proved. Mr. Clement Markham, the eminent botanist, with competent assistants, was deputed to proceed to America, and explore the forests of Peru for a quantity of seeds and plants. This was in 1861. The record of their experiences cannot but be read with thrilling interest, and as we read of their hair-breadth escapes we almost fancy the pen of DeFoe, or Mayne Reid, was employed on the task of telling the story of how the fine cinchona trees now flourishing on the slopes of the Neilgherries, were brought from their native home. Not only did the explorers experience dangers in the Peruvian forests, but the people and Government of the country opposed the exportation of plants and seedlings to the utmost in their power. But Markham and his colleagues at length accomplished their difficult task, and in the year 1863, the first cinchona nursery was opened out at Ootacamund on the Neilgherries. Now, whole forests clothe the slopes of the Neilgherry Hills, as well as those of Sikkhim, Assam, &c. To the late Mr. William Graham McIvor, the first Superintendent of the Ootacamund Cinchona plantations, must be accorded the credit of making the cultivation a success. But still while the Government have a sufficient quantity of bark, at a cheap cost, for medical consumption in the country, the febrifuge is not placed within the easy reach of the people. It is true that a very cheap concoction is manufactured from the various alkaloids of the bark, and sold to the public, as well as being kept in hospitals, but something more is wanted. We have before us now an order of the Madras Government, directing that a letter from the Collector of South Canara regarding the efficacy of Neilgherry cinchona bark in the treatment of fever, be circulated to all Collectors. We have not seen the letter in question, though we have no doubt that it will tend to make the efficacy of cinchona bark more widely known. But what is required is that the *cultivation* of the tree should be more encouraged. Villagers, ryots, &c., should be induced to put down a few plants round their houses. By this means a cheap and simple remedy for fever will always be within the reach of the rural population who live at a distance from hospitals and dispensaries. It is well-known that planters prepare a decoction from the cinchona bark, which is a reliable remedy in simple case of fevers, and the most ignorant native could be taught to do the same.—*Athenæum.*

CINCHONA CULTIVATION IN JAVA.*

IT is scarcely necessary to say that the climate where the cinchona flourishes best in Java, *viz.*, at a heighth of 4,000 to 6,000 feet is the most delicious for the European; there reigns an eternal spring, a medium temperature of 60 deg. Fahrenheit. When we look around, in place of the gloom of the forest, we see the regular lines of the cinchona trees. In place of the dark green of the great trees, the ruddy color of the succirubra or the light green tint of the ledgeriana plants. In place of the impenetrable wilderness formed by jungle and "lianos," we see beautiful paths and a carefully weeded plantation. We will describe, however, the cinchona cultivation more in detail. The method now most in vogue in cultivating, is by sowing the seeds, but these being extraordinarily light and thin, much precaution must be taken to obtain it good. The seeds are sown above the ground, on virgin soil or fine sandy earth. To preserve the seeds from the heavy rain, or the hot sun, a raised covering is constructed of *alang alang*, and on two sides the beds are protected from the wind. Usually, if the seed is good, it comes up speedily, and after two to four

* Translated from the Dutch *De Indische Mercuur*, a useful paper published in Amsterdam.

weeks the first small leaves make their appearance. The "paggors" are taken away by degrees so as to accustom the young plants to the sun and air, but the "pajong" remains, because the sun would yet be too strong for them, but principally because heavy rains would wash the plants away. As soon as the plants become strong enough, *i.e.*—one thumb (Rhineland) they are planted out at a distance of half a foot (Rhineland) from each other in regular beds which are also covered. Some months after these covers are removed, in order that the growth of the plants may not be checked now that they have attained more strength and are in the open ground. Of course, if one has but few seeds, greater care will be taken in planting, but the principal care is to sow in good soft earth, and to see that it is kept of a regular moisture.

The cultivation of cinchona by seeds is excellent for obtaining a large quantity of plants; if, however, we want a special kind, a different course must be pursued. The cinchona very readily gives hybrids, not only from the different varieties, but from the different kinds also, so that it is difficult to get seeds upon which we can rely as of a specified kind. Above all, the Cinchona Calisaya has many varieties, and as to all of them there is as yet little clearness. The best variety of this kind is C. C. ledgeriana, which contains the greatest cinchona value; next to this is the C. officinalis, which, however, cannot be compared to the best varieties of C. ledgeriana. The remaining kinds, such as C. pahudiana, which is very bad, the C. Hasskarliana, the C. Calisaya Javonica, and other Calisaya forms, the cordifolia, mecrantha, lancifolia, &c., are, for their quinine-value, not worth the pains of cultivating. The only one of which the bark is used by apothecaries is the C. succirubra.

The three kinds which must be cultivated are C. ledgeriana, C. officinalis, and C. succirubra. The last is easily propagated by cuttings, but as the seeds are usually pure, it is best to cultivate from them, and this also is the case with C. officinalis. It is different with the C. ledgeriana.

The first samples which were imported of this kind have been chemically examined, and it is remarkable how great a difference there is between the different plants and their quinine-value. Some samples contained not more than 3 per cent. of quinine, while others gave upwards of 10 per cent. It therefore became evident that the plants from seeds of this variety did not give equal results. There were forms which were very devious from the mother plant, so much so that they were thought to be hybrids. It was concluded to undertake an artificial increase by different ways of propagation by cutting, but the results obtained were so bad that the project was given up. The progagation of the ledgeriana and the succirubra has been tried in the open plantation and two or three grew passably well. Mr. Moens cut out the bark above and below the graft, and found the remarkable result that the bark of each was different as they came from different trees. One can therefore surely graft one upon the other without deteriorating the quinine-value. I find, however, that grafting is not always successful on the succirubra, and I therefore adopted another means.

I took some sets of growing roots of succirubra, grafted on them the ledgeriana, in the same manner as in Holland the aucuba and rhododendrons are treated, and placed them under double glass, and I have heard, from Mr. Moens that a part of them are flourishing. On this plan great quantities can be propagated; and it must also be borne in mind that all kinds of roots can be used for this purpose.

H. OTTOLANDER.

CINCHONA BARK FOR DRUGGISTS' PURPOSES.

37, Mincing-Lane, London, February 12th, 1880.

(*From Messrs. I. A. Rucker and Bencraft.*)

THE buying trade is divided into two main sections, *viz.*, (*a*) the druggists, and (*b*) the manufacturers. Of these the last named are far the most important, and the orders arising from them overshadow the more variable and less constant demand of the druggists. It will, however, be more convenient for us to consider the nature of those two demands in inverse order to their importance. We, therefore, take first:

(*a*) The druggists.

This portion of the trade may be said to buy on appearance only and with little reference to the analytical value of the bark. They dispose of the bark, when bought, in small lots, chiefly among the Continental chemists, who make from it various infusions, tinctures and decoctions, and even simply powder it and sell it without further preparation as "Bark," or "Tonic Powders." For purpose of this sort, they do not go to the trouble and expense of analysing the bark to ascertain the real nature of its contents—the smallness of their purchases in many cases rendering the porportionate cost of the process far too heavy—but are content to judge what is presented to them by certain traditional appearances and signs, which though no doubt originally founded on guiding principles deduced from the results of a number of analyses, have now been warped or altered so far as to often fail completely if depended on as guides to the intrinsic value of the bark.

We have, therefore, at the outset to face a somewhat anomalous demand, which puts a fictitious value on the presence of certain conditions, altogether, or at least in great measure, ignoring the richness or otherwise of the secreted alkaloids. It is obvious that this is a state of things which must result in the giving of what may fairly be called fancy prices for bark of a certain description and *primâ facie* such prices should be eagerly sought after. We will proceed now to explain the peculiarities on which such stress is laid, and then attempt to determine how far it is to the profit of the grower to aim at securing and preserving their presence when preparing the bark for market.

First, as a general principle, it may be laid down that anything which is symptomatic of care in the preparation of the bark, is accepted as favourable evidence; and evidence of some sort is required by the chemist, not only as to the qualities of the bark, but also to establish its actual identity. The fact that no analysis is attempted affords great facilities to the passing off of other bark worked up to resemble cinchona in taste and appearance, and the first doubt to be satisfied is as to the identity of the bark. Admitting that to be satisfied, we come to certain requirements for show purposes. Bark is wanted for exposure in the window, and the public have to be convinced of its medicinal properties by outward and visible signs. Again, as the chemist wishes to avoid any elaborate working out of the raw material, he requires bark which will readily yield enough of its contents to give to his preparations sensible tonic qualities. Lastly, he wants bark which, while it fulfils these conditions, does not possess stores of the higher alkaloid which he cannot extract by his rough and ready process, but which would increase the price he must pay.

Reducing these generalities to a more detailed form we find that the chemist wants (*a*) a bark possessing what is to his mind undoubted evidence of belonging to the tribe of the cinchonidæ; (*b*) a handsome bark for show purposes; (*c*) a bark which will readily yield a good proportion of its contents; (*d*) and which does not possess stores of valuable alkaloids useless to him.

It is plain that the succirubra meets this last requirement better than the more valuable officinalis. It sometimes happens that the large druggists are obliged to buy officinalis. When this happens, they usually re-sell the bark, after extracting by their method a part of its contents, to the manufacturer, and it not unfrequently happens that the bark proves to be just as rich in quinine as it was before it had been subjected to the treatment of the druggist. His method fails to effect the comparatively insoluble quinine, while it extracts a proportion of the lower alkaloids. It is obvious then that the chemist does not want a valuable quinine bark, but rather a soft red bark like the succirubra, rich in total alkaloids, which are separable by his method, but comparatively poor in the obstinate and unyielding quinine. It is true that even the lower alkaloids are not completely extracted by the process he uses, but they yield to infusion sufficiently to justify him in styling the result a tonic mixture. Its actual medicinal value must vary according to the care and trouble expended on its manufacture—if indeed such a term may be applied to the process—in each individual case.

As a cheap bark, but yet rich in the more easily separable tonic and febrifugal matter, the succirubra may then be rightly termed *par excellence* "Druggist's Bark." Nor is it deficient in the other attributes required by them. A larger tree than the officinalis variety, its bark shapes into a larger, and therefore to the uninitiated eye, a handsomer quill. The appreciation of the quinine manufacturer of the beauty of the deeply marked and scored officinalis bark would seem to be an acquired taste, and resultant on his educated knowledge of the properties it contains; for the chemist finds the eye of the public attracted rather by the silvery coated but smooth surface of the stout stem red quill.

We may then accept the fact that not only is the succirubra bark at its present price proeminently fitted for druggists' use, but even if the value of the officinalis were to decrease it would still be unsuited for a trade which aims at holding the contents of the bark *in solution* and not at working them out into a pure *precipitate*.

With this premise we may proceed to particularise the point in the appearance of the bark, the general nature of which we have already determined. They are—

(1.) *The boldness and fineness of the quill.*

Stout stem quill from fully matured trees is required.

(2.) *The regularity of the roll of the quill.*

The double roll finds most favour. It should be uniform throughout, and there should be no knobs or knots in the bark.

(3.) *The length of the quill,*

which cannot be too long, though if otherwise suitable; quill from a foot onwards in length may be termed "Druggists' Quill."

(4.) *The evenness of the parcel.*

This is obviously of considerable importance since it is brought by appearance, but provided there is no absolutely short broken quill, it is of less moment than the conditions mentioned before.

All the points so far alluded to may be classed under the general heading referred to above, as evidences of care in the preparations of the bark, and they therefore indirectly testify, for the satisfaction of the chemist and his customers alike, to the identity and, as a necessary corollary, to the medicinal virtues of the bark. Their presence in combination will also go far to secure the value of the bark as a show specimen.

But we have now another point to mention, to which tradition has given a fictitious importance. That is—

(5.) *A silvery coating of the epidermis of the bark, and if possible the presence of crustanaceous and stringy lichens.*

No doubt the silvered bark is peculiarly adapted for show purposes, but the value placed upon this condition of the epidermis is too great to be accounted for solely in this way. It is prized rather because tradition has not altogether unwisely declared it to be together with the bitter taste of the

bark, the great safeguard of the chemist against deception and the strongest proof of the indentity of the parent tree.

We have before us at this moment a beautiful specimen of prime druggists' bark bold, stout, long, well-grown, double rolled stem quill. Its intrinsic value as a quinine-producing bark is about 3s. but it fetched at public sale no less than 4s. 6d. But for some reason or other, though there are evident signs of the existence on it at some time of a complete silvery coating, it has been carefully scraped and denuded of the adherent matter. This was, no doubt, done for some good reason, such as the presence of a parasite or the mouldiness of the coating, but there is little doubt that its enforced removal depreciated the value of the bark by a considerable percentage; indeed an almost identical specimen but beautifully coated realised in a market, somewhat lower in tone, as much as 4s. 10d.

We see now why, to quote our own words, which were lately misunderstood, stout stem bark "must never be sent flat to market," for, if so prepared it would at once lose its chance of realising, on the strength of its appearance, a price far in excess of its intrinsic value.

To ensure its arrival at the home market in the condition we have described, bark likely to command the attention of this portion of the buying trade must be most carefully prepared and packed; and this opens up the further question as to how far it is to the profit of the grower to attempt to meet the requirements of, and in return command the rates given by this section of buyers.

We have already stated that the druggists' demand for bark is but a small one as compared with that of the manufacturers. This drawback is a factor in the question, the importance of which can be, in great measure, accurately determined. But there is a feature in this demand which is apt to upset all calculations; and that we have already referred to when we call it "variable and less constant." It is possible to depend on its presence. Orders from abroad may or may not have been received, and in their absence, the finest quill will fetch but its true analytic value, a value which would not have been impaired had it arrived denuded of its silvery coating, flat and in broken chips.

It may be urged that by holding over bark until the demand is present, this difficulty is easily obviated; but the remedy is not so simple a one as it appears. In the first place, it is a question whether if attention generally was directed to sending over druggists' quill to market, the amount would not exceed the demand. Further there is the expense of holding the bark to be considered a slight one, it is true, but still a factor in the calculation. Samples have to be redrawn and redistributed, and rent paid. And here again we meet a fact to which we have alluded before, namely that the buying trade is so small that their favourable disposition is a matter of importance. There is no doubt that there is on the part of the principal buyers for the manufacturers a strong feeling of jealousy towards any large buying in. We do not attempt to defend or even to explain this feeling, but its presence is an admitted fact. In a strong market, no doubt, it can be ignored, but in a weak one prejudice of this kind may materially affect a sale. If then, after holding over for some little time, in the hope of obtaining the fancy price, a retreat has to be made on the second line of the manufacturers, it may be found that the movement is not so successful as it would have been if undertaken at first.

However this may be, the variable nature of this demand introduces an element of uncertainty which is not encouraging to those who court it. But if present, it must clearly be understood that it results in distinctly fancy prices. Thus some magnificent Broughton quill, exactly suited for the trade fetched not long ago 4s. 6d. to 4s 8d. An eminent manufacturer commenced the bidding at 2s., and we have little doubt that analysis would prove it was not worth to him more than 8s. Again at the last public sales, held on the 10th instant, some very fine Darjeeling quill realized 4s. 1d. A similar lot, but not so fine in appearance, fetched 2/8, and after the sale the same gentleman we referred to above, told us the two lots gave almost identical analyses. Instances of this sort might be multiplied indefinitely, but we have said enough to shew how materially the value of the bark is enhanced, if it excites the competition.

But it must be remembered the additional rate obtained is not all profit. Picked labour must be employed to bark the trees, constant supervision is required in all the process of shaping, drying and packing, to ensure the presence of, and then to preserve intact, the characteristics required. Cases must be used instead of cheaper packing, the quills must not be pressed so as to be broken, not packed too loosely so as to impair their silvery coating through friction. All this to us on this side the water seems but a simple matter, but a Ceylon planter will tell us that it involves no small expense and labour.

How far then this expense and labour will prove profitable, must depend largely on the circumstances ruling the outlay. On the supply of labour at his disposal and even more on the average intelligence possessed by it will often hinge the advisability, or otherwise, of an attempt to secure these high prices.

On our side we can only point out the margin of profit to be gained, and leave to each individual to determine, how far that margin will be reduced and frittered away in the effort to gain it. But we can shortly summarise the results of many experiences, when we say that as a rule it *is* worth while undergoing the expense and trouble necessary to secure this market and that, too, notwithstanding the possibility of occasional disappointment, from the variable nature of the demand.

If then a planter has bark which is likely to shape into "Prime Druggists' quill," we advise him, under ordinary circumstances, to prepare it for market in such a way as to preserve in it the characteristics noted above and we believe that he will find his enterprise a profitable one, though not so much so, as he would be tempted at first sight to imagine, on reading the prices obtained.

Besides the fine quill bark, the druggists buy the small twigs, for they most readily yield their contents to unscientific methods. For this reason twigs must be packed separately, and not bulked with other sorts of bark.

We must defer till our next circular the discussion of the requirements of the manufacturers as affecting the preparation of bark for market. —*Ceylon Observer*.

SERICULTURE.

VEGETABLE SILK.

THE possibility of obtaining vegetable silk is based upon the observation first made by Mulder that silk is soluble in certain liquids without being decomposed by them. While, for instance, cellulose is dissolved and at the same time destroyed by concentrated sulphuric acid, fibroin, the real substance of silk, dissolves in muriatic acid, in a solution of the oxide of copper in glycerine, &c., just as sugar dissolves in water, and though, of course, disorganised (*i.e.*, its structure destroyed), it can be reprecipitated as fibroin from all those solutions. In this re-precipitated state it appears, after being washed and dried, as a soft amorphous powder of a silky lustre, and capable of taking up certain dyes from their solutions without the aid of a mordant.

In order to make use of these facts in cotton dyeing, by precipitating the above substance on the fibre of cotton according to well-known principles A. Muller and E. Sopp obtained, in 1871, French, Belgian, and English patents for the production of a mordant from silk waste, by means of which greater brightness is communicated to vegetable fibres, and they are rendered capable of taking up dyes in the same manner as silk.

This process, in consequence of various technical defects, has fallen short of the great expectations entertained, and has remained dormant. The patentees never intended in this manner to convert cotton into silk, but remained, as may be seen from the title of the patent, within much more moderate limits.

Whether other chemists who have taken up the first idea and have enlarged it into the "conversion of vegetable fibre into silk," have been more fortunate, we are unable to decide. The matter is, however, worth a close examination.

TOBACCO.

A VERY general opinion prevails that two or three crops of tobacco are sufficient to ruin the best land. No more erroneous opinion could exist. Tobacco extracts, principally the nitre from the soil, which enters very slightly into the nourishment of any other of our products. The drain on this element can be counteracted in two ways; first, by sowing rye on the land immediately after cutting the tobacco, and ploughing it under the next May; rye is not only the most fertilizing of all the cereals, but contains more nitre than any other; second, by cutting up the tobacco stalks, which themselves contain a large proportion of nitre, into pieces three or four inches long, scattering them back on the land and ploughing them under with the rye. Land treated in this manner is capable of producing as many consecutive crops of tobacco as of corn without material injury to the soil. Three acres of land so treated have produced the fourth consecutive crop, which compares favorably in texture, weight, and color with the remainder of the crop grown on virgin soil; and land so treated for three years produced corn in 1879 as heavy and well matured as that grown on the same quality of land lying immediately adjacent and which has produced only its second crop from the sod. Probably one cause of the widespread opinion as to the injury to the soil resulting from the culture of tobacco lies in the fact that a large proportion of the tobacco cultivated in Kentucky and elsewere is grown on steep hill-sides, the inevitable washing away of which, consequent upon cultivation, suggests a ready reason for the rapid depreciation of the land, outside of the exhaustion produced by the crop. Tobacco is undoubtedly an exhaustive crop, but with a careful and judicious system of farming it can be successfully and profitably grown on blue-grass lands with as little damage to the soil as that resulting from the culture of hemp or corn.

TOBACCO cultivation is now pursued with unusual energy in the country. We believe that, at this season, there are more lands under tobacco than on any former period. Extensive tracts of waste lands have been reclaimed for this purpose at great cost. The demand for compost manure is very great and the price per cart-load generally reaches Rs. 2·25 we are told. It would be well

if local cultivators turn their attention to imported manures, many of which are said to possess properties that will be of much value for the weed.—*Jaffna Patriot.*

TOBACCO.—The United States produces annually between 400,000,000 and 500,000,000 pounds of tobacco. The world's annual product is estimated at from 1,500,000,000 to 2,000,000,000. In the United States, fully 50,000 persons are employed in the manufacture of tobacco, earning £2,800,000 in wages, and turning out a product worth £14,400,000. Tobacco ranks sixth on the list of American exports, and last year the United States sent abroad about £10,000,000 worth. Germany is her best customer, but Great Britain follows closely.

HOW TO GROW AND CULTIVATE WHITE BURLEY TOBACCO.

PLANT-BEDS.

To be successful in raising a crop of tobacco depends entirely upon the first step taken in that direction. Secure plenty of plants and have them early. Select for plant-beds a fine soil (south or south-east exposure—new and slightly elevated), and ground holding sufficient moisture so as not to dry out during the day; burn your beds sufficient to kill all the seed of grass or weeds; then you are ready to dig up your bed. Dig in the ashes well, then rake and pulverize every clod; be sure and take out all roots, rocks, and whatever other obstructions may be found in the bed. Sow your seed any time from the first of February until the last of March. Sow a bed for every acre you intend planting is a good rule to go by. Sow about two large tablespoonfuls to the hundred square feet. Then one of the most important parts is securing the plants, and do not fail to do it by brushing your beds heavily with a green brush. The seed should be mixed with ashes or corn meal before sowing, so as to prevent getting them too thick.

SOIL, &C.

The soil best adapted to the white burley tobacco is generally given up to be of a limestone nature. The best and finest tobacco that comes from the cutting district is grown on new land, first and second crops, and in some cases a good crop is raised the third year, but that is running the ground too hard. All our fancy cutting tobacco is raised on such land, and as a general thing it is underlaid with limestone, although we raise a really nice article on old land. It should be the aim of every tobacco grower to go for quality.

PLOUGHING AND CULTIVATING.

Land intended for tobacco should be ploughed in the winter, if possible, and ploughed deep, if you expect a crop. In the spring the ground should be turned with a double-shovel plough and harrowed and rolled, if rough and cloddy. The more you cultivate your land before you get your crop out, the less work it will take to tend it after it is set. After you have it planted, keep the plough and hoe going constantly, and plough just as deep as possible. The best plough for that purpose is a double-shovel plough, shovels not wider than three inches and full ten inches long. The more work you give your tobacco, the better body it will have.

TOPPING, SUCKERING, CUTTING.

Now comes another important point in the growth of the crop, and that is topping. Don't top to more than 14 to 16 leaves at the farthest, your top leaves will all fill out well and mature, and be as large as any on the stalk. As to cutting, don't cut until ripe, which is about four weeks after topping. Keep all suckers off, to concentrate the strength of the plant in the leaves. Suckering tobacco is very tiresome, and is the most laborious work that is connected with the crop. Worms and suckers at this period in the crop demand the planters' entire attention until it is matured and ready for the knife, cutting is now to begin; a good hand will cut from 500 to 800 sticks a day, and some extra hands 1,000 to 1,200. Place from eight to ten stalks on a stick; you will have to be governed by size of plants.

HANGING AND STRIPPING.

In hanging in the barn, the sticks may be hung about eight inches apart, if dry and well wilted. Never take tobacco in the barn if wet with dew or rain, as you are likely to have it house-burned. Never use fire in curing white burley tobacco, as the smoke renders it useless for cutting purposes; but keep the barn open, so that the air can circulate freely. When your tobacco is sufficiently cured to strip, you should be careful in keeping each sort by itself. First, keep all the chaffy trash leaves together, then your bright lugs; next comes bright leaf, which is about the centre of the stalk, and sometimes all on the stalk is bright after the lugs are off. Be sure and keep each color and each length together by itself.

BULKING.

Having your crop all stripped, it is now ready for bulking. Great care should be exercised in having the case right, as too much casing will cause your tobacco to funk. Heavy bodied tobacco will stand more casing than a fancy article will to get in proper condition for bulking. It should dry out thoroughly after stripping and then, as the leaf comes in case before the stem, it should be just moist enough, so as not to break under your knees as you bulk it. The stems may be dry enough to break, but that will not damage the tobacco if the leaf has sufficient moisture to keep it from breaking.

PACKING AND PRIZING.

Next comes prizing in hogsheads, preparatory to shipping. This is not a very great task, but a great many make it so. There is but one way in which tobacco should be put in the hogshead, and that is, every kind you have should be packed in a hogshead by itself. Prize not over 1,000 to 1,100 net pounds to the hogshead. Don't mix different kinds together; if you do, you are sure to get the worse of the draw, and your tobacco will sell for what the lowest grade in your sample is worth; therefore, you lose all your good tobacco simply because a few hands of trash or some other worthless article is in your sample.—*Journal of Agriculture.*

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.

Calcutta, 1st Feb. 1876.

CONTENTS.

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces; that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

CORRESPONDENCE.

COWDUNG.

TO THE EDITOR.

SIR,—Will you kindly tell me whether cowdung if exposed to the sun for a month or six weeks will deteriorate? I was very much obliged to you for your note regarding the "keeping of tea in tin boxes."

TRAVANCORE TEA PLANTER.

CATTLE-BOX MANURE.

TO THE EDITOR.

SIR,—In your issue of the 10th instant, I notice an interesting article on the results of experiments on the different kinds of manures tested by Mr. Harman at the Government Experimental Farm at Bangalore, and I would be extremely obliged by your kindly explaining to me what is meant by "Cattle-box manure."

KENNETH DONALD.

Our correspondent will find his query answered elsewhere.—ED., *I. A.*

RHEA FIBRE MACHINE.

TO THE EDITOR.

SIR,—Please allow me to explain the exact state of things relative to my machine and process, as I think the notice you kindly gave may produce an unfavourable impression.

I must state that, practically and commercially, I have most effectually got rid of the difficulty arising from the glutinous matters of the plant, by first boiling the stems. In this process at least three-fourths of the gum is set free, and the vegetable albumen becomes fixed and ceases to be an impediment to the removal of the cortex. As to the wood—that has never been a cause of difficulty, and is always most easily removed. In my case at present, in consequence of the stunted condition of the Rhea grown at the Botanical Gardens, Howrah, no wood—so to speak—was formed, and few of the stems exceeded 1 foot 6 inches in length, and certainly none thicker than a pipe stem. This failure of the crop must be taken into account, but the real and principal cause of the result not having been more definite was one entirely beyond my control. When the last day's experiment was performed, I was struck with the fact that the oscillation of the upper rollers in the forward direction of the drum's revolution did not move at all—in fue their action was *nil* in this direction. I investigated the cause of this defect, and soon found that a *pinion* wheel of only 13 teeth, was occupying the place of one which has 25 teeth, these wheels being connected directly with the crank shaft of the machine. Of course the change of these wheels would give the machine four times the executive power, and produce corresponding results. The error arose from the workman of the makers having in the hurry of packing put on the shaft the wrong wheel. I hate excuses, still I love the truth, and these being the facts, it would be extremely unjust to condemn the machine because of the untoward accidents of the condition of the 12 maunds of stunted rhea and the mistake in the wheels. These are trifles light as air; but, to the ignorant, proofs against the machine and process, which cannot be allowed to remain unnoticed by me. My experiments in spite of the difficulties in the rhea and the lame state of the machine have been a great success and demonstrated and corroborated two most important facts—1*st*, that the boiling process does not in the least degree deteriorate the fibre; 2*nd*, that the bark is easily removed, and the fibre is practically and commercially clean.

If there remain a few specks of bark, these disappear at once on the alkaline boiling in Europe for the removal of the resinous substance of the plant. I have proved that the Rhea imported into England from China contains full 35 to 38 per cent. of resin and other extractive matters; still this commands from £40 to £50 the ton. It is the limited supply from China which prevents the more extensive use of this, the most valuable of all fibres. The Chinese prepare it by hand; one Chinaman can decorticate from 2lb. to 2½lb. per day, leaving 38 per cent. of extractive matters. With my machine, which is now to be placed at Messrs. Gladstone, Wyllie & Co's Jute Mill, Garden Reach, on the coming season when the Rhea crop will be more propitious, I will demonstrate that this machine will operate most effectually on 1½ ton of Rhea stems per hour and extract from the same 210lb of clean marketable fibre worth at a minimum £35 the ton at a total cost of all and every condition, including the cultivation of the Rhea at one pound the ton, covering labour, fuel, wear-and-tear of machinery, interest on capital at £10 per ton, leaving a clear profit of £25 per ton. I, will shortly leave for England, and if I do not return, I will elect a competent representative,

ROBERT COLLYER, M.D.

TEAK SAPLINGS.

TO THE EDITOR.

SIR,—In continuation of my letter published in your issue of October last, I send some further particulars of teak plantations in this district. In November 1878, I put down 70 plants, averaging 9in. in height, of teak which had germinated spontaneously from seed dropped from the parent trees given in alluvial soil. The soil of my plantation is the red ferruginous clay found in the proximity of laterite formations such as that of Tanjore. On taking the measurements of my plants at the end of 12 months, I found their average height to be 6 ft. 9in.! I may mention that they were carefully watered and pruned during their growth.

R. R. E. BROCKMAN,
CAPTAIN, R. E.

Tanjore, 17th April 1880.

SOAKED *vs.* BOILED GRAM.

TO THE EDITOR.

SIR,—Can any of your numerous readers inform me whether there is any truth in the tradition which the natives of this district have, to the effect that the use of soaked gram (*Dolichos uniflorus*), instead of boiled, for feeding draught and milch cattle induces in the latter a failure of eyesight, after this food has been continued for a couple of months or so? It appears from what the natives say that cattle thus fed cannot see after sunset, and they assert that all the Government Commissariat cattle are in this peculiar condition in consequence.

R. R. E. BROCKMAN,
CAPTAIN, R. E.

Tanjore, 21st April 1880.

SERICULTURE.

To the Editor of the Ceylon Observer.

SIR,—With reference to Mr. Horsfall's letter to you on this subject, published in your issue of 5th instant, the scheme proposed seems rather impracticable. I presume that the insects referred to are the larvæ of the oleander hawk moth, from the description given of their ravages, but this insect does not belong to the Bombycidæ. Mr. Horsfall tells us, though, that he has recently seen some cocoons collected from the branches of cinchona trees, so that it is evident that, unless these were produced under artificial conditions, they were not cocoons formed by the ordinary larvæ so common especially on succirubra.

I am aware that there are other species of larvæ that feed on cinchona, having met with two kinds myself, but I do not remember to have anywhere seen any whose silk would prove remunerative. The common caterpillar, *Deilephila nerii*, constructs its cocoon in the earth, small particles of which are mixed up with the threads, but these are so interlaced that I question if winding them is possible.

But, even if the cocoons shown to Mr. Horsfall were produced by other insects, and their silk was worth cultivation, I still fail to see why our cinchonas should be sacrificed for the sake of a new industry, the permanence of which is doubtful and the profit uncertain. Mr. Horsfall says that the prunings alone would supply a large part of the required food (the worms feeding on other plants besides cinchonas), but he is apparently not aware that it is absolutely necessary to feed silkworms on one kind of food only, from the times of hatching until they spin their cocoons. I have hitherto believed that the quality of cinchona bark depended in no small degree on the minimising of light, and that the most moderate pruning possible was desirable in order to secure the secretion of alkaloids. But Mr. Horsfall tells us that this secretion is known to be stimulated by every measure that tends to check too great luxuriance, so that I am apparently mistaken. I am, however, rather doubtful if our trees are likely to suffer much from this cause, for we have been told by Mr. Hughes that Ceylon soils are naturally poor, and few of us at present manure our cinchonas.

But admitting I am wrong on all these points, there is one objection to the proposed use of prunings, which seems a serious one. Cinchona branches, in order to be kept fresh, must have their stems immersed in wet sand, and must be frequently changed. The worms will not readily leave their position on the stalks, so that it would be necessary to leave some of the old food with each of them when giving a fresh supply, and I think that this accumulation of *debris* and the continual damp occasioned by the wet sand would in very little time engender disease.—Yours faithfully,

SCRUTATOR.

April 8, 1880.

[The most considerable and successful experiment in sericulture made in Ceylon we suppose, was by Mr. Bury on Golconda estate, Haputale; but the result was not very encouraging. Thunderstorms are very injurious to the health and even lives of silkworms, and in this respect Ceylon is at a disadvantage. We do not know if the same objection would apply to the cinchona caterpillar, and the experiment suggested by Mr. Horsfall is well worthy of a trial at least.—ED., *C. O.*

CINCHONA SEED.

To the Editor of the Ceylon Observer.

SIR,—Now that the cultivation of cinchona is extending so rapidly in Ceylon, there must, I presume, necessarily follow a desire amongst cultivators to secure seed of the more valuable kinds. This appears to be a most difficult matter for private individuals to accomplish, and you would be conferring a great benefit on the planters of Ceylon by urging upon Government the great and pressing necessity of establishing Government cinchona gardens if on ever so small a scale. The Indian Government is very far ahead of us in this respect, and is, I believe, in a position to supply seed of the more valuable kinds of cinchona to the planters in the Neilgherries, Sikkim, &c., and the seed so supplied can, I understand, be relied on as genuine and valuable. One constantly sees advertisements in your paper of guaranteed Ledgeriana plants and seed, but one fears to purchase at the prices asked, for fear of not securing the real article. Could you or any of your numerous readers enlighten me as to the supply of Ledgeriana seed available from Java at the present time, and whether statistics as to quantity of seed which has been sent out during the past two or three years from the Government gardens, Java, are procurable. Some of your readers may be in direct communication with Java, and if so, would greatly benefit their brother planters with a little information upon the subject. It would be a serious matter to expend a large sum of money upon seed and plants which might prove worthless, and at present we are most lamentably

IN THE DARK.

March 22, 1880.

FIRE AND FIRE LINES.

To the Editor of the Pioneer.

SIR,—Having seen a letter in your paper suggesting that, perhaps, fires in forests were beneficial than otherwise, and having also read your Review on the Forest Reports, I waited for many days to see if no one more competent than myself would answer them. No one having done so, I have ventured to send you a few remarkks on both these letters. Knowing how hard theory is to prove, I will do my best to stick to facts only. Your correspondent (I, having mislaid the number of the *Pioneer* in question, cannot give his signature) questions whether fires by manuring the ground with ashes are not more good than harm to the forest. I will try to prove to him that fires in forests are second to nothing in the damage they do to the trees. Even in England fires are strictly prohibited, and then although trees are almost, so to say, gardened. I never heard of ashes being applied as a manure to them, although largely used for carrots and other crops. I was reared up on the borders of the Woolmer Forest, and can well remember the general features of the place. Many herds of three-quarters wild ponies, villagers' cows and geese, and small lots of pigs and sheep grazed in the forest there, and often fires were lighted and, if the season

was a dry one, burnt for days. Since then the Government has closed the forest. To the astonishment of many, without seed being sown, it now grows large patches of fine pine or fir timber, nothing having been done to promote their growth but protection from fire and grazing. I must state that there always were a few clumps of old fir trees about. I saw the forest last year many times, and was astonished at the change. Not far from the same spot is Wiltey Common, where the same thing has happened exactly. At Liss, on the road from Liphook to Greatley, and near the rifle range in the forest, are the most remarkable changes in my eyes. Near the rifle range a fire had killed many hundreds of fine young firs. If protection from fire is so beneficial in a damp climate like that of Hampshire and Surrey, how much more must it be so under the burning of an Indian sun in April? The effects of fires may be briefly described as killing all vegetation that is small enough to be killed, or burning all that is dry enough to blaze. After a fire has passed over the ground, the surface is left bare; the following rainy season beats the surface very hard; the following dry season bakes it. Surely that is hardly the way your correspondent would prepare his garden seed-beds. On the other hand, protect that forest from fire, the leaves and grass rot on the ground, making year by year a thicker layer of leaf mould. The rains fall on the leaf mould; it acts as a sponge, and prevents the water running into the rivers as fast as it falls, which it certainly does off the burnt surface. The only fact I can imagine as being brought against the protection from fires, are insects; but take insects in the lump (I mean what outsiders usually call insects, and not the naturalist definition of them), they are cultivators very often, ants especially. Think of the tons and tons of soil they cause to change places; but a-lowing that insects do increase to an enormous extent, surely it is better to be able to say that the forests are infested by insects, than to say there is not food enough for caterpillars to live on; but the rule is that, when any form of insect increases, another that feeds on their bodies does likewise, so I do not fear any stoppage of forestry from insect life. In your Review of the Forest Reports, you say, *the system seems to be (alluding to fire conservancy, &c.) to cut diagonally what are called fire-paths some fifteen feet broad.* Further on, after Mr. Campbell's fruitless attempt is described, you say. *It may be imagined how useless a fire-path of fifteen feet wide must be to stop such a fire as this*; and I have no doubt you are perfectly right, as there are few places where a fifteen-feet path *alone* would stop a fire; but you have been misled somehow, at least as regards the North-Western Provinces. You are quite right in calling the path a fire-path, but you have forgotten the *fire line*. The grass is cut on either side of a path, say from twenty to ninety feet, according to height of the grass, making a total of fifty-five feet to 205 feet for the width of *fire line*. The fire-path is included in this. The object of the path is to prevent creeping fires, and it has to be kept strictly clean of grass, leaves, or anything that will burn, and it is sufficiently wide to stop the creeping fire when it gets into the stubble of the cut grass. The fire line is the thing that stops the raging fire (or is meant to). I would also point out that what is sauce for the goose is not sauce for the gander; I mean that a 400-feet fire line might be required in one bit of grass, and then fail to stop a fire, perhaps, if the wind was blowing a real gale; whereas five feet clear and clean would do it, perhaps, not a quarter of a mile further on the same line. For instance, on the top of a sharp ridge, the fire can be stopped by a small six-feet path; in the bottom of a steep *khud*, with well-wooded sides, twenty feet is ample in many cases; but on a broad *maidan*, where the grass is high, with the wind blowing over the open, unbroken by trees, then may the forester shake his head, and say, "Oh, cruel fate!" The proper thing to do with *maidan*, of grass is to fire them in November and December, as then the high grass is burnt into patches. The width of fire lines must be determined by observation and experience; as, if too wide, money has been thrown away. There is no doubt that, as the young stuff grows up, the cost of protecting it will become less.

O. GREIG.

THE CULTIVATION OF TREES.

(FROM A CORRESPONDENT.)

A CORRESPONDENT of the *Indian Agriculturist* wrote to that paper early last year, wanting to know whether the girdling of apple-trees would cause them to yield in greater perfection, but up to the present time there has not been a single reply in that paper for, or against, such a process. The question, however, was answered privately, so that no time should be lost in preventing the death-warrant being issued against the trees, this being a process that all trees that are to be felled for timber undergo, in the first instance, not so much as a distinguishing mark, but to dry them before they are cut down; hence, when cinchona trees are barked, there is still a long surface of the bark allowed to remain intact, while by mossing and other methods, the parts stripped once more regain what they were deprived of.

All fruit trees with gum or milk in the bark may be subjected to the following process. When the young fruit has shown its appearance, cut notches in the bark. If of 24 inches in circumference, run one line of chalk-mark round the body, at, say, 4 feet from the ground, then run another chalk-mark round it at a distance of one foot above; or at least that is just as I did to one solitary mango tree that was in bearing for the first time. I had many others, some that were in bearing for several years, and one that was in its first season. From this last I did not get a single fruit, all fell off prematurely; the other trees also lost largely in the same way, but on the wounded tree, the fruit exceeded in size that of every other tree in the garden, and while fruit was falling plentifully by the force of the wind from day to day from other trees, none fell from this. But I saw that they had become too heavy to stand any squall, so I got all the straw-cases of bottles that I could, into which I introduced the fruit, tying up the mouth of the straw-cases with dried plantain stalls, taking the weight of the fruit from off its stalk, and transferring it to the branch by the same piece of string; then to prevent the case from dangling and being caught and torn by the other branches, I tied the other end to the same branch with the same kind of plantain stalk, thereby securing the straw case to the branch from end to end. For want of more straw cases I got long straw, tied a good handful up at one end, settling the fruit carefully within, and securing all in the first instance. The long grass being cut, I got the dried stalk of the plantain tree, tied the ends of the stalk together, and enveloped the fruit in it, and secured it in the same way. That same night a heavy squall of wind and rain came on. All the trees in the garden lost nearly all their fruit, while this one tree did not lose a single one, though there was not the least shelter of any kind near it. In about a week after they were getting ripe, I measured thirty-two of them; they gave ten inches and five-eighths in length and ten and-a-half in circumference. In fact they were the largest mangoes in the garden, and all who saw them, said they never saw anything like them in that place. Mr. Strettell in his journal states that while on his journey to find and compute the area occupied by the India-rubber tree in Burmah, the Chinese, on the frontier close to Bamoo, wounded their pumalow trees in a similar way, for a like reason, the sap that has risen to its full extent being retarded from running down, and consequently remaining to supply the fruit with nourishment. But the custom is a wide-spread one, as we may learn from that passage in "Sam Slick" on the taming of the shrew, where he tells us "Father used to say—a woman, a dog, a walnut tree, the more you lick em the better they be." So from this it is evident that the walnut tree must have yielded a larger quantity of nuts, by this licking, *i.e.*, the bark of the tree is beat en with a stick, or back of a chopper. When mangoes are blown down by squalls, they are in general allowed to be a total loss; this ought not to be so, because by carefully removing the rind, and slicing the fleshy part thin, and drying them carefully, and then pounding in a morter, and passing the dry powder through a cloth, then putting the powder into mustard bottles, putting them out in the sun occasionally to keep the powder dry, the powder will be found to give curries a far better taste and flavour than tamarind, this latter article being in general exposed, to dust and flies from day to day, in the bazaars.

I will now give a few lines about the jack tree, and close for this time. A Bangalore correspondent of the *Indian Agriculturist* shows the advantages of planting the jack seed in the exact spot in which it is intended the tree should spring up and grow permanently, the only drawback to this being that the gardeners are "likely to dig the seeds up and either roast or boil and eat them." To those who would wish to plant jack trees, I would offer the following advice. In the first instance make choice of the largest and best fruit you can get; let it remain on the tree till it is so ripe that you can press your finger in. If the seeds have sent out their roots, then take all out. Place the seeds in a shallow basket of cowdung for a couple of days: by this time they will be so impregnated with the fumes of the dung, that rats, or gardener will not have any thing to do with either nibbling or eating them. It is only the old well-grown trees that bear fruit or the root underground; the trees begin bearing fruit in the main limbs, then on the body or butt, and last of all on the root below, the ground begins to crack; then the ground is dug about and loosened to give room for the fruit to expand. The fruit is not removed until it sends out a ripe, sweet smell.* This bearing on the root is not confined to any particular variety; all bear alike on arrival of the tree to its full age. Can any of your readers tell how this fruit came to be named "Jack?" The first place that Europeans landed at in India, was the Western or Malabar Coast, say Calicut. On inquiring the name of the fruit from the natives, they were answered "chuckray," this being the Malayalam name for Jack." The Portuguese improved it into "Jaca," and the English into "Jack." I have not seen any one in India extract a dye from the wood. In Burmah even the sawdust and chips are carefully gathered up, and all the clothing of the phoonghees, or priests are dyed yellow from the liquor of this wood. It was in a similar way that the gold coin of Madras was called "pagoda." During a Hindoo festival a goddess was coming out on men's shoulders, the wondering Europeans wanted to know what it was, to which the natives replied by giving the neme of the goddess as "Bagotheeummal." This led to the gold coin with the temple on it being called "pagoda!" We have all heard of the pagoda tree; the present generation only know it, and its fruit, by tradition.—*Madras Mail*.

OBSERVER.

NOTES FROM ATTOCK.

ATTOCK and neighbourhood are very bare of trees; the entire country was once well covered with arborescent vegetation, of which it has in the course of centuries been denuded. The cultivatable area has in consequence largely decreased, and the surface of the country having had nearly all its humus washed into torrents, presents generally a wild and desolate appearance. In the immediate neighbourhood of villages and within the influence of short lengths of irrigation channels, agricultural operations can be carried on with advantage to the villagers, but all outside that is very unproductive, and is but slightly cultivated, and even then, only after considerable time of fallowing, even the limestone table lands are uncultivatable in places.

The barley is ripe, corn is ripening; as soon as the former is cut, the ground will be prepared for joar. The ber (*Zizyphus*), loquat fig and mulberry are now fruiting: the pomegranate; bead (vern. bakáin) smelling like lilac, shishan, lime, orange, and wild caper, are now in flower. Roses in abundance; a few larkspurs, geraniums, maiden hair fern; of vegetables there are only onions, lettuces, radishes. Strawberries are in flower. The plane poplar came into leaf at the beginning of March. among the wild shrubs the ak (*calotropis*); verma (Rhazya) pleasant scent; hermal (one of the Rutaceæ); and some others are in flower.

Village arborescent plantations would be of great service to this part of the Punjab.

G. P. P.

Kúnd, April 4, 1880.

The Indian Agriculturist.

CALCUTTA, MAY 1st, 1880.

ON CLEANING GRAIN.

WE observe with satisfaction that attention is being paid to the important subject of cleaning wheat. In no other country in the world would wheat be exported in an unclean condition, necessitating the paying of freight on dust and foreign matter. This averages from 3 to 10 per cent., five being an average perhaps not on the side of excess. It does seem strange that this has not been attended to long ago. The local importers and exporters have been steadily paying railway freight and steamer charge on five maunds of foreign matter in every hundred, for no earthly reason than that they have been too indolent or indifferent as to the cleaning of it. It has also been said that they have had to pay the price of wheat for this five per cent. of dirt, but this is not correct, as grain and seeds are purchased in Calcutta under a "refraction" clause, which virtually removes the charge for this useless excess. We may assume, therefore, that if grain and seeds were absolutely clean and unmixed, or as nearly so as we can reasonably expect, the price would be proportionately increased. Hence the present loss to the merchant is in freight. There is, however, another loss which the merchant has to bear indirectly, but which falls directly on the cultivator. Indian grain—wheat in particular—has acquired a bad name from this impurity, and hence a much lower all round value is put on it at home. And it may safely be assumed that the merchants at home, whose valuations practically control the market, take care to err on the safe side for themselves, in thus depreciating the market value of Indian grain. Two difficulties lie in the way of our sending clean grain, and they are, the present mode of threshing, and the expense of introducing an improved method. We might perhaps add as a third, the habit of growing two crops simultaneously. This does not so much account for dirt as for the introduction of foreign grains. The cultivator sows together crops which will ripen perhaps three weeks apart; when the first is ripe, it is gathered by cutting the ears only, the straw being allowed to stand till the other crop is ready. It, however, happens that along with the first crop handfuls of the second and unripe grain are also cut; or, if the first crop has not been all removed, the remnant is cut along with the second. From either cause the two get irretrievably mixed up, to the commercial deterioration of both. The proper kind of threshing, winnowing, and separating machinery might to a large extent remedy this, but here the great pecuniary difficulty presents itself. If we wish to clean our grain properly we must first of all introduce improved threshing machinery, and the initial difficulty here is not, as might be supposed, the native conservative objection to anything new, for with all his faults, the cultivator is ever ready to adopt an improvement provided the success be certain, and the cost not more than the cost of his own method. But, so far as experiments have gone, the latter condition cannot be realised, as the native system is beyond doubt the cheaper. We are convinced, however, that the ultimate results of the use of improved threshing machinery would show that it was cheaper in the end than the native process, and our great difficulty will be to convince the cultivator of this.

For instance, the advantages of improved threshing, winnowing, and separating are thus shown, as compared with the method in use. It has been found by careful experiments that treading out the grain leaves from 10 to 15 per cent. unseparated from the ear, while threshing by machinery separates all; that steam threshing costs sixteen pies per bushel as against three pies per bushel if done by cattle treading, but that the outturn is worth two annas per bushel more from being cleared of foreign matter and dirt. Supposing the grain as now produced be worth to the cultivator Rs. 2 per maund, this is equal to Re. 1-7-5 per bushel. The account-current then would be as follows. Say the experiment was tried on a quantity of grain estimated to produce 100 bushels :—

By bullocks :—							
85 bushels grain in marketable condition	... @	1	7	5	124	6	5
10 bushels left in straw	...					?	
5 „ „ dirt	...					?	
					124	6	5
Less cost of cleaning 100 bushels	... @		3 ps.		1	9	0
				Nett value Rs.	122	13	5
By steam power—							
95 bushels grain in marketable condition	... @	1	9	5	150	14	7
5 „ dirt	...					?	
					150	14	7
Less cost of cleaning 100 bushels	... @	0	1	4	8	5	4
				Rs.	142	9	3
				Balance in favor of Rs.	19	11	10

If it be urged that the resultant straw by the machine process will not be so valuable as that by the other, on account of its not containing the ten bushels of grain, we reply that it will be more valuable, and for this reason: the straw trodden by the cattle is so cut up by the irregularity of the pressure exerted upon it, that it will not keep any length of time, while that chopped in the machine, is done at one operation, and is not bruised unnecessarily, while it is clean and unmixed with dirt, and hence of a higher value as a cattle-food. What, then, we may ask, is to be done with the view of improving the condition of our grain? Granting machine-cleaned grain to be the best and ultimately the cheapest, how are we to set about the introduction of machinery? Two methods present themselves—the introduction of powerful steam machines, and the providing of smaller ones, to be driven by hand or bullock power. For many reasons the former would be preferable. The work would be better done and at smaller cost than by the smaller machines, but there is one objection to their use in India, which must be considered fatal, and that is, the want of roads for moving them from place to place; our village roads not to speak of main roads, make this impracticable. Consequently we must revert to smaller sized machines, and doubtless these could be provided at a reasonable rate, one for each village or group of villages, the cost of purchase and keeping up being chargeable *pro rata*, the rate being based on the quantities

cleaned by each cultivator. In connection with the estimated cost of threshing and cleaning grain by the present cattle treading process, nothing has been charged for the labour of the cattle or of the men driving them, the estimated cost being principally made up of the hire of women for winnowing purposes, and the purchase of *soops* and other implements adapted to this mode of operation. The reason of this is that a cultivator does not think of debiting the cost of his own cattle's work, which is an error. When a cultivator has to hire, as is sometimes the case, if the weather is threatening, the cost of threshing and winnowing is raised to nine pies per bushel instead of three.

AGRICULTURE, N.-W.P.

THE memorandum by Mr. Buck on the measures proposed for adoption on the Awa estate under the Court of Wards is a very carefully compiled document. We may from time to time feel called upon to dissent from the action of the Department of Agriculture and Commerce, N.-W. P., but on this occasion we have little but praise for the intelligence displayed in the suggestions made, and this not so much on account of the agricultural value of the suggestions themselves, as for the evidence scattered over the memorandum, leading to the conclusion that the proposal has been carefully arrived at, and that due regard has been shewn all through it to the prejudices of the cultivator, so far as may be done without detriment to the success of the experiment. This is of more importance than many will admit, but it is undoubtedly true that if we wish the cultivator to leave his old beaten tracks, and follow our leading, we must not begin by shocking his prejudices by changes too abrupt, however valuable they may intrinsically be. It is hardly worth while to take the trouble of proving our right to make these experiments on the properties entrusted to our care under the Court of Wards. Notwithstanding the objection raised to the justice of our making any experiments in these estates, we conceive we are not only justified in doing what we feel convinced will prove of ultimate advantage to them, but that we are guilty of dereliction of duty if we fail to do so. We are clearly bound to do for them what we or any wise, intelligent and liberal landlord would do for his own property, if he had the available funds. Mr. Buck disposes of this objection by two propositions. He says—"Government ought, in my opinion, to do nothing that it is not prepared to advise or perhaps require other land-owners to do;" and again, speaking of the proposed experiments in the Awa case, he says—"none are to be tried which have not elsewhere proved improvements, and which have not, therefore, a *primâ facie* prospect of success." These seem to us to dispose of the objection. A sytematic attempt is to be made to get rid of *reh*, and it is to be utilised as far as may be in glass-making. On the subject of wells, it is proposed to spend ten thousand rupees, Awa being a district where canal water is not to be depended on. The wells are all to be *pucca*, and this money therefore cannot fail to be well spent, if ordinary care be exercised over the work. In this connection might it not be advisable to try tube wells. They are found to give satisfaction, and where sunk to the depth of 100 to 150 feet in India, usually become practically artesian wells, from which the water runs spontaneously. Even at the cost of a little more expenditure in boring, this advantage is worth trying for, as the cost of drawing the water when wanted is always a heavy drain on the cultivator, and to do this, he is frequently compelled to withdraw his cattle from other field operations. The question of the improvement of cattle is next taken up, and here it is thought that legislation will be necessary, and on this point we are perfectly at one with Mr. Buck. What will be the use of introducing, say, half-a-dozen superior bulls into a district, if there also remain with the general herds dozens of common country bulls; on this point it seems clear that some wise legislation will have to be passed. There is another difficulty. It has long been a custom for wealthy natives to permit Brahmini bulls to roam at large among the village cattle. This was originally done from religious motives, and is probably so done still; but the objection to it is, that in many cases these very bulls are the very last that a prudent stock-raiser would think of breeding from. One point besides will have to be attended to. If the stock be improved in quality, better arrangements will have to be made as to feeding, as the present mode of feeding will not support a superior breed of cattle. The planting of timber both for fruit and firewood purposes has not been lost sight of, and this we look on as perhaps the most promising of all the suggestions made. Given the country well covered with reserves of timber, our periodical famines and scares will speedily disappear. The difficulty in the way is how to set about this. We are not among the number who think that the Forest Department should attend to this. However we will not discuss this vast subject at present. On the subject of the plough, we are not quite at one with Mr. Buck, as we think it a mistake to endeavour to introduce a plough on an English model however good, the double handles being we are afraid a fatal objection. The improvement of crops by a careful selection of seed is next discussed, and the pedigree selection system advocated is no doubt the best, but to be successful, we fear its adoption must be begun by the Government in its model farms and agricultural schools. Doubtless a liberal system of agricultural shows and good prizes for the best set of heads might do something, but if pedigree grain is to be raised in any useful quantity, it will have to be done by intelligent European agency. Besides the more ordinary agricultural operations, we find that attention is also being directed to the introduction at Awa of improved machinery of various sorts, so that Awa, if these schemes get a fair trial, ought to be a model estate. The new sugar mill of Messrs. Thomson and Mylne, is highly recommended for introduction. It seems to be the opinion of Messrs. Buck and Benson that the "bunnia" system might be made use of in the introduction of improved seed, &c. Here we differ, as we cannot conceive the bunnia being of any use except to himself; his whole instincts lead him to screw all he can out of the cultivator, and we cannot imagine him interesting himself in improvements. The introduction of new staples is taken up with caution, and this is highly commendable, as the inclination is to run to extremes in this direction. Their planting and sowing have not been overlooked, but as Mr. Buck says—"In this, as in all tentative experiments, great care should be taken to test the new system by comparison with the old." This caution speaks well for the success of the experiments. On the subject of their sowing, we presume it has now passed the experimental stage, and the system may be considered a success. Mr. Hume's remarks on those proposals will be read with interest by all who have studied the subject of Indian agriculture. They are characterised by sound sense, and are therefore more valuable than the quasi-official utterances of members of the Government who have not studied the subject.

EDITORIAL NOTES.

DR. COLLYER has recently been trying experiments, with the view of showing the capabilities of his new rhea machine, and we are sorry that a more definite result has not been obtained. It is perfectly true that the machine crushes out the wood without injuring the fibre, which remains intact the full length of the wood; but the great difficulty has not been got over, and that is the removing of the glutinous substance which is peculiar to this fibre, and which stands in the way of its being thoroughly stripped by *any* mechanical process. We believe that this machine of Dr. Collyer's will do the mechanical part of the work thoroughly well; but we do not see how it is to be utilised completely until the other difficulty is got over. Experiments were tried with raw wood and with boiled, and the latter undoubtedly *gave the better result, shewing doubtless* that the boiling tended to remove a portion of the mucilaginous secretion of the plant. So far as this particular trial is concerned, we may mention that the rhea plants supplied to the Doctor were very far from good, being only about two and-a-half feet long and composed almost entirely of bark and pith: ripe wood was entirely absent. In consequence of this, the machine of course had not a fair trial, as the rollers were formed to crush wood and not soft pith. It is marvellous that such a delay has occurred in receiving the award from London relating to the trials of the several machines at Saharunpore in

September last, and this delay naturally puts Dr. Collyer, and others like him who do not belong to India, to a very great expense, and to endless trouble.

If the difficulty of getting rid of the gummy secretions, which must be treated chemically, were satisfactorily got over, we should anticipate a great future for this industry, and Dr. Collyer's machine will certainly be found in the van when this step is gained. Surely this problem is not beyond the skill of our practical chemists, who, we trust, will now more than ever devote their attention to its solution.

THE vast improvement that would be effected in the condition of the cultivators of this country by a very slight improvement in the modes of cultivation and the national benefits accruing from such improvement, do not seem to strike our rulers. It is often forgotten that a nation's greatness consists not so much in the wealth and influence of the upper ten of the population, as in the comparative comfort, pecuniary and otherwise, of the great mass of the people, and that when a long series of hard years—the result most probably of imperialistic or autocratic rule—leads at last to a revolution, it is because the masses can endure their position no longer. If our Government wish matters to move smoothly, let them make an effort to improve the condition of the millions of cultivators who form the masses in India. As we have repeatedly stated, startling reforms, even if they are acknowledged improvements, are a mistake; what we want is a very gradual but steady effort towards making two blades of grass grow where only one grew before. Take an illustration of the effect that would follow a very slight increase in production. The present production of wheat alone in India is about 36 million quarters. This is at the rate of 13 bushels per acre, which we take to be about the present average. If this were increased to 14½ bushels, the increase would amount to about one million tons, and the more immediate result to the cultivators would be the receipt by them of about 540 lakhs of rupees per annum for wheat alone, more than they are receiving just now, and who can tell the increase of comfort that would follow to all classes in the country from such an increase in its wealth?

WE have received the prospectus of "The Agricultural Institute of Bijnor," an association about to be established by the Rajah of Tajpore, "in the hope of starting earnest and continuous effort for the improvement of agriculture." It is proposed that the institute should, as a commencement, have set before it the following objects: the communication to landlords and cultivators of information about improved agricultural implements or processes; exhibitions; the supply of good seed to cultivators; the improvement of stock, and protection from drought. Mr. Buck, the Director of Agriculture and Commerce in the North-West, has made some useful suggestions for the furtherance of the end the projector has in view, and an inaugural meeting will be held next month. The Rajah has constructed at his own cost a building at Bijnor for the proposed institute, and has arranged to invest Rs. 15,000 in Government securities to cover present expenses.

THE report on the Government Experimental Farm at Bangalore for 1878-79 is more than ordinarily interesting, and this is saying a good deal, as Mr. Harman's reports always evince care in their compilation, and give the carefully digested results of intelligent experiments. During the year under review the sickness of Mr. Harman and of his overseer prevented the accomplishment of much that had been arranged for; nevertheless several important results were tabulated. Experiments with the sunflower resulted as usual, nothing decisive having been arrived at. While the plant possesses considerable economic value and grows freely in many localities, the lesson to be drawn from its cultivation here seems to point to our climate being of too forcing a nature. The plant grows with the greatest luxuriance, but the resultant oil is almost always deficient, as compared with the outturn elsewhere. The yield per acre was 450lb. of cleaned seed, which was exceedingly little, and the resultant oil 70lb. or under 15 per cent., while 40 per cent. is not an unusual percentage elsewhere. It would appear that the climatic conditions of India are unsuitable for the proper maturing of the seed, while they force a greater growth of woody fibre than is profitable. An experiment with sugarcane was tried to test the effects of wide planting. The result was satisfactory; the plot, planted 18 inches apart, gave a crop of 75,960lb. per acre, while that put out 36 inches apart gave only 500lb. less. The labour on the latter plot must have been less, and much more room available for hoeing and weeding operations. Another experiment to test the comparative values of different manures was gone into with the following result, in thousands of lb. per acre.

Unmanured	62
27 loads tan-bark	63
77 maunds castor-oil cake	67½
27 loads cattle-box manure	76

All experiments hitherto undertaken intelligently have gone to prove the great value of cattle-box manure. To further test the comparative values of cattle-box manure as compared with manures collected in the ordinary manner by the ryot, a further experiment was tried, which seems to leave no room for doubt as to the value of cattle-box manure:—

	Produce per acre.	
	Maize cobs.	Fodder.
	lb.	lb.
Unmanured plot	3,860	3,060
Ashes of 5½ tons cow-dung	4,620	4,480
5½ tons dry cow-dung	4,480	7,150
5½ tons cattle-box manure	5,870	9,710

Whatever may be the comparative values of a given quantity of cow-dung, and the ashes resulting from the cineration of the same quantity, there can be no doubt as to the great value of cattle-box manure.

MR. HARMAN gives some interesting information regarding his recent tour through Mysore, made with a view to inquire into the present condition of agriculture among the villagers, and a comparison of the same with that of former years. He found universal complaints of the destruction of forests which had taken place during the past fifty years. Many of the cultivators told him that in old times they were in the habit of preparing a compost of cow-dung and decayed vegetation of all sorts, an important ingredient in which was dead leaves from forests which have long since ceased to exist; that in those days firewood was available, and that cow-cakes were not so universally used for burning purposes. To use Mr. Harman's own words, "The decrease of forest and jungle causes less fuel to be at hand and forcing the consumption of cattle-dung on the people. The decrease also causes the direct loss in diminished supply of leaves—themselves a valuable manure." This recent dearth in manure has compelled the ryots to substitute low for high class crops. This has materially tended to reduce their profits. Mr. Harman gives an instance of a ryot who had spent some time on a coffee estate, and had seen the benefit of manuring, and who tried bone-dust on his paddy field, by which expenditure he trebled his crop; and he significantly adds, "but even this failed to induce his neighbours to do likewise." Possibly the want of means had something to do with this apparent conservatism. Mr. Harman deplores the disappearance of substantial farmers, and lays it principally to account of the generally more impoverished condition of the cultivation; at the same time he is of opinion that the present system of education—a system which supplies almost everything but agricultural training—is at fault, and we are inclined to agree with him. The ability to use a pen usually leads the student to abjure mechanical work of all kinds as degrading, and it is extremely likely that this has a good deal to do with the decadence which Mr. Harman deplores.

AN encouraging feature in connection with native education is the desire now obtaining among a certain class of students to leave the beaten tracks of collegiate training where the only goal is a B.A. degree, and to aim at quite another kind of object. An illustration of the truth of this has been seen in the large numbers who have applied for admission into the Mechanical and Technical School at Seebpore. There is no reason, why that ingenuity so inherent in the Bengalee should not find scope in mechanics much more readily than in preparing

Governmental *nukshas*, or copying out dry official documents. When the Bengalee gives his mind to a profession requiring great mental work, and the exercise of close study and thought, we do not find him wanting, as witness his success in law and medicine, and there is no reason why he should not turn out a creditable engineer. Only to do so, he must not be ashamed to soil his fingers. Our most eminent engineers have all worked hard and served actual apprenticeships to their several professions, and hence in a great measure their proficiency. Although natives make admirable penmen as a rule, we think that putting a pen in a Bengalee's hand is not the best use you can put him to. He pre-eminently among natives seems gifted with a good amount of brain, and in a large number of cases, the opportunity alone is wanting to develop this brain power. The other day two very intelligent youths called on us to obtain information as to the Sydapet Farm, Madras. They expressed themselves as desirous of spending a sufficient time there to enable them to learn improved modes of agriculture; they represented themselves as, and seemed to be, the sons of a petty landholder, and we warmly commended their ambition, which may prove of much more real service to them than all the university honour within their reach.

THE *Pioneer* draws attention to a subject we have frequently noticed, *viz.*, the propriety of manufacturing oil in this country, and of retaining the cake for feeding and manuring purposes. There can be no doubt that this is an important question, but we are afraid that nothing will come of it till the cultivators come to understand the value of an improved breed of cattle. A considerable quantity of oil is made in the country already, principally by means of the common revolving mill, but wherever a market can be found, the resultant cake is sold for cash. The oil is made, not with a view to increase exports, but to reduce the cost of the article by manufacturing as near the place of production as possible, and thus saving needless charges in carriage of refuse. The oil is made to supply the local demand, and is largely used for cooking purposes. In many parts of India, notably near the tea and coffee districts, the cake is bought up to be used as manure, and in some places it is used—but to a very limited extent—to feed cattle; yet we find that during the year 1878-79 the following quantities were exported :—

From		Tons.	Value Rs.
Bengal	... ...	9,846	4,64 906
Bombay	... ...	654	37 938
Madras	... ...	5,575	4,82,400
B. Burmah	... ...	195	10,404
		16,270	9,95,648

This cake was valued at Rs. 61 per ton, and this export trade will continue, so long as linseed cake fetches ten guineas per ton at home. However, laying aside the natural supineness of the ryot in this connection, there is another view which may be taken of it, and that is the benefit which the country itself might derive from a more extended oil manufacture. The oil could be extracted more cheaply here, and the carriage on all refuse saved. In the matter of castor-oil, this seems to be the rule followed largely, and it is strange that the same method should not obtain regarding the other seeds.

DR. FORBES WATSON'S report on cotton gins, and on the cleaning and quality of Indian cotton recently published, contains much matter interesting to the statesman and the merchant. He divides his subject into three heads—agricultural, mechanical, and commercial. The first embraces the growing of the plant and the means to be adopted for improving the quality of the staple; the second, the means of separating the fibre from the seed so as to injure the former in the least possible degree; and the third, the improvement of the means of communication between the growing and exporting districts, and the prevention of fraud by adulteration. The means of communication can be improved only by the construction of light lines of railway penetrating at different points into the cotton districts, and the improvement of the village roads. As for adulteration we fail to see what the Government has to do with this. The ordinary criminal law of the country, with average intelligence on the part of the exporting merchants, ought to suffice. In jute, for instance, the exporters see every bale packed under the supervision of an agent appointed by themselves, and unless the Bombay cotton merchants adopt a similar system to protect themselves, they need look for little or no help from any amount of specially protective legislation. What is really wanted is improved seed and superior cultivation; this latter including the harvesting of the crop, the quantity of leaf removed from some samples of Indian cotton being as high as 6¾ per cent. That there is room for great improvement in the cultivation no one can doubt. The quality of Indian cotton is vouched for by the price it realises in Liverpool, as compared with the product of other countries. The quantity produced is, beyond question, lower than it ought to be. Dr. Watson calculates the average outturn of clean cotton in India to be 67½lb. per acre, while in America it is 250lb. The proposal as to improvement in seed is a wise one, Dr. Watson deprecating the introduction of exotic varieties. He holds that we have the quality best adapted to our climate, and that we must improve it by a system of pedigree selection. In eight or ten years we should become possessed of a vastly superior article if this plan be followed; although, as we said when speaking of pedigree selection in connection with grains generally, not much can be looked for in the way of improvement, unless the pedigree experiments are conducted under intelligent European agency. Not to appear too sanguine, we do not see why we should not at least produce a fibre equal to a fair American variety, and this without revolutionising our modes of cultivation.

THE Persian Company's steam-ship *Henry Bo'kon* left Bushire on the 12th ultimo for Bombay, touching at Galle first, to transfer to the China mail 600 chests of opium, 400 of which have been put on board at Bushire, and 200 await her arrival at Bunder Abass. This consignment forms the remnant of last season's produce. It is estimated that in that season, 7,000 chests of opium have been embarked from the Gulf ports for China and London. The manufacture of this drug in Shiraz, Yezd, and Ispahan has steadily increased year by year, and great care is now being taken to render the quality as pure as possible, so as to preserve the reputation it has recently established in China. It is generally believed that during the next season, *viz.*, from 1st May 1880 to 30th April 1881, no less than 10,000 chests will be forthcoming from the places abovenamed. A wealthy merchant of Bushire has in contemplation a scheme for running steam vessels direct mainly for the purpose of conveying opium.

AN ANNEXATION.—The Consul-General of Liberia sends the following :—"By a recent Liberian mail official advices have been received at the Liberian Consulate-General of the annexation by the Republic on the mutual and peaceful terms of that vast and important country adjoining the interior frontier of the Republic, known as the kingdom of Medina. Medina abounds in the richest of African productions; there are thousands upon thousands of acres of gold and iron fields; its forests are teeming with ebony, palm, gum, and rubber trees, while the well-known Liberian coffee tree is found growing spontaneously to the height of 30 and 40 feet in all its native splendour. In this new acquisition Liberia has opened still wider the door into the interior of Central Africa. The Medina Bopora country, with its 700,000 souls, will, with the exception of the coffee plantations on the St. Paul's River, form the richest and most populous portion of the Republic. Extraordinary impetus has lately been given to agricultural pursuits in Liberia, owing to the great demand for Liberia coffee seeds and plants in almost every coffee-growing country."

OUR Madras neighbours are talking of trying to manufacture paper out of aloe fibre. They possess the aloe in abundance, but they cannot yet make cheap aloe fibre paper. The process was patented in England for the purpose as far back as 1838 by a Mr. Berry. The first cost of the fibre is placed at six annas per viss, by a Madras paper manufacturer, or Rs. 268-12-9 per ton. The local Superintendent of Stationery does not yet consider it advisable to substitute the paper manufactured from the fibre for any paper now in use. He admits that the paper is superior to ordinary country paper, but it is also dearer, and perhaps

above the price which need be paid for paper for the uses to which alone it would be applied. Nor does he think it worth while to make an experiment only to produce paper equal to the sample referred to. A better paper, he thinks, is wanted. And it seems to him that more advantage is likely to be gained by offering a prize for the best paper made from the aloe fibre, with a description of the process and particulars of cost, than by having a quantity of paper produced equal to a standard already attained. But the Board of Revenue do not think that there is any use in going on with experiments unless there is a prospect of paper being produced at a much lower price than that now reported. The Government are of the same opinion.

We have much pleasure in drawing attention to the following experiment as to the value of cattle-box manure. It is taken from the Government *Gazette*. We have always held that manure should be much more carefully stored than is the custom in India, and the result of this experiment is conclusive on this point.

CATTLE MANURE EXPERIMENT.

The following experiment has been made for the purpose, of bringing forward the difference in value of manure under the system of 'Cattle-box' manufacture adopted on this farm, and of the two common methods of treatment by the ryots in this province.

"The 'Cattle-box' system of housing cattle is briefly as follows:—Over a pit sunk about two-and-half feet in the ground a shed is erected with eves overhanging in such a manner that neither the sun's rays can penetrate (except at an oblique angle in morning and evening) to dry up the manure, nor the rainfall on or run into the pit, the pit to unduly wet the contents and render it too moist for the cattle to rest on. The cattle are housed in this shed at night, each in a separate compartment, and were supplied, in the case of the present experiment, with grass only. In the morning a little litter, stalks of plants, leaves or unconsumed food is strewn over the box especially where the dung has been dropped, and nothing is removed until the pit is full, when the bulk of the manure is carted away to the field. The top layers not decomposed are replaced in the bottom of the empty pit as litter. In this way twenty loads of manure per annum containing the whole of the dung and urine dropped while the animal is not at work are secured; and bulk is obtained by utilizing any waste substance for litter, thus adding a large amount of organic matter which, placed in the soil, acts as a powerful retainer of moisture.

The cowdung employed in Plot No. 2 was obtained from a grazing ground and placed in a heap for some months until required, the common native method of storing manure not required for fuel. The ashes were the result of burning an equal weight of the same cowdung representing the residuum from the "bratty" or cowdung cake used for fuel throughout India.

The experiment was to test the comparative value of equal weights of each manure. Had the experiment taken the form of using the total amount of manure obtained from a bullock in the same time, the result would have been more striking.

It may be remarked that the dung was from mature cattle fed only on grass, without any gram, oil-cake, or other food, to enrich the manure.

The crop on which the experiment was tried was Queensland maize, grown on a poor light sandy loam. The seed was sown in rows 2 feet apart on the 18th April, and harvested for the sale of the green cobs, 18th of August.

The rainfall during the period of growth was 3·85 inches, but this was supplemented with occasional irrigation from a well as required.

The following are the results per acre:—

No. of Plot.	Manure per Acre.	Green Cobs lb.	Percentage of increase over unmanured plot	Fodder lb.	Percentage of increase over unmanured plot.
Plot No.	I. Cattle-box manure, 5½ tons ...	5,870	+74	9,710	+71
Do.	II. Dry cowdung, 5½ tons	4,480	+88	7,150	+26
Do.	III. Ashes from 5½ tons cowdung ...	4,620	+37	4,480	−20
Do.	IV. Blank	3,360	......	5,650	......

The small quantity of manure employed, the minimum of water used, and the comparatively poor soil to which they were applied, fully account for the light yield, but the comparative result is very clear.

The yield of the cattle-box manure both in cobs and fodder of 74 per cent. and 71 per cent. respectively over the unmanured plot is remarkably high, the manure being well rotted and taken from the lowest part of the pit where it was thoroughly saturated with urine.

The slight increase of 4 per cent. given by the ashes over cattle dung unburned is due to the forcing action of the former; the whole of the constituents being released from the organic combinations, they were held as unassimilable vegetable matter. But as the dung of an animal has been proved by careful experiments in Europe to contain only about one-fourth of the plant food voided in both dung and urine, it is not surprising to find the result of its action far less energetic than when both are combined as in the case of the cattle-box manure. The actual decrease of fodder when ashes were employed is curious. The plants probably suffered under the too stimulating action of ashes from insufficient moisture, though the amount given when aided by the organic matter combined both in the dried cowdung and the cattle-box manure was adequate. The frequent waterings asserted as necessary for maize by native gardeners round Bangalore, are probably largely due to their partiality for ashes as a manure, for on this farm when cattle-box manure is chiefly employed, and where a deeper cultivation is given, crops are raised with a considerably smaller amount.

OFFICIAL PAPER.

ANNUAL REPORT ON THE GOVERNMENT GARDENS AT RANGOON FOR THE YEAR 1879.

BY LIEUTENANT-COLONEL H. P. HAWKES (MADRAS ARMY), HONORARY SUPERINTENDENT.

Dated Rangoon, the 31st December 1879.

HAVING reported in detail on the Government gardens at the end of last year, it will now be necessary to allude only to the more important operations of the year just concluded.

2. One of the old summer-houses, having become unsafe, was removed, and a new one built in a more suitable locality at a cost of Rs. 393-3.

3. The building originally erected for a gardeners'-house having been found to be damp and unhealthy, has been converted into a store-room. In place of this, one of the old tool-houses has been re-roofed, and a second similar building erected: these afford excellent accommo dation for the three gardeners on the permanent establishment.

4. The Liberian coffee alluded to in paragraph 27 of last year's report continues to thrive; it is now shewing signs of flowering, and will be in full bloom about the middle of next month. I hope therefore to be able to venture upon some estimate of the probable economic value of this coffee at the close of next year.

5. The mahogany experiment has been an unqualified success. The seeds alluded to in paragraph 29 of my last report were sown on the 7th September 1878. When the plants were exactly a year-old, three of them were measured and found to be 8 feet 3 inches, 7 feet 5 inches, and 6 feet 1 inch in height respectively, with a girth of from 3¼ to 3⅝ inches, a rate of growth which, as far as my experience goes, is altogether unprecedented even in the case of indigenous trees. In addition to this rapid growth, the mahogany tree appears to be very hardy, and promises to bear with impunity the extremes of heat and moisture characteristic of the Burmese climate. Of the last 112 plants raised from seed not one has failed. We have a large number planted out, and they seem to thrive in the poorest soil where it is difficult to keep other plants alive.

6. I believe that this tree has a great future before it. The Forest Department now plant teak almost exclusively, and there is no other tree which can altogether take its place, especially in those situations where structures made of it are liable to the attacks of white ants. But there are many purposes for which a light handsome wood is required; this want would be met by

the mahogany, and there would doubtless be a considerable demand for export.

7. We have also succeeded in introducing a selection of graft mangoes from Calcutta. The first supply of plants, sent down in May 1879, were destroyed by the heavy weather experienced during the voyage, but the next consignment sent in a Wardian case arrived safely, and will be planted out on 1st January 1880.

8. For these mango trees, as well as for a large supply of palms and crotons, the public is indebted to the liberality of Dr. King, Superintendent of the Royal Botanical Gardens at Calcutta.

9. We have had the usual difficulties with gardeners. Of three brought down from Calcutta in May last, two had to be sent back.

10. The heavy rains (11 inches) on the 1st and 2nd November destroyed the early operations in the vegetable garden, and retarded all subsequent planting so much that the outturn of vegetables is likely to be small and the quality inferior. Considering the exceedingly short season during which vegetables can be grown (November to January), and the liability to damage from unusual weather, it becomes a question whether it will be worth while in future years to expend so much labour with the probability of such an inadequate result.

Account current of the Government Gardens, Rangoon, for the year 1879 :—

	Rs.	As.	P.
Cash in hand	873	14	10
Sale of vegetables	134	8	8
" grass and fruit	245	0	0
" toddy	1,410	0	0
By miscellaneous receipts	118	13	5
" local Government	1,000	0	0
" sale of flowers	240	9	6
Total ...	3,522	9	0
Cost of seeds and plants	558	0	0
" tools	129	15	0
" sundries	861	4	4
" establishment	612	6	3
" gardeners'-house	373	3	5
" summer-house	393	9	0
Cash in hand	595	3	0
Total ...	3,522	9	0

SELECTIONS.

DR. AITKEN ON FIELD EXPERIMENTS WITH MANURES.

At the last meeting of the western district of Mid-Lothian Agricultural Association—Sir James Gibson Craig, Bart., presiding—Dr. Aitken, chemist to the Highland and Agricultural Society, delivered an interesting lecture on the agricultural experiments now being carried on by the Society at Pumpherston. Among the large company present was Mr. M'Lagan, M.P.

Dr. Aitken, at the outset, expressed satisfaction at the interest manifested by the association in the progress of the experiments, and it was with much pleasure that he accepted their invitation to explain, somewhat more in detail than was possible at the field demonstration held in September, the results of the recent cropping. He explained that the aim of these experiments was, in the first place, to discover, by practical means, what were the best forms of artificial manures of the various kinds, so as to guide farmers in the selection of what would most economically produce the best crops. The amount of money spent annually in artificial manure was enormous; and it would be admitted by any one that a considerable portion of the sums spent did not yield the returns expected, and that much of the money, though perhaps not thrown away, was comparatively ill applied.

Almost every farmer was experimenting on this subject, and as the result of their investigations, many farmers had arrived at a very shrewd appreciation of the value of the manures they were accustomed to apply; but even the best practical agriculturists were often at a loss, and felt the want of some definite information as to the suitability and productiveness of different manures. The experiments at Pumpherston were an attempt to supply this; and those who visited the station during the last crop must have noticed how very different was the crop-producing power of different manures. The three great classes of manure experimented on were phosphates, potash, and nitrogenous manures. The phosphatic manures were five in number—bone ash, ground coprolites, bone dust, phosphatic guano, and apatite or other mineral phosphate; and they were applied to the soil both in dissolved and in undissolved form. The potash manures were two—muriate and sulphate; and the nitrogenous manures, six—nitrate of soda, sulphate of ammonia, shoddy, dried blood, rape cake, cotton cake; and also various guanos. The great basis of experiment was, that to all the plots on which the manures were being tried, the same amounts of phosphoric acid, potash, and nitrogen were applied; and the only thing in which they differed was the form in which they were applied. If this principle was not kept in view, the results obtained would be misunderstood. The lecturer then explained, by reference to the chart exhibiting the kinds of manures applied to each plant, how the plan was arranged to give precise information as to the efficacy of the various forms of manures, compared with others of a similar class. He then described in detail the result of the experiments with phosphates. The application of undissolved phosphates, except in the case of bones, was very little practised. At the time when mineral phosphates were first regarded as manure, they were dissolved by means of acid; and it has remained the custom ever since to convert mineral phosphate into superphosphate before applying it to the soil. Recently, experiment conducted in Aberdeenshire by Mr. Jamieson showed that the undissolved phosphate, if ground fine enough, was a very good manure, although many had entertained the belief that undissolved phosphates were useless. The experiments at Pumpherston quite corroborated this, as did also the results at Harelaw Experimental Station. This was an interesting fact, and tended to correct a popular error; but the results of the experiments of dissolved *versus* undissolved phosphates had been misunderstood by many. The experiments made in Scotland had not proved that undissolved phosphates were as efficacious as dissolved phosphates, much less that they were better; but that they had shown neither to that they were not so far behind the latter as was usually supposed. Still more at variance with the results of the experiments was the notion that good crops were to be got by the sole application of undissolved phosphates ever so finely ground. The lecturer then showed, by reference to a diagram detailing the result of the experiments at Pumpherston and Harelaw, that undissolved phosphates uniformly produced a smaller crop than the same amount of phosphate dissolved, and that where the phosphate was applied alone the crop was a failure. He also showed how erroneous was the opinion entertained by some who had superficially regarded the experiments, that the fineness of ground phosphates was able to compensate for the want of ammonia or other nitrogenous manure. There was nothing that could make up for the want of nitrogen, and to apply phosphates without nitrogenous manures was a misapplication of money. In the comparative experiments with phosphates, all the plots had received an equal amount of nitrogenous manure, except in the case of two odd plots. The results shewed that phosphates from different sources, when dissolved, gave very similar returns. When undissolved, the slowest acting manure was bones; but that was partly to be accounted for by the less available nitrogenous matter contained in them. There was a strong popular opinion in favour of bones; and though the results of the first two seasons was unfavourable to the application of that form of manure, he believed that future crops would probably show that the popular predilection was not unfounded; and reminded his audience that the results of one or two seasons, and especially of the first two seasons, of experiments, should be accepted with great caution. He then showed that the result of applying dissolved phosphates seemed to be to increase the proportion of water in the crop of turnips, and to a smaller extent in the crop of barley. He also showed that with all forms of manure containing fatty matter, the action was very slow—as, with bones, shoddy, dried blood, and rape and cotton cakes. Speaking of nitrogenous manures, the results obtained showed that nitrate of soda and sulphate of ammonia were about equally effective. The lecturer then proceeded to discuss the merits of the various potassic manures, guano, and superphosphate. He thanked the Association for the interest they were taking in the experiments, and expressed the hope that they would continue to give them their attention, and intimated that he would at all times be glad to hear any suggestions or opinions they had to offer in connection with them, for, while he hoped they had all something to learn from the experiments, he was sure he could not fail to learn much from them if they would give him their co-operation.

At the close of the lecture, a hearty vote of thanks was given to Dr. Aitken for his interesting and instructive lecture.

MANURES.

Anything which, being added to the soil, directly or indirectly promotes the growth of plants, is a manure. Manure directly assists vegetable growth, either by entering into the composition of plants, by absorbing and retaining moisture from the atmosphere, or by absorbing from it nutritive gases. Manures indirectly assists the growth of plants either by destroying vermin or weeds, by decomposing in the soil, by protecting plants from sudden changes of temperature, or by improving the texture of the soil. The manure from cows and all animals that chew the cud, is considered cold and suited to a light soil; that of horses, hogs, and poultry is hot, and best suited to a cold heavy soil. All new and fresh manure engenders heat during fermentation, and has a tendency to lighten the soil, while old, rotten manure is thought to render it more compact and firm. The manure of birds is richer than that of any other animal. Three or four hundred weight of manure of fowls, turkeys, &c., is equal to from fourteen to eighteen loads of animal manure. Guano is manure of this class. It is well to apply about two hundred weight per acre, with one-half the quantity of other manure. Guano should never, in fresh state, come in contact with seeds or roots or plants, as it is sure to destroy its vitality. A thick coat of hog pen of barn yard manure spread on the garden and turned in every spring, will enrich, warm and lighten the ground better than any application of other manures. The principal animal manures are those of the horse, the hog

the cow, and the sheep. Of these, the horse is the most valuable, in its fresh state. but it should be exposed as little as possible, as it beings to heat and lose its nitrogen immediately, as may be perceived by the smell; mix it with other manures, and cover it with absorbents as soon as possible. That of the hog comes next in value, while the cow is at the bottom of the list. The richer the food given to animals the more powerful is the manure. If animal manures are employed in a fresh state, they should be well mixed with the soil and given to coarse feeding crops, such as corn and the garden pea, nearly all plants do better if the manure is composed and fully fermented before use. Bone dust, mixed with ashes or pulverised charcoal, and sown broadcast over the ground at the rate of three bushels per acre, is very beneficial, and the most valuable for, turnips, cabbages, &c., and the quantity needed for an acre is so small, that the expense is less than almost any other application. Common salt at the rate of six bushels per acre, sowed in the spring, on lands distant from the sea shore, not only promotes fertility, but is very useful in destroying worms and slugs Marl, where it can be obtained, may be supplied with advantage, especially to sandy soils. Soot is excellent to drive off insects and vermin. Very little of this can be obtained, but it should be carefully preserved and applied in small quantities to cabbages, turnips, cucumbers, melons, squashes, and all plants infected with insects. Charcoal renders the soil light and friable, and gives it a dark color and additional warmth for early crops. When composted with night soil it becomes *poudrette*, and is second only to guano as a fertilizer. Leaves, straw, and rubbish thrown together, and moistened with a mixture of lime and salt, if kept damp until decomposed, forms the best known manure for trees and shrubs. Swamp muck, mixed with salt, lime, or leached ashes, is of value where it can be obtained, but of still more value is the leaf mold, or black surface soil of the woods. For the vegetable garden, it is best composted with fresh animal manure, but can be applied directly to most plants in the flower garden. many of which will not flourish unless this material is present in the soil. Tanbark, decayed chips, sawdust, and shavings, covered with soil are of great advantage to potatoes. Wood ashes, leached or unleached, may be used with decided benefit as a top dressing to most growing vegetables, especially onions and turnips. Plaster sown upon the growing crop, is good for turnips, cabbages, beans, cucumbers, squashes, melons, and all broad leaved plants. —*D. M. Ferry's Seed Catalogue.*

THE GROWTH OF PLANTS.

THE free evening lecture at the Working Men's College, Great Ormond-street, on February 21st, was given by Mr. Francis Darwin, M.D., a son of the well-known naturalist of that name. Mr. Vernon Lushington, Q.C., took the chair. The growth of a plant, the lecturer said, might be linked to the growth of a snowball set rolling down a snow covered hill side. Both plant and snowball grew in size by the addition of matter; but while, if the bulb of a hyacinth were placed in water and kept in the dark, it would grow in the ordinary sense of the word, in reality the plant would merely have taken stuff out of the bulb and arranged it in a different way, whereas in the growth of an oak tree from an acorn a quantity of new stuff was formed. These instances of growth suggested the questions—first, how a bulb or bean re-arranged its matter in forming a plant, and, secondly, how all the new material was obtained that went to form the tree. He intended on that occasion to speak of only one-half of the question—how the plant in growing arranged its material. First, it was necessary to know what a plant was made of. If 100lb. weight of some growing plant were taken, say turnips, and the water driven off by drying, it would be found that the weight would have decreased by 90lb. and that the solid woody part remaining, about 10lb. in weight would nearly all burn away, leaving but a few ashes. In order to give some idea of the way in which this large quantity of water was held in a plant, Mr. Darwin compared the effect of water on dead matter such as tea leaves or leather with the effect of giving water to a growing plant—the stiff day tea leaves became limp and soft, while the drooping, flaccid stem of a living plant when watered, became stiff and elastic. How could the plant build up a strong, stiff stem with so much of so unstable a material as water, and how did the water become a source of strength to the plant. To understand this they must know how the water was contained in the plant. The solid material was formed into little cavities, and these—an infinite number of little boxes, as it might be—were filled with water. The way in which the water might become a source of strength could be seen by forcing water into a flexible tube or bladder, or by blowing air into an empty glove. The pressure of the water contained within caused the walls of the cells to become stiff. There were other ways, too in which this stiffness was obtained, the water getting into the texture of the woody stuff and stiffening it as water stiffened sailcloth. This state of things existed also in the pith and each cell, being overfilled with water was for ever trying to lengthen itself. Some of the results of these conditions in the plant were then explained by the use of two pieces of spiral spring, and for a more familiar example the audience were referred to the effect of splitting a dandelion stem. Each half curled over outward be cause the more elastic pith trying to lengthen itself was prevented from expanding on one side by the less elastic bark. With two pieces of spiral spring in a linen tube it was next explained how, when the pressure of water in the cells in the two halves of the pith was not equal, the stem did not grow straight. Not that plants bent accidentally or in a purposeless manner. On the contrary, when the plant bent it was with some distinct and useful object. To the explanation of this point the rest of the lecture was directed. The directions and forms which the root and stem of a young growing plant might take, were happily illustrated with a piece of whitened lead pipe of small bore put through a cork, which did duty for the bean. A great many theories had been offered to account for the fact that the root always tried to grow towards, and the stem away from the centre of the earth. Having related Andrew Knight's ingenious experiment with a revolving wheel, by which, with centrifugal force as a substitute for gravity, the plant was deceived and the direction of growth in seedlings was changed, the lecturer next dealt with the influence of light and damp on the growth of a plant. The stem was invariably shot out or bent aside in order to get at the light and the root, with equal persistency and certainty, was sent to find moisture. It would have been noticed, Mr. Drawin said in conclusion, that he had throughout spoken of plants perceiving the light and knowing where the centre of the earth was, and had used other expressions of a similar kind usually only applied to animals. He had done so with no idea of being paradoxical, but because he thought that by thinking of plants in this way we were more likely to learn what was going on within them. If we would understand the actions of an animal, we must know what was useful or not useful for that life, and it was quite as necessary to consider in the life of a plant of what use its actions were, and in a certain sense why it acted in a particular way.—*Times.*

THE AGRICULTURAL INSTITUTE OF BIJNOR.

PROSPECTUS.

Raisees and Gentlemen.

IT has long been my wish to establish an Agricultural Institute or Association, in the hope of starting earnest and continuous effort for the improvement of agriculture. The possibilities in this direction are practically unlimited; but until the large landed proprietors of India resolutely set themselves to the task, no appreciable results are likely to be obtained. It will be creditable to the Bijnor district if it takes the lead in this matter; and you are doubtless aware that the subject is one in which the Government takes the greatest interest, and that any real and practical endeavour to improve the agriculture cannot fail to meet with the sympathy and approval of his Honor the Lieutenant-Governor.

Mr. Buck, the Director of Agriculture and Commerce, has very kindly made some suggestions for the guidance of the proposed Association. In a letter addressed to the Collector of Bijnor, he writes:—

"Para· A. 4.—I suggest that the institution proposed be called the 'Agricultural Institute of Bijnor,' founded by Jaggat Sinha; that it should, as a commencement, have set before it the following objects:— (1) the communication to landlords and cultivators of information about improved agricultural implements or processes: (2) the exhibition of new implements of processes; (3) the supply of good seed to cultivators; (4) the improvement of stock; (5) protection from drought.

"B. 5.—Meetings should be held (not too often, and perhaps once in each half-year would be sufficient). If an organized system be established and carried into effect, some other landlords will see its practical utility and be attracted to join in its operations. At the same time the Institute would be the means of communicating to Government the wants of landlords in connection with cattle-bleeding (it may be in the supply of bulls or the grant of a waste tract for grazing or otherwise), without which the endeavours of the landlords might be of much less effect. So also in the supply of good seed which Government has certain facilities for supply.

"C. 6.—A permanent Secretary should be appointed, who would collect from this department, from the Agri-Horticultural Department of Calcutta, and elsewhere, records and papers likely to be of interest.

"D. 7.—Members of the Institute or Association should undertake to give through cultivators on their estates a thorough and careful trial to any new implements or processes submitted to them by the Agricultural Department, and to return a just verdict of their merits or demerits. It will often be as useful to be told that a supposed improvement is useless, and why it is useless, as to be told that it is a success. It is the verdict of cultivators that we require.

"E. 8.—A certain sum should be obtained each year for the purchase of new implements or seeds for trial.

"F. 9.—One annual meeting or exhibition should be held, and prizes given for implements, produce, and stock. I should not advise this being done for another twelve months or so. April is, I think, the best month after the harvest is gathered in.

G. 10.—The present proposal may be the means of founding an Agricultural Association for the North-Western Provinces. The Talukdars' Association has already taken up a similar proposition for Oudh, and the first meeting is to be held in the first week of next April to discuss future operations."

I have to inform you that I have constructed at my own cost a building at Bijnor for the proposed institute, and have arranged to invest Rs. 15,000 in Government Securities to cover present expenses.

I propose to hold an inaugural meeting next month (due notice of the date will be given). All raises, landed proprietors, and gentlemen, who are willing to join, are requested to send me their names.

BIJNOR,
The [illegible] April 1880.

JAGGAT SINHA,
[illegible]

METEOROLOGY AND AGRICULTURE.

THE study of the general movements of the atmosphere and the investigation of the signs by which atmospheric disturbances herald their approach, and forewarn us. to some extent, of the direction they are likely to follow, are already provided for in France in a special institution richly endowed by the public authorities. But General climatology and the dynamics of the atmosphere, the study of which is intrusted to the Bureau meteorologique in the Rue de Grenelle-Saint-Germain, represent only one side of "the science of weather," the investigation of the *causes* which induce diversities of climates and variations in the appearance of the sky. There is another side which it is equally advantageous to cultivate; the investigation of the effects produced by such diversities and variations on growing crops and on the public health. These two branches of one and the same science are as opposed in the means by which they are pursued as in the object at which they aim.

General climatology requires numerous meteorological stations scattered over the whole surface of the globe. But at each of such stations only elementary barometric and thermometric observations, and notices of rain, winds, and clouds are needed, such as have been collected for the last 200 years. Far different is the case with regard to the study of the effects produced by changes of weather on vegetation or on animal life. Here the number of stations is of far less consequence than the adaptation of the facts observed to their proper object. The field of observation is widened considerably at the same time that it is transformed. In it physiological study and experiment are of considerable importance as a means of learning which of the climatic data are really active, and what are their immediate or remote consequences. None of the meteorological observations made from the point of view of the dynamics of the atmosphere would be of any direct utility with respect to the progress of the crops; they are either too artificial, or too general, or too vague. Hence it is that so little success has attended the efforts hitherto made to found a system of agricultural meteorology.

Theoretical meteorologists put their thermometers in the shade, and do all they can to protect them from external radiation. But our crops do not go on growing under such conditions; on the contrary, they live by radiation from the sky. Solar light, either direct or reflected by the clouds, determine their alimentation. The classification of clouds, the description of their various shapes, are here of no real importance; it is the illumination of plants which it is really essential to recognize and to estimate numerically by appropriate instruments, for this alone is the source of their labour of assimilation. The hygrometric condition of the air acts but very indirectly upon vegetation, plants evaporate very little; they transpire enormously in the daytime by reason of the intensity of the light which impinges on them, and of the water which their roots can imbibe from the soil, and not in consequence of the humidity of the air. Wet seasons are bad years for cereals, not because they are wet but because they are deficient in light.

Heat promotes vegetation and favours the migration which, in wheat for example, conveys from the stalk to the grain the organic elements of which the latter is to be formed; but an intemperate heat may bring about this migration before the elements to be transported are completely elaborated, while a deficiency of heat may unduly prolong the process of vegetation in plants which ought to ripen early.

The influence of certain elements of climate on the success of our harvests, while universally recognized, has often been incorrectly interpreted, or greatly exaggerated. There are other elements, again, the part played by which has been completely overlooked in practice notwithstanding the labours of physiologists, because the means of estimating it have been wanting until quite a recent date. Precisely the same holds good with regard to climatology as applied to hygiene. Consequently it became necessary to institute, in conjunction with the establishment charged with the study of general climatology and the issue of daily weather warnings, another establishment entrusted with the investigation of the intimate connection which exists between changes of weather and the progress of the crops, or the oscillation of the public health. This is the occupation of the Montsouris Observatory, the sole institution of its kind in Europe, where very interesting and valuable work has been done under the directorship of M. Marie Davy. A *résumé* of this labour is drawn up every year in the form of a report. That for 1880 has just been issued, setting forth the results thus far obtained since the commencement of the work, and from this volume the subjoined subject-matter is extracted.

Plants are like cold-blooded animals—their vital activity increases with the temperature. The cultivation of wheat, like that of silkworms, can be perfected in a shorter time, the higher the temperature in which it is conducted. M. Boussingault asserts that wheat, to arrive at maturity, requires a number of days such that the sum of their average temperatures shall form a total of 1,900 to 2,000 deg. This law, which is hardly approached when we use thermometers placed in the shade to indicate the temperature, is verified in the most exact manner, according to M. Marie-Davy's experiment, if the thermometer be exposed to the sun instead of in the shade. At the same time it is true only for wheats of the same kind.

We meet with early wheats and late wheats, each variety requiring its own sum-total of average temperature. The soft wheats of Norway, for example, require nearly a third less heat than the hard varieties of Africa. From the state of the temperature in a given place we are thus enabled to predict the dates of flowering and harvest in that locality.

On this point, indeed, agriculturists are rarely at fault. But such is not the case with respect to the quality of the straw and grain. Notwithstanding the prevailing opinion to the contrary, it is not heat but light which operates here. M. Marie-Davy has repaired and brought into constant use the pieces of an instrument once belonging to Drago which were left behind in the cupboards of the Paris Observatory; this is nothing less than the actinometer with which he measures every hour in the day the sum of the rays falling in the instrument from the sun, the sky, and the clouds, having transformed it into a constant self-registering apparatus. The sum of the materials assimilated by every plant and absorbed into its tissues is in direct proportion to the amount of light it has received. If, at the time the wheat flowers, this amount is a high one, the plant will have amassed abundant materials destined for the formation of the grain; and in spite of any vicissitudes which may occur between the date of flowering and maturity, it may be predicted with almost absolute certainty that the grain will be good and well filled. This relation has already been verified by several years' observations and experiments, and for the last four years it has been practically applied by several of the larger corn dealers of the country in forming their calculations.

In 1875 and 1876 the actinometric degree reported was very high, reaching about 4,600 by the date the wheat flowered. Quantity and quality were very good

In 1877, although the crops looked remarkably well, the sum total of actinometric degrees at flowering time (June 15) was only 4,075 deg. The cereal crops were very middling.

In 1878 appearances were even more favourable, but by June 10, when wheat flowered, the actinometer had registered but 3,660 deg., and a short yield and inferior quality were confidently, and correctly, predicted.

In 1879, on the other hand, the appearance of the crop gave rise to grave anxiety, especially owing to the deficiency of heat; and yet this very deficiency of heat compensated for a deficiency of light. The date of flowering was thereby thrown back to June 21, and thanks to this delay the sum of actinometric degrees had meanwhile accumulated to 4,063; about the amount registered in 1877. Thereupon, M. Marie-Davy was able to announce that the harvest would be far better than had been anticipated in the north of France. In Avignon, the sum of actinometric degrees had risen to 1,800 at flowering date, thus foreshadowing an excellent crop, as it turned out to be later on. On the whole, the wheats of 1879, though far from abundant in quantity, were of fairly good quality.

The influence of the electricity of the atmosphere has not been clearly determined as apart from other factors.

For four years past M. Albert Levy and his assistant M. Allaire have made daily analyses of the air in the park at Montsouris. The object of this investigation is to follow day by day the variations which take place in the accidental elements of air, such as ozone, carbonic acid, ammonia, and nitric acid, so as to estimate the part played by the atmosphere in the nutrition of plants, to determine the influence of such elements on the public health, and to examine whether such variations may not be connected with the mode of circulation of the atmosphere, on which the character of our seasons depend.

This labour was commenced by M. Marie-Davy, and forms the subject of a memoir presented by him to the Institute on January 5 last. At present he deals only with carbonic acid. On this point it appears that, in the midst of incessant changes in the weather, the proportion of carbonic acid contained in the external atmosphere is subject only to oscillations at long intervals in connection with the meteorological character of an entire year. In 1876, a dry light year of good crops, the proportion of carbonic acid was small, about 26 parts by volume in 100,000 parts of air. From 1876 to 1877 the proportion rose a little from 27 to 30; there was increased humidity, a decrease of light, and the crops were less favourable. In 1878, and especially in 1879, the proportion of carbonic acid became large, from 34 to 36 parts in 100,000 of air; these two years were very wet and deficient in light, and on the whole the crops were bad. From October 1879 it began to decline, reaching 25·5 in November, and 24·4 in December. If four years' observations were sufficient in such matters, one might conclude that we are about entering on a cycle of well-lighted years—favourable to crops. Not that the carbonic acid by itself has the least influence on *the state of the sky* or the transparency of the air. M. Marie-Davy simply sees in this gas an evidence of the general mode of circulation of the atmosphere over the surface of Europe, and an indication of the position and amplitude of the great aërial currents known as the equatorial and the polar currents. The carbonic acid of the air thus becomes one of the most important factors in estimating the general characters of an approaching season, and it will be extremely interesting to see what results will be given by similar examinations of the ozone and ammonia, soon to be undertaken.

One of the questions which has most fully engaged the attention of the Directors of the Montsouris Observatory is that of the part played by water in agriculture. The quantity of water which plants absorb from the soil by their roots and give up to the atmosphere by the transpiration of their leaves under the stimulus of light is very considerable. In an ordinary way, this transpiration is limited by the quantity of water avilable in the soil; the yield of the crops is limited for the same reason. But it must not be thence concluded that this yield is always

proportionate to the quantity of water given up by the soil to the air through the medium of the plant. Transpiration is but the means to an end, not the end itself. The object is to excite the absorptive action of the roots, and to effect the conveyance to the plant of the materials with which the water in the soil is charged. If the soil be too poor in soluble matters useful to the plant, this latter only exhausts itself by profitless transpiration. If the soil be rich in assimilable products but poor in water, the former are not utilized. To manure land is to leave our work half undone, if we do not at the same time supply the necessary water. In our climate there is no want of water in certain wet years; but if there is a deficiency of light, the plant transpires badly and assimilates little. In hot, dry years water and the materials which it should supply are too often deficient. But where there is abundance of water and of light on a rich soil, heavy crops will be obtained.

Formerly but very moderate crops were exacted from the soil; the land was left to rest for one year in every two or three; marshes and pools of stagnant water were met with everywhere, and the underground sheets of water were consequently fed with a relative abundant supply. At the present time the land is cleaned; standing water is rarely seen; crops are more abundant; and fallowing has been replaced by the cultivation of deep root crops, which absorb the water right down to the subsoil. As a consequence the subterranean waters are less abundantly fed, and the supply from springs has diminished. Constant progress in agriculture is a necessity of the first rank in a country like France, and one of its consequences is to diminish the water-supply, and as agriculture cannot prosper without water it becomes of the first importance to make the best of what there is.

The enormous transpiratory power that irrigation might develop in plants is of peculiar interest for the City of Paris, encumbered with 300,000 cubic metres of sewage water, which she turns daily into the Seine, to the great injury of proprietors down the stream. Several plans have been proposed for purifying this water. Chemical purification, besides presenting practical difficulties, gives very unsatisfactory results, returning to the river the whole bulk of water, with more or less of the microscopic germs and soluble organic matters it contains. Filtration through earth gives much better results. Sewage thus filtered contains but a minimum of its organic soluble matter; but its volume is only very inconsiderably reduced, while all the manure in it is lost though recoverable in the filtered liquid in the form of nitric acid or ammonia. In these respects the cultivation of plants on the filtering surface represents a distinct progress. Experiments made by M. Marie-Davy on the 800 superficial metres of growing vegetation placed at his disposal by the Municipality of Paris, in the gardens at Gennevilliers, showed that very little of the water employed in their irrigation ran off by the drains and was lost, nearly all of it being given up to the atmosphere by evaporation and transpiration from the plants grown on them; only one-tenth of the water used escaped their action. Similar results were observed in a course of four months' weekly irrigation experiments carried out at Montsouris. While profiting by the sewage water and the manure contained in it, vegetation has therefore the effect of accelerating the evacuation of the water given to the soil, of promoting the aëration of the latter, and consequently of hastening the nitrification of the organic refuse thrown upon its surface.

The microscopic germs which abound in sewage water further contribute largely to this result. In fact, on submitting to comparative analysis the water that had drained off from plants irrigated two or three times a week with sewage, and that from plants similarly treated with rain or Seine water only, it was found that the former is quite as poor in organic nitrogenous matter as the latter, only containing a larger proportion of nitrates and mineral salts. The whole of the manure is nitrified in both cases; but, in consequence of the large doses of sewage employed in the former, the vegetation was unable to utilize all that it contained.

Analysis of the air circulating over the surface of the irrigation fields at Gennevilliers showed, among other results, that though this air contained more organic matter than that in the Montsouris park, the excess is due to the far greater number of cryptogamic spores which are present in soils that are frequently irrigated. These have no baneful influence whatever on the public health; while the germs of bacteria, several kinds of which are dangerous from this point of view, are actually less numerous than in the air of Montsouris. There should therefore be no hesitation as to the possibility of purifying the sewage of Paris by the soil, especially if we consider how enormously its purifying action is enhanced by cultivation, and how it in turn is enriched by the manure it abstracts from the sewage. No kind of danger to man or to the health of stock fed on sewage-grown crops can possibly arise if the operations of irrigation be properly conducted. —*L'Echo Agricole.*

MANURE EXPERIMENTS UNDER GLASS.

It may be accepted as a hopeful sign of the times that, notwithstanding the great difficulties in the way of farmers in their individual capacity successfully conducting scientific experiments, several of them have applied themselves to the work of testing in a scientific manner, the comparative utility of different forms of manures. Prominent among the Scotch farmers who have engaged in this kind of inquiry is the name of Mr. Scott Dudgeon, Longnewton, St. Boswells, who has followed up his experiments with oats under glass, conducted in 1878, by another set of experiments carried on last year with phosphatic manures in the growth of barley in pots under glass. The results are set forth in the report to hand of the proceedings of the Chemical Agricultural Association of Scotland. The leading inference drawn from the oats experiments was that the proportion of phosphorus present in a manure it matters little whether in its natural state or acted on by acid (that is dissolved or undissolved from coprolite or from bone), exercises a material influence on the yield especially of grain. The subsequent experiments have been solely devoted to the further elucidation of this inquiry. Mr Dudgeon has, like many of his co-experimenters, occasion to regret that the results are disappointing, having regard to discrepancies between individual pots of the same group where uniformity was expected. Investigations of this nature will not, however, have been in vain, even if they do no more than establish the necessity of procuring as many duplicates as possible in experimenting, before accepting as facts of national and general application what may have reference only to local and particular circumstances.

The experiments with barley have been conducted in the same pots and within the same erection as were used for the oats series —under a glass roof with the sides open and protected by three-quarter-inch wire netting. The pots, 38 in number were ranged in the centre of the structure. Each pot was made as far as possible the exact counterpart of every other, and the conditions as to soil drainage, seeding watering, thinning out, &c., were assimilated. The seed, chevalier barley was sown on the 29th April, when the dressings of manure were applied; and on the 21st of May the plants were thinned to the number of ten to each pot. In July the ear appeared, and in October 21 all were ripe enough for cutting. Three manures were used in the experiments, *viz.*, bones, bone ash, and coprolites, these being used in their natural state, ground or crushed, and again in their dissolved state after being acted on by acid. The amounts applied were regulated according to the proportion of phosphorus in the different substances, as analyzed by Mr. Falconer King. Five pots received phosphate of lime in the form of bone meal, five in the form of bone ash, five in the form of coprolite, five in the form of dissolved bones, five in the form of bone ash superphosphate, and five in the form of coprolite super phosphate. In addition to these there were four pots which received an application of half the phosphate in the form of coprolite, and the other half as coprolite superphosphate, and the remaining four pots received no phosphate of lime. In order that all might be placed in similar conditions regarding nitrogen, each pot (with the exception of the two which got no phosphatic dressing) received an application of nitrate of soda, in the proportion of about a cwt per acre.

The results, as shown by the subjoined table, differ somewhat materially from those recorded in the case of oats. The great advantage in produce as shown by the average of the reliable pots, would in this instance appear to lie with the application of bone ash superphosphate at a cost of 38s. per acre, whereas in the case of oats a loss was recorded from the use of this form of manure. Next in order of increase come dissolved bones, which in the former set of experiments resulted in a considerable deficit. Mineral superphosphate ranks third, as compared with a former failure. Fourth in point of yield we have coprolites finely ground. In 1878 also they were found to be a profitable application.

Among the more notable features of these experiments is the failure of the bone meal application, and the favourable position assigned to the application of manures in the dissolved form. The previous experiments conducted by Mr. Scott Dudgeon pointed in the same direction, the produce of dissolved bones with Peruvian guano and muriate of potash standing then highest on the list as regards profit, with one exception, *viz.*, well-rotted farmyard dung. These manures were used in the first instance to test the source of nitrogen, and on this occasion are dispensed with.

Regarding the conclusiveness of these experiments, there may, and doubtless will be, diverse opinions. The objection will be urged that, having been conducted under glass they are not likely to afford a reliable guide as regards the unsheltered products of the open field. But the advantages of such a mode of experimenting should not be altogether overlooked—*viz.*, uniformity and regularity of the soil, the easier allotment of manure, greater facilities for observation and thinning, regulation of moisture and protection from the ravages of beast or tempest. Mr. Dudgeon will no doubt be the first to admit that it is difficult to lay down a hard and fast rule amid so many varying circumstances of soil and climate. In closing his interesting report he says:—'I forbear making any remarks or drawing any inferences from the results. They speak for themselves, and it must be confessed are disappointing, because they exhibit great discrepancy between individual pots of the same group (even after every allowance is made for diseased heads &c.) where uniformity was to be expected. One thing they teach, the great necessity there is for many duplicates in experimenting, and how careful we should be in not hastily drawing conclusions from single or isolated instances. It must only be by repetition and re-repetition that the truth can be discovered. Let us not then be discouraged, but still persevere.'

The thanks of the agricultural community are due to Mr. Scott Dudgeon, and men like him, who encounter the giant difficulties connected with work of this kind. Whether these agree or disagree with other experiments, it is well to have as many carefully conducted tests possible, in as many different localities as possible. It is indeed a question which might well engage the attention of our national agricultural societies—Whether individual farmers ought not to receive pecuniary assistance and encouragement in carrying out labours of this kind for the general good? In this way the character and requirements of so many

different soils and climates might be accurately ascertained. To show that there is considerable room for action and reform in regard to this vitally important matter, it may be mentioned that a tenant farmer experimenter not long ago expended £80 on analyses of soils, manures, &c., in connection with experiments whose results he embodied in a report, for which the Highland and Agricultural Society paid him the handsome sum of five sovereigns!

The following is the table of results referred to in the foregoing remarks:—

No.	Manures.	Quantity, Cwts per Acre.	Cost per Acre.	Produce, being average of all Reliable Pots in each Series. Equal to per Acre— Bushels of barley.	Cwts of Straw.	Increase over Nothing in Grain.
1	Bone ash, finely ground ... and nitrate of soda ...	2·35 1·08	39s. 6d.	31·1	23·9	5·7 bush.
2	Bone ash superphosphate ... and nitrate of soda ...	4·01 1·06	38 0	48·1	33·0	19·7 "
3	Coprolites, finely ground... and nitrate of soda ...	2·82 1·08	26 6	34·7	23·2	6·3 "
4	Mineral superphosphate ... and nitrate of soda ...	4·85 1·05	34 10	36·6	24·8	9·2 "
5	Bone meal ... and nitrate of soda ...	2·91 ·383	27 6	25·6	19·3	(Decrease 2·8 bush.
6	Dissolved bones ... and nitrate of soda ...	3·91 ·571	35 10	38·0	25·0	9·6 "
7	Coprolites finely ground ... Mineral superphosphate ... and nitrate of soda ...	1·41 2·42 1·05	39 3	33·7	22·8	5·3 "
8a	Nitrate of soda ...	1·08	14 0	33·4	22·2	4·9 "
8b	Nothing ...	—	—	28·4	21·5	

In the above it will be seen that the quantities of manure applied to each pot have been calculated so as to give the cwts per acre. Then follows the cost of the different applications per acre, these having being valued by the usual standard per unit of ingredients, according to analyses. The produce of grain and straw is next given, the bushel being computed to weigh 56lb. In striking the average some pots had to be omitted owing to diseased heads.—*North British Agriculturist.*

REPORT ON THE BOTANICAL AND AGRICULTURAL GARDENS OF JAVA.

WE have received a copy of this Report (published early) and we proceed to notice and translate such portions as are of most interest to Ceylon readers:—

THE AGRICULTURAL GARDEN.

After reporting various changes and improvements in the establishment, and giving a list of persons and gardens which have sent contributions, Mr. Scheffer,* the Director, states that the agricultural garden is progressing. A note informs us that this garden, in extent about 70 hectares, (*i.e.*, about 173 acres), was founded in 1876 as a branch of the botanic garden, and that in the same year there were planted in it besides the different varieties of coffee mentioned further on ½ a bouw (about 7 acres) each of *sūriyan* trees, balm of Peru, *kapok* (*Eriodendrum anfractuosum*) vanilla, legumes, *widjen* (sesamum), jute, &c. In 1877 they were planted, besides the ordinary plantation of rice, ½ bouws of *Coffee Polyspermum C. Preanger, kosambi, Calliandra spec.*, Cochin China cinnamon, nutmegs, cacao, oil, palms, *ramih*, and grasses, so that at present the fixed plantation extends to more than 15 bouws (210 acres), without reckoning the ground occupied by annuals. The report then goes on to give details of the experiment made with different plants at Tjikeumeuh, Tjibodas, and Tjisaroewa.

THE BOTANIC GARDEN.

The botanic garden establishment is composed of the following separate gardens:—The botanic garden proper at Buitenzorg, 800 feet above the sea; the agricultural gardens at Tjikeumeuh, near Buitenzorg, 800 feet; Tjisaroewa, 3,500 feet; Tjibodas, 4,500; Tjibeureum, 5,500. The last three are situated in the Preanger residency, on the side of the Gedeh mountain. After descriptions of the ploughs used, statistics of the school of agriculture, and an account of the trial of bees, the director proceeds to give the results which have attended the planting of *Eucalyptus globulus*, which is being used by the Government for the reforesting of the mountains in Java. In spite of white-ants, caterpillars, and the burning of the forest by the natives, the trees are growing well and successfully. The trial of the *Eucalyptus alba* in the low-country was a failure, the plants not coming up owing to want of proper supervision. *Eucalyptus piluluris* suffered much from cockchafers and was slow in growth; other species of *Eucalyptus* were tried with various success Of the *juar* (*Cassia florida* VAHL.) Mr. Scheffer speaks very hopefully especially for reforesting under 1,000 feet. It has been recommended as a shade for coffee, but was thought to be injurious. The *suriyan* (*Cedrela febrifuga* BL.) was planted alternately with cinchonas and eucalypti, and proved very successful: the wood is said to be good for tea-boxes.

ALBIZZIA MOLUCCANA.

The demand for seed of *Albizzia moluccana* was very great. Of this tree Mr. Scheffer says:—"The culture of *Albizzia moluccana* is very easy. It is sown in hothouses or nurseries. The seeds are soaked in water before sowing. It is well-known that most of the coffee planters in Java employ fullgrown forest trees as shade for coffee. In some situation, this proceeding appears to me unnecessary, in others it is destructive, but the plantations are situated in circumstances so varied as regards climate and distribution of rain in the different months that it would be very imprudent to lay down a general rule. For shade the dadap (*Erythrina spec*div.) is generally employed. Although this tree is preferable to those which are used in Ceylon (where, *e.g.*, the *Artocarpus integrifolia* is much employed) it has many drawbacks. In the first place the dadap, which is always propagated by cuttings, soon rots at the lower extremity of the trunk; then it suffers much from the larvæ of a *cerambyx*, which eat the pith and cause the death of the tree; besides, the leaves are largish and end in elongated points which form as it were watercourses, by which the rain always falls in the same spot on the coffee trees; finally, the dadap has too bushy a foliage and does not attain to any considerable height. The *Albizzia* on the other hand grows more quickly; it gives a shade which is placed at a considerable height above the coffee trees, which allows a free current of air; its foliage is not too thick and the leaves are divided into numerous folioles of small dimension. Further, the folioles, as is always the case with mimosas, are pendant and turned downwards during the night, so that the dew and the moon's rays can penetrate to the plantation. For reforesting, if only an amelioration of climate is in view, or firewood is required, I know of no tree better than the *Albizzia*. Mr. Dennison planted it in order to obtain firewood for his limekilns, and he writes to me that he has no culture more profitable. Trees of three years old were large enough to furnish planks of sufficient dimensions for a box containing 70 kilos of tea." The Director received very varying reports as to the benefit of this tree, some saying that it gave very little humus and no shade, while others report the exact opposite. There is no question, however, that the tree is very fragile, but Mr. Scheffer states that this fault may be remedied by thoroughly pruning the tree when young. A Mr. Winsser reports that the plant is slender that the shade is too dense, that the branches are too horizontal and too low, and that consequently the tree hinders evaporation, and thus gives rise to many evils in the coffee. Mr. Scheffer answers these complaints by saying that if the plant is slender, the other statements can be true, and if the latter statements are true, the complainant has not followed the directions given as to pruning. A Mr. de Haan cut down some trees for firewood, and he obtained excellent charcoal for his tea-house.

VARIETIES OF COFFEE.

Reports on trials of camphor, guttapercha, cassia, nutmegs, cacao, and oil-palms (*Elæis guinensis*) follow, and then comes this statement with regard to coffee:—

"The plantation of different varieties of coffee, opened at Tjikeumeuh, and mentioned in my last report, is in good condition.* Besides the 13 varieties named in the reports, a half bouw of polyspermous coffee and Preanger coffee was planted; so that there are in all 7½ bouws planted with coffee. From Mauritius two further varieties were received, of which one, called Leroy, is found to be the same as that which here is known under the name of Laurina. The other, called Victoria, is as yet unknown. We hope soon to be able to multiply this variety. During the extreme and unusual drought, many of the coffee trees appeared to be in a very bad state. Many trees lost their leaves, which the drought had yellowed. As soon as the rain commenced, however, these trees recovered in a surprising manner, and very few plants died. In the month of November the soil round the plants was dug up with the

* We regret to have to notice that Dr. Scheffer has died since this article was received.—ED., *I. A.*

* This plantation has an extent of 6½ bouws [A bouw is 14 acres.—ED., *C. O.*], of which half a bouw is occupied by each of the following species:—large moka, small moka, laurina, angustifolia, Aden, Woengoe-Kadoe, Mauritiana, Menado coffee, with monospermous fruit, Padang coffee, and Liberian coffee. Besides there has been planted the *jamboe* coffee, a very reliable kind, found in the old coffee gardens near Sookaboemi, and which seems more productive than the other kinds. Finally, half a bouw was planted with plants produced from very large seed gathered at Tjikeumeuh. Of this last species again the largest seeds will be gathered, and by repeating this process several times it is hoped that a large-beaned variety will be got. All the seeds were sown in March 1876. The plants were put out in December 1876 and January 1877.

pick, and each plant received about 5 kilos of good cowdung. In beginning of July the following varieties began to flower;—the large beaned coffee from Tjikeumeuh, the Padang, the monospermous species from Menado, the Mauritiana, the large moka and the small moka. The prevention of the blossoming was tried, by removing the buds and flowers, but this operation had to be given up: 1st, because for about 3,000 plants, this labour took too long; second, because, as soon as the first flowers were removed, other opened. Only half of the trees of each species were pruned. Half of the pruned plants were put under shade, the other half were exposed to the sun. The influence of shade has given no conclusive result this year. The pruning was begun by nipping off some of the lower primaries, but the drought arrested the growth and gave no satisfactory result. In December the same process was repeated, and the result was different in the different species. On the Mauritiana the nipping had no effect, and no secondary growth developed. On the Woengoe* variety only some rare secondary branches appeared, and we may say that the nipping gave no result. On the other sorts (Tjikeumeuh, Padang, Menado, monospermous, and large moka) many secondary growths developed, but the same result was experienced on the unpruned trees, and especially on those with primaries, which had suffered from the black blight, of which I shall speak later on. The Aden coffee gave many secondary shoots after the nipping. The trees which had not been pruned gave less, but still a pretty large quantity, many secondary shoots on the plants which had been nipped had to be cut off. On the small moka the same thing took place. This operation was not performed on the Laurina, as this species always gives too many secondaries. The effect of this experience is therefore mostly negative. The results may be thus summed up:—some species gave no secondary shoots, even after the nipping; some others produced shoots, but quite as many without the nipping. There are other species which without nipping produced a good number, and there is even a sort which without nipping produced too many secondary shoots. As soon as the wood of the primaries is ripe, we shall try by pruning them, to force the trees to produce secondary shoots, if they do not produce sufficient by themselves. The same experiments were tried on some Padang coffee trees, which happened to be outside the regular plantation. We had received these plants in March 1876. In the case of some only the development of the second shoots was regulated, in the case of others the branches were cut pretty short. We cannot judge of the result of this operation until the crop time, which should take place at the beginning of 1880. In the places where the first shoots had been cut the secondary branches developed regularly. These were again nipped and gave consequently abundance of fruit. With the exception of the Liberian, the coffee trees at Tjjibodas have grown well, but they have not yet blossomed. The plantation of *Maritiana* coffee of Mr. Blokhus (see preceding report), containing 884 plants, has prospered exceedingly well, notwithstanding the want of rain. In 1877 the plants were 3½ feet high. The crop obtained by Mr. van der Meer at Ternate was pretty satisfactory, and he got 58 to 60 cents. per ½ kilo in Europe. The bean was small, but much sought after in German commerce. As to the Laurina coffee, the reports which have reached me are those of the residents of Madioen, Solo, Samarang, the Preanger Regencies; from the Assistant Resident of Painan; and from Messrs. Blommonstein, Boers (Repacking, Bojolali), Blokhuis, Hudig (Remves, Kendal, J. F. van Leeuwen (Semo, Bojolali), Pieterynaat (Madjalegka), and de Sturler (Tjomas, Buitenzorg). The opinion of different planters regarding this species does not agree. The opinion of Mr. de Sturler, who possess a 2,000 plants at an elevation of 1,800 to 2,000 feet is not favourable. "The tree, according to him, is small, the branches are too close, the berries are small, and the crop is very poor. Its taste, it is true, is very bitter. At Wonogiri (Solo) the plantation of this kind has been considered a bad speculation, and it is said that the crop is less than that given by ordinary coffee. The planters kept it for their own use on account of its superior aroma. On the other hand, the plants in the private garden of the *controleur* of Bandoeng, although the situation of the garden is unfavourable, produce quite as much as the ordinary Java coffee. It is said that this kind of coffee fetches a higher price in the markets. I have not been able to test this fact, but its aroma is generally praised, and the market will not be slow to appreciate it at its true value According to certain reports this species of coffee is a native of Sierra Leone, and was planted largely in Mauritius, where it is known under the name of Leroy coffee. I hear from there that it is better suited to elevated regions, and this opinion appears to be confirmed by the plants at Tjibodas, which grow more vigorously and are less compact.

LIBERIAN COFFEE†.

The progress of our plants of Liberian coffee* leaves nothing to be desired. As was said in the previous report all the trees had to be transplanted on in the beginning of 1877, having been too closely planted at first. Not a single plant perished through this operation, and in spite of the extraordinary drought which immediately followed.

* A variety produced in Java. It is distinguished by dark-red leaves.

† As the Liberian coffee is of recent introduction, and as it promises to gain the preponderance over ordinary coffee, I believe I shall be doing well in giving here the history of its introduction into Java, drawn from my reports for the years 1873 to 1876. In 1873 I proposed to the Government to get from Liberia seed of the species of coffee indigenous in that country, and the quality of which was highly praised. Through the help of our Consul at Greenville (Mr. N. J. A. Maarschalk) we received in 1875 four small boxes filled with seed. At the same time, Mr. Maarschalk informed us that the large-beaned trees were very rare and that for this reason he sent me only a small quantity of seed. On measuring them, I found them (they were still enveloped in the parchment) 22 millimetres long and 12 mm. wide. The other boxes contained beans of smaller size. Unfortunately in spite of the greatest care, not one of the seeds germinated. In 1874 some Liberian coffee trees were successfully introduced into Ceylon, and Mr Thwaites, with his usual kindness, offered me several plants. But as the coffee leaf disease had manifested itself in Ceylon, and as the plants introduced from Liberia were all infected with it, I dared not accept the offer. I therefore proposed to Government to make a fresh attempt and to ask Mr. Maarschalk to sow the ripe beans in wardian cases and transport them in this manner. This advice was followed, and the result was that in October 1875, we received a sufficient quantity of healthy plants. All the seeds had germinated during the voyage, and not one of the plants was dead Shortly afterwards I received another case of young plants from Dr. Hooker of Kew. Unfortunately, the young seedlings were not yet fit for transplanting. We proposed to plant them in the new agricultural garden at Tjikeumeuh, which would shortly be at our service. For this reason they were kept in pots for a longer time than was desirable. They leaves of the young plants were 30 centimetres in length by 12½ in breadth, and their base was more cuniform than that of ordinary coffee. In the same year we received a quantity of seed from Liberia, of which none germinated. In 1876 the garden of Tjikeumeuh was granted, and in February I transplanted 118 plants, after having first had holes dug, which were afterwards filled with earth of good quality. Not one was lost, and at the end of 1876, they had already attained a height of the 4 to 5 feet. At the beginning of 1877 the first blossoms appeared, and as at first only one flower was found in each axil, whereas in ordinary coffee a number are found, it was feared the produce of the Liberian coffee would be very small. However the succeeding blossoms appeared in great number in each axil, and the carpels were well fertilised. Nevertheless our plants had one defect. In the ordinary varieties (except the small moka) the lower primaries usually very prolific spring from the stem at a little distance from the soil. In our Liberian coffee plants the lower primaries were 2 or 3 feet distant from the soil. I believed this fact to be owing to the planting in pots in which we were obliged to keep them too long, and which hindered the natural growth. The base of the stem produces many adventitious buds, and I attempted to employ them for multiplication by sowing them as in Europe the buds of some trees are sown. These trails met with no success. However a portion of these buds were allowed to grow, and the young sprouts were used for cuttings. This preceeding was more successful, and at the end of 1876 we were able to transplant 20 plants produced from cuttings, whilst we had in the nurseries 115 slips with roots and 200 without. The spacing of trees is 10X10 feet. Several plants were transported to Tjisaroewa and Tjibodas, in order to test the influence of a colder climate. This influence was fatal, and nearly all the plants died; a result which accords very well with the information received from Liberia.

Our plants correspond very closely with the description of Mr. Hiern (On the African Species of Coffee, in Trans. Linn. Soc. 2nd ser., Bot 1., p. 171), but the beans received in 1874 were much larger than those figured by Mr. Hiern, and also than those received from England followed only a few plants appeared to suffer for a time: since then they have been perfectly healthy. My opinion, that the absence of primary bud, on the lower part of the stem was to be attributed to the fact of our plant having been kept too long in the pots, proved to be correct the young plants, afterwards transplanted, produced from cuttings of the original plants, do not exhibit the same defect. The blossoms which opened at the beginning of 1877 set well and gave some fruit at the beginning of 1878. The first important and general blossom took place in July 1877, and the fruit, which appeared in large quantity, was gathered in 1878. In each axil he cherries are found in such large number that in my opinion it is impossible that they will have good large beans. The fear, therefore, that each axil would produce but few berries has proved groundless. The still green berries are 15 to 27 millimetres long by 12 to 21 broad. The same trees on which are these berries had another large blossom in Feb. 1878, on the branches produced in 1877. At the elevation of Buitenzorg, therefore, Liberian coffee appears to blossom twice a year, in February and July. As has been mentioned above, between the blossoming and the maturing, there is a lapse of twelve months. This leads me to believe that this coffee will succeed better at a lower elevation than Buitenzorg. The multiplication of this species of coffee by cuttings, tried at first with good results, proved afterwards to be very difficult. A number of cuttings were put in nurseries, both under glass and uncovered, and in beds both warmed and cold, but in the course of the year scarcely one struck root. However, few died and all the remainder formed callosity. The rainy season brought a better state of things, and we were able to remove from the nurseries many cuttings having roots. The very young cuttings, with still green wood and short joints always succeeded best. We possess about two thousand cuttings without roots. Besides the 115 cuttings. with roots, which existed at the beginning of 1877, 27 were fit to be planted out, so that actually the whole of our plantation is composed of 332 plants in the open, 25 cuttings with roots, and 2,000 cuttings more or less without roots. The 25 cuttings, which have taken root, will be transplanted, with 13 others as soon as they have got stronger, so that our plantation will consist of 360 plants, which, planted 10X10 feet, should cover the

surface of half a bouw. This plantation once made, the remaining cuttings can be sold, as soon as they have taken root. We have noticed no influence caused by the shade on the coffee trees. The blossoms of this species of coffee differ exceedingly among themselves, in the length, breadth, and number of petals. However, these different forms are usually found on the same tree, and have no connexion with the form of the fruit which on each plant is always the same. According to the fruit, we may divide our plants into four principal forms, distinguished from each other by the demension and the form of the base of the style, which, after the fructification and the falling off of the corolla, remains attached to the carpel. In the first form the base of the style is long and almost conical; its lower part is as large as the circumference of the calyx. In the second, the base of the style is of the same length, but it has a cylindrical form, and it is not so wide as the calyx. In the third form this base is almost as broad, and it is also of cylindrical form, but at its lower part it is suddenly contracted, so that there it is much narrower than at its upper part. Lastly, in the fourth form it is small and narrow Two varieties of each of the first, second, and third form may be counted: one with nearly round fruit, and the other with the fruit oblong. Of the third form we possess only the oblong variety, which is very remarkable for its dimensions and which seems to produce the largest fruit. In each variety the fruits of elliptical form are always larger than those of nearly spherical form. It is usual to speak, as of two different species, of Liberian coffee and Cape Coast coffee, without however being able to indicate the characteristics which distinguish them. We have received from Kew plants of the two species, and an analysis has shown me that if the names are particular there is no difference between the plants. It is true that all the plants of Liberian coffee, produced in Kew, bear fruit of the fourth form, but this form is found in the Cape Coast coffee plants. The other Cape Coast plants have the second form of fruit. Rather that assert that plants with an erroneous name have been sent as Cape Coast coffee, I would believe that there is no difference between these two species, the rather that the Liberian also has several varieties. The plants which we received direct from Liberia through the medium of our consul display all the form of fruit mentioned. Nevertheless, these plants as a rule give a larger fruit than those which we received from Kew and London, and as British India and Ceylon have been furnished exclusively* by Kew and London, I venture to think that we possess better varieties of Liberian coffee than those of other tropical countries: the more that all the plants of the best variety (the third from of fruit) have reached us direct from Liberia. In multiplying the mother plants by cuttings and seedlings, we shall in future note the variety to which they belong, and so we shall be able to see if the form of the fruit is hereditary. As a good number of varieties have been derived from the ordinary Java coffee (*e. g.*, the red coffee), so it may happen that the Liberian will also produce new varities in our island† It would be very useful to profit by this disposition to try to improve the species. In accordance with the preceding facts, during 1877, we were not able to distribute a single plant, whether to Government or to private individuals, except in cases where a very advantageous occasion presented itself of exchange for other plants or seeds. In the course of 1878 we shall probably be able to dispose of a large number of cuttings and a quantity of seeds, a portion of which might be reserved for private cultivators. However, the demands of the latter are so numerous, that it will be difficult to find a fair method of allotment, and I think the best way will be to divide this quantity into a number of little portions, which will be sold by public auction, for the profit of the agricultural garden. Another portion of these seeds and plants may be used by Government for an experiment on a larger scale. It will be better to make large experiments in one or two localities, and to place in charge a special employé, who will be certain of not being replaced during the earlier years, than to send a small number of plants or seeds to several localities and different employés, who are continually changing their stations, and who consequently cannot take upon themselves the responsibility of the plantation. Experiments should be made in Java, where the seasons are more pronounced, and also in Sumatra and Borneo, where the rains are more regularly distributed during the year. The two coffee trees, which survived out of those planted at Tjibodas (at 4,500 feet elevation) are not flourishing: they are rather retrograding; however, Mr. de Sturler of Tjomas, informs me that a tree planted by him at 2,000 feet, is growing very well and bearing fruit abundantly. On the part of private persons there have been many attempts to introduce the Liberian coffee. Messrs. Muller & Sons of Rotterdam, who also helped in the transport of our plants, sent to Messrs. J. F. van Leeuwen & Co., in Batavia, considerable quantity of seed, which, being sold by public auction, obtained unheard of prices. I had not much confidence in this importation, having myself several times received seed from Liberia, of which not one germinated. Therefore only a small quantity was bought by the Director of the Department of the Interior, who sent me the seeds, asking me to germinate them and then divide the plants between several employés. But of all these seeds nothing came up, and I learn that none of the other purchasers was more fortunate. At last, to ascertain positively if it would really be impossible to succeed in importing seed in good condition. I asked Mr. Bull of London to send me some seeds by way of experiment. I had learnt that seed sent by him to Brisbane had germinated. However, this correspondent informed me that he was not importing any more seed, but only plants; that he had formerly sent to Liberia a person of trust to gather and pack the seed with all possible care, but that none had grown. In Ceylon also several attempts were made for this purpose, but with the same negative results. However, the importation of plants always succeeds. Many private agriculturists have received plants from Mr. W. Bull. A planter at Solo formed a project of sending a person to Liberia to procure plants. Messrs. Moormann & Co., of Batavia, before knowing that the disease called 'coffee leaf disease,' attacked the Liberian coffee trees as well, had ordered from Ceylon a number of plants, which were imported at Batavia in October. Immediately I advised these gentlemen to burn all the plants, seeing that no inspection or analysis could determine whether these plants did not carry with them the spores of the disease. My counsel was immediately followed. Government indemnified those gentlemen, and the introduction of coffee plants from Ceylon was prohibited. Mr. W Bull also wrote me that a Ceylon planter, who had gone in person to Liberia, had told him that the Liberian coffee tree produces ten times as much as the ordinary Ceylon coffee. He asserted that the Liberian coffee obtains in commercial markets on account of its superior aroma, double the price of ordinary coffee: that at the first picking the Liberian tree gives only a small quantity of fruit: but that afterwards 20 to 24 lb. a tree are obtained. Mr. Dennison of Koeripan, also gave me information received by him from Ceylon. The only plantation where the Liberian coffee is being grown, is situated at about 1,400 feet elevation above the level of the sea. A crop of 2 to 3 tons per acre (48 to 72 pikuls per bouw) is talked of, but a year elapses between the blossoming and the maturity of the fruit, which is attributed to the low temperature of the climate; a plantation in the low-country has been tried, with good results at the beginning. Mr. Sonderegger, of the firm of Moormann & Co., Batavia, himself visited Ceylon, and informs me that on an estate at Kandy, they had already had a crop of about a ton an acre (400 trees, so 4 katis per tree, 20 pikuls per bouw), but that afterwards there was still so much on the trees that he reckoned that at the end of crop, double this figure would have been obtained.

(To be continued.)

* The vast bulk of the plants now in Ceylon are from seed received direct from Liberia.—Ed., *C. O.*

† And in Ceylon.—Ed., *C. O.*

AGRICULTURE IN MADRAS.

THE quinquennial statements of Agricultural Statistics for Madras for the five years ending 1876-77 have recently been laid before the Secretary of State. The returns are said to be not more unsatisfactory than was to be anticipated from the occurrence of the famine during the latter part of the year under review. Notwithstanding, however, the fact that in several districts people were compelled to resign a large quantity of land in consequence of the famine, there was a net increase on the whole in the occupied area of 271,000 acres, or about 1·4 per cent., part of which increase appears to have been due to more accurate measurements and part to the cultivation of land hitherto unoccupied. There is still a wild field for the extension of cultivation, as it appears that nearly ten millions acres of assessed waste, or about half as much land as has yet been brought under cultivation, is still available to meet the wants of a growing population. Assessments increased, partly from revision of settlements, partly from extension of the area in occupation, by over eight lakhs during the quinquennial period. Considerably over twenty lakhs appear to have been expended during the period comprised in the statements by Government and by private persons on new works of irrigation, the new wells alone constructed by private enterprise exceeding 80,000 in number. On the other hand, there was a serious decrease, caused by famine, in agricultural stock, while the statistics of occupancy appear to indicate that the sub-division of landed property is making rapid progress.

AGRI-HORTICULTURAL SOCIETY OF INDIA.

THE usual Monthly General Meeting was held on Thursday, the 25th March 1880.

W. H. Cogswell, Esq., V. P., *in the Chair.*

THE proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members:—

His Highness the Maharajah of Burdwan, Dr. R. F. Swaine, Messrs. H. Pratt, L. G. Middleton, James Hutchinson, Edwin Kock, and Harry Morison.

The names of the following gentlemen were submitted for Membership:—

Major J. Liston, Depy. Commissioner, Lalitpore,—proposed by Mr. J. W. Quinton, seconded by the Secretary.

Lieut. A. Connell, Asst. Engineer, Fyzabad, Oude,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

T. J. Cumming, Esq., Merchant, Kurrachee,—proposed by the Secretary, seconded by Mr. G. L. Kemp.

Philips White, Esq., Depy. Commissioner, Jaloun,—proposed by Mr. J. W. Quinton, seconded by the Secretary.

W. A. Court Beadon, Esq., Supdt. of the Central Jail, Midnapore,—proposed by Mr. W. Cornell, seconded by Mr. F. Wilcox.

Andrew Ker, Esq., (Messrs. King, Hamilton & Co.) Calcutta,—proposed by Mr. G. L. Kemp, seconded by the Secretary.

Manager of the Rampore Tea Garden, Cachar,—proposed by Mr. H. F. Brown, seconded by Baboo P. C. Mittra.

CONTRIBUTIONS.

A small collection of grass seeds. From the Director, Royal Botanic Garden, South Adelaide. Plants and seeds from the Nicobars. From E. H. Man, Esq.

Seed of Alphitonia excelsa and Stenocarpus Cunninghami. From L. A. Bernays, Esq., V.P., Queensland Acclimatisation Society. Mr. Bernays writes that the former is a good bitter bark, and the latter a very beautiful tree with crimson flowers.

Seed of Eucalyptus globulous and Grevillea annulifera. From Baron F. Von Mueller. The following is extract of a letter forwarding the above seeds:—

"It affords me much pleasure to send you some Euc. glob. seeds at least sufficient for tests in various places. I have no means of collecting these kinds of seeds on an extensive scale; indeed all kinds of Eucalyptus seeds 'en gros' are now articles of trade by seed merchants. The seed of E. globulus has risen in price as gradually, the native trees in the forests become extensively felled; it used to be 15 shillings per pound, but cannot now be got for less than 18. But one pound contains seeds enough for a multitude of thousands of plants. If therefore any Member of your Society wants to rear on *an extensive scale* it could be easily calculated at what price the seeds might be got in the Melbourne market, where I will be happy to procure them and see that they are fresh and correct to name."

A collection of Cucerbitaceous Maize and other seeds. From Captain J. F. Pogson. These seeds are available to Members. (Full particulars regarding them will be found in the body of the proceedings.)

GARDEN.

The Head Gardener's Report was read as follows:—

"The weather has been seasonable, though the rough south-west winds have caused rapid evaporation, thus requiring extra labour in watering the plants which we are obliged to keep in pots to be ready at a moment's notice for any orders that may come in. We have re-established the water communication with the west tank so as to free as many hands as possible for potting off young stock, and arranging the same; also to bring all the fruit trees into one section of the garden, such as Mangoes, Lichees, Peaches, Limes, "forbidden fruit," Anona, Loqout, &c., of all of which we have a very fair stock. Members' orders to the number of 63 besides many supplemental ones have been executed since the opening of the year 1880, exclusive of sales to non-members. Of Palms we have a large stock, especially Caryota of kinds, which when planted out in a garden, are extremely useful, as they grow fast and their foliage is elegant when compared with surrounding shrubs. Of Araucaria Cunninghami, we have about 20 fine plants averaging 6 feet in height. During the cold season many Palms and Araucarias, &c., were successfully moved to new sites as they were becoming crowded. One corner of the garden which was originally covered with jungle has been planted out with Agaves, Fourcroyas, Euphorbias, Cacti, &c. The large Plant House near the dwelling has been repaired and enlarged, the size now being 110 feet in length by 38 feet in breadth. I however propose that we might have separate houses for Orchids, Ferns, Dracænas, Crotons and miscellaneous plants, so that members and others would be saved from loss of time in making their selections. Of new Marantas and Crotons we have a fair stock in hand, also a large stock of Alamanda of kinds, extremely showy plants for lawns as they stand the sun well. Six Plantains presented by C. Ady, Esq., of Moulmein have been planted out on the north side of the Kitchen Garden. This plot of land, I think, might be utilized for the trial of vegetables, but must in the first instance be heavily manured as the soil is very poor. We have many Janipha Manihot plants in hand. The west tank near the principal entrance should be excavated early this year as soon as the water gets below zero. Of Liberian Coffee we have 140 plants available; the seed sent on the 6th of January 1880, from Mungeerabad (Madras Presidency) has not yet germinated fully. Of Mahogany plants we have only 28 left of those sent by W. H. Cogswell, Esq., and 170 of our own sowing. We have only 34 Avocado Pears left. The flower bed should next year be distributed more equally around the Garden grounds where space permits, instead of in one special place near the west gate, which though introductory is certainly unsuitable on the north side of the entrance tank, the flower beds having been arranged under the Mangoe trees some years ago. New Rose beds will be formed around the central lawn and other positions as opportunities offer. Caladiums are being started, preparatory to potting off, they are therefore available for a short time. *Contributions.*—A large quantity of house-rubbish has been placed at our disposal from the Collectorate compound, Alipore, being closely adjacent to the Garden, and will prove extremely useful for repairs of walks. Manure of good quality is being steadily and gradually carted from the Stud Depôt, Garden Reach, through the kindness of Major Roberts. Anæctochilus sp. (gold veined leaf), presented by C. Weynton, Esq., in company with orchids and other plants, the first named is doing very well, the remainder fairly good. The Anæctochilus having been kept in a cool place without any glass protection whatever and being liberally supplied with water, have succeeded very well in the sand and moss into which they have been transferred. We really require a large supply of moss for numerous purposes. Members who are placed in situations suitable for the collection of moss might respond to this request.

Mr. Gleeson also sends lists of Rose plants recently received from the Allahabad and Agra Gardens, which have reached in good order. Those from the Lahore Garden have been but partially successful; while those from Mr. Bull of London have unfortunately proved a failure. A list of 20 rare plants transferred to the Royal Botanic Garden, Howrah, is also appended. These consist principally of Anthuriums also Marantas, Cumerias, Alocasias and Aralias.

The Gardener likewise forwarded a box of cut flowers of Petunias, Phlox, and Verbena raised from seed contributed by Messrs. Sutton & Sons, and sown on 3rd December last. These were all much admired.

The Secretary also placed on the table some plots of Phloxes and Asters of superior kinds. Flowers of the latter measured nearly three inches in diameter.

NEW PLOUGH.

A preliminary Report was read from a Sub-Committee of the Council on a new plough manufactured by Mr. W. Martin of Etawah. The Committee state that this plough made by a common native mistry, costing four rupees, and weighing about 12 seers, was tried at the Society's Garden with an ordinary native plough costing two rupees. "The trial lasted about half-an-hour. The bullocks and men employed for the first 15 minutes on Mr. Martin's plough were transferred to the native plough and *vice versa*; but the cattle and men, in both instances, appeared to work with greater ease with the native than with Martin's plough. The trial was only so far determinable, as the man and cattle who worked on the new plough were evidently quite unaccustomed to the extra weight thrown on them by the mould board in the act of inverting the sod. Another great drawback was the dry and hard condition of the land. For this and other reasons, it was agreed to have another trial under fairer auspices on as early a date as possible. It was, however, evident to those present that the plough had considerable merit and did its work well, breaking the soil fairly up with one ploughing. Your Committee are not prepared to add more to this report, the trial being a partial one, and merely preliminary."

Resolved.—That another trial, with such other new ploughs as may be offered, be undertaken at commencement of rainy season.

EXPERIMENT WITH CATTLE MANURE.

Submitted a Resolution of the Government of Bengal on the subject of trials with cattle manure in reference to recent experiments at the Farm at Bangalore, and suggesting that probably trials of a similar nature might be undertaken at certain localities in Bengal; whereupon it was resolved that a Sub-Committee, consisting of Drs. Barry and Lynch, Messrs. Cogswell and Stalkartt, be appointed for the purpose of suggesting the best means of furnishing the Government with information on the subject of manures.

KOTEGURH AND ITS AGRICULTURAL PRODUCTS.

The Secretary next submitted the following interesting paper from Captain Pogson, in reference to the various kinds of seeds alluded to under the head of contributions:—

The value of Kotegurh over Simla as a sanatarium is simply incalculable, and when it is borne in mind that the water running from hundreds of springs is as pure as can be, whilst the air is absolutely untainted, cold and dry, conditions due to its perpetual descent from the snow-clad Himalayas, the apparent neglect with which these priceless gifts of nature are treated by the public in general, and the sick in particular, is very remarkable.

Kotegurh Church has an elevation of 6,400 feet above the level of the sea, and the river Sutledge, visible from its door, is 3 200 feet above that level, whilst Mount Huttoo, on one of whose stupendous spurs Upper and Lower Kotegurh is built, has an elevation of 10,400 feet, and as all the North-Western spurs slope towards the Sutledge, the scientific and practical Horticulturist and Agriculturist has it in his power, by a judicious selection of sites and altitude, to grow all kinds of tropical fruits and crops on the banks of the Sutledge, and European fruits, flowers and vegetables at various altitudes; for every 530 feet of ascent gives a change of soil and climate, and accounts for rice, cotton, mangoes and plantains growing at Kapoh, and superb English apples, and other European fruits at Bureree, (Upper Kotegurh), whilst all kinds of American maize and pumpkins, choice English flowers and vegetables, as well as the Jooar of the plains, and the Imphee or sugar-cane of China, thrive in my newly made garden a hundred feet or so below St. Mary's Church.

The pleasing task of improving the indigenous agriculture of the locality rendered it necessary that I should seek and secure the aid of the authorities, and through them of zemindars, whilst in the Rev. Mr. Rebsch, of the Kotegurh Mission, and Rev. Mr. Carleton of the American Mission at Arnee, I had most valuable supporters and fellow-labourers. I am greatly indebted to Baboo Goodroo Mull, who, in addition to being a zemindar, in possession of large ancestral holdings, is the Tehsildar, of the important iron-producing district of Kot Khai, as well as of Kotegurh.

The New Orleans and Sea Island Cotton seed obtained by me from the Agri-Horticultural Society, were made over to Baboo Goodroo Mull, who caused them to be sown on land owned by him at Kapoo on the right or Kotegurh bank of the Sutledge.

[Mr. W. H. Cogswell, a member of the Cotton Committee, has kindly favored the Society with the following report on the samples sent by Capt. Pogson:—

Sea Island unginned, good color but a little stained, good and regular in length, silky but of weak and brittle staple, probably occasioned by being grown at such a high elevation.

New Orleans, unginned, excellent color, staple fair and of good length, but wanting in strength. The same remarks apply to this as regards elevation in the cultivation].

In the samples submitted herewith, we have part of the first crop of these cottons ever grown within the Himalayas. The Paharees are greatly pleased with both kinds of cotton, and *now* I shall have no trouble in getting them to grow these, in place of the indigenous kind, therefore in due course pray send me all the cotton seed you can spare for distribution to applicants. I may mention that weavers of cotton and wool are by no means scarce in these hills, hence the production of superior cotton wool will have a most beneficial result.

The varieties of Maize alluded to were—*1st*, 'General Grant's Corn;' *2nd*, 'Golden Sweet Corn;' *3rd*, 'Stowell's Evergreen Corn;' *4th*,

'Moore's Concord Sweet Corn;' *5th*, 'Mexican Sweet Corn,' and *6th*, Early Canada Field Corn.' These seeds were given me by the Rev. Mr. Carleton.

Mr. Duthie, Superintendent, Government Botanical Gardens, Shaharunpore, in answer to my application, sent me as follows:—1st, 'Yellow Canada Corn;' 2nd; 'Red Cuzco Maize;' 3rd, 'Striped Cuzco Maize,' 4th, 'Yellow Cusco Maize;' 5th, 'White Cusco Maize;' 6th, 'Mammoth Sugar Corn;' 7th, 'Gourd Seed Corn,' and 8th, 'Red Indian Corn,' and as all the above came to maturity, whilst the seeds were largely preserved for this year's sowings, I have every reason to hope that from Kotegurh as a centre these superior kinds of maize will gradually find their way into the hands of zemindars, and be cultivated far and wide in place of the very inferior indigenous maize of these hills.

In making my division of these seeds, I gave Rev. Mr. Rebsch a supply and kept a portion for myself, and our joint crops have been most successful, the smallest number of cobs on my plants (manured with bone-ash, and limestone in powder) being three, and the largest six, and in many cases so heavy were the cobs, that the growing plants broke down under their weight. As I was much pressed for room several kinds of maize had to be sown in one plot of land, and the result has been most curious, for the 'Red Indian Corn' and the 'Red Cusco Maize,' have, in numerous instances, hybridized the other kinds: thus I have cobs of yellow Cuzco Maize, with numerous single seeds, and groups of seeds of a deep dull purple colour: white maize with pale pink and striped seed; the stripes in some cases being pink, in others red or reddish. I have some cobs in which there are white and yellow grains, more or less striped red, and a few seeds of deep purple amongst them: thus showing treble impregnation, and indicating of possible means of improving the ordinary maize of the plains by crossing it with the red and striped Cuzco Maize, both kinds ripening seed early, and bearing cobs, thickly and perfectly supplied with fully developed seed. I find I have forgotten to mention the 'Golden-dust Corn,' which you sent me with three other kinds, the former bore abundantly and a good supply of seed has been preserved, and the latter were sent to Kombarsun to the Rana's *malles*, whose report has not yet been received. The Jooar (*Sorghum vulgare*) of the plains, it was stated, would not grow up here, and being of a contrary opinion, I obtained some seeds, which were sown, the plants grew well, and the crop of ripe seed harvested has dispelled the popular fallacy connected with the subject. In like manner, it was affirmed that gram (*Cicer artinum*) would not grow here, and this fiction was similarly disposed of. The price of gram is never less than two annas a seer, and six seers of it per rupee is the price during the season when travellers have been fleeced by the bunniahs, who being directly interested in the matter, do not at all approve of my small gram field, or that of the zemindar who is growing it at my suggestion, with seed supplied by me, the price demanded being beyond his means.

I now come to my pumpkins, of which I have three superior kinds, the flesh of all being of a deep golden color, crisp and firm, the smell and taste exactly resembling that of good cucumber, and as all have been so eaten, uncooked, the value of the fruit is apparent. All are very good to eat cooked in various ways, and all make very nice preserve. No. 1 produces round fruit, the skin being milk-white. No. 2 is called the Turban Squash, and has kept perfectly since last October, and No. 3 is the Giant Pumpkin of Chili.

Rev. Mr. Carleton sent me four seeds of it, all of which germinated and flowered profusely; the constant rain interfered considerably with the impregnation of the fruit flowers, and a good deal of perfectly formed fruit was in October destroyed by frost, and during the rains by some insect. Five pumpkins of various weights, ranging from five to thirty pounds, were cut and eaten, one large pumpkin of over forty pounds was stolen by a Paharree, and I had five matured pumpkins when the frost set in. These were cut and weighed as follows:—No. 1, 131lb. 10½oz; No. 2, 120lb. 5oz.; No. 3, 95lb. 4oz.; No. 4, 75lb. 3oz.; No. 5, 52lb. 7oz. Total weight 474lb. 13½oz.

I have the pleasure to present the Society with three hundred seeds of this monster pumpkin known at Kotegurh as the *Maha Kuddoo*, and I also present seeds of the two other kinds and, in addition, a packet of *Chirata seed*, for experimental culture in England, where it should answer.

I have forwarded in the parcel two cobs of Maize: the dark red striped cob shows how well this variety grows up here, and the yellow as a good specimen of crossing.

I trust some Members of the Society will try the experiment of improving the common maize of the country by hybridizing with the red striped kind and report the result, and I will do the same, and if by our joint exertions the numbers of cobs per plant as well as the grain is increased, a positive boon will have been conferred on the people.

Letters were read—

From Mr. T. B. Fernandez, Superintendent of the Revenue Survey, Bhernagore, reporting the result of his sowings of the Bamia Cotton from seed received from the Society, and sending a small specimen thereof.

From Mr. W. Foley, submitting specimens of tobacco raised in Sylhet from seed received from the Society, and of a fibre and cloth made therefrom from the "Kaddeema" tree (*Villebrunea appendiculata!*)

Baboo Pertab Chunder Ghose reports favorably of the tobacco. The fibre possesses great strength.

Further particulars regarding the latter to be supplied by Mr. Foley.

INDIAN TEA.

AMONG the various articles of export from this country tea takes a place in the front rank, and although the imports into the United Kingdom (the chief market, at present, for Indian tea) have increased from 17,278,000lb. in 1874, to 38,488,700lb. (or 122 per cent.) in 1879, and the amount consumed per head of the population (allowing for increase of population), from ·56lb., per head in 1874, to 1·037lb. per head in 1879, or an increase of 84 per cent., still from various causes, some of which, together with their remedies, we will try to enumerate, Indian tea of the present time does not stand well in the English market and its outlook is anything but rosy. In regarding the price at which an article must be sold in the retail market, we must take two standpoints, the producer's and the consumer's, and endeavour to find the price from them. In looking at the matter from the tea planter's standpoint, we will presume that he can produce tea, and sell it with a fair margin of profit at the plantation for a certain price per lb., say a. On his selling the tea it passes through various hands, each expecting a commission on it, and its value is further increased by the various charges of duty, freight, insurance, loss in weight, &c., until it reaches the hands of the retail dealer, who finds that he cannot sell it to the *consumer* with a profit to himself, under a price per lb., which we will call b. Bearing these facts in mind we will now look at the matter from the consumer's point of view.

The average consumer says:—"I am willing to pay a certain price per lb. for my tea," which we will call x, this being so, if the price of tea rises above x, the demand from consumers *decreases*, and, as a consequence, stocks *increase*, and the price of tea falls to somewhere about its normal level. It becomes necessary then for us to work backwards from the price x the consumer will buy at, and endeavour to find out from this, at what price the planter must sell at to ensure the public demand, and so his own profits, being kept up; we will suppose that deducting the cost of freight, insurance, duties, commissions, profits of middlemen, &c., from x the price the consumer will give, he must sell his tea at a price per lb. we will call y; in short that the difference between x and y represents the profits of the men through whose hand the tea passes until it reaches the consumer, plus the charges, such as duty, freight, insurance, &c., if he would sell his tea at all, and it behoves him therefore, to use every possible form of economy. The charges which we have enumerated as being imposed on the tea after leaving the planter's hands are not capable of much reduction, as many of them are not profits on the tea but items such as freight, duty, commission, and insurance which *must* be paid before the tea reaches the consumer.

Remembering that a and b are the prices the planter and retailer can respectively sell at profitably; when the price b is arrived at from a as basis of calculation; and by an inverse process of reasoning that y is the *price* at which the planter must put on the market if the public are only prepared to give x; we arrive at the following facts:—

First, if such a happy state of things exist that the prices a and y are one and the same, the planter and all others concerned make their profits, and the consumer is satisfied.

Secondly, if a be less than y, increased profits accrue to all concerned; but as b is less than x the retailer, however shortsightedly, probably raises b to x, after which in time the increased profit is spread through the different hands the tea has passed through, the shares of profit however going in a decreasing ratio from the retail dealer towards the planter; for it nearly always happens that the producer is the slowest to feel the advantage of a rise, and the quickest to feel a fall in the value of the manufactured article, of any of the hands through which it passes.

Thirdly, supposing a to be greater than y, or in other words that the *cost of production of the tea*, is too high, what must the planter do? He must either sell at a loss or reduce the cost of production.

Now we greatly fear that what the Indian tea trade is now suffering from is this, that cost of production is too great. The only thing the planter can do to try and make a profit is to use the strictest economy, to exercise the most careful supervision, and to sell *every scrap* of tea to the best possible advantage. Here comes in the question of markets. The English market will only take the best stamps of tea and as it will not pay a high enough price for the planter to make a real profit, on this his best tea, if his lowest classes remain a drug on the market, he must try and find a profitable market for his commoner qualities at present unsaleable on our English market. By doing this he relieves stocks and will command a better price for his good teas in consequence of the general character of Indian tea on the English market being improved by the withdrawal of the lower types. The question that now comes before us admitting that a market is wanted for these low teas, is: "Where is this market to be found?" We answer with confidence, in Australia.

There, people have not reached such a degree of fastidiousness as they have in the old country, and the lower classes of Indian teas are in good demand. What is wanted for them is a better circulation, more "pushing" to use a term often found in advertisements for commercial travellers. Indian tea only wants to be thoroughly known in our colonies to be thoroughly appreciated; and the advantage to the planters by a ready sale for the lower classes of teas would be enormous. It would in the course of a few months clear off those stocks of tea in the United Kingdom which are daily growing larger, and which as Indian tea, owing to the rapid drying practised now-a-days, (which compares with the slower method formerly in vogue very much as Indian tanning does with English), deteriorates very greatly and very rapidly by keeping, are anything but profitable to their holders; it would by this clearance obtain a better demand, and therefore a better price for the finer tea which would alone represent India in the English market.

Another thing for planters to remark is, that ever since the present "pungent rasping flavour" insisted on by the brokers, and given by rapid drying, was imparted to the tea, stocks have steadily increased, so that it is reasonable to suppose that, great as the advance of Indian tea in public

flavour has been, it would have been still greater had the old flavour been adhered to. In addition, too, we must remember that the process by which the pungent flavour is imparted to the tea is probably the cause of the Indian tea of the present day deteriorating so much in quality by keeping. This argument that the increase of stocks is due to the pungent flavour being introduced is justified by the fact that, while the tea had the old flavour, the public taste increased as the imports, and therefore, stocks remained stationary; but as soon as this flavour called very aptly "rasping" was introduced, immediately stocks rapidly increased from 1874 to 1878, this increase of stock being 24½ per cent., while the demand of 1879 was 5 per cent. below that of 1878; the reverse being the case for China teas. Undoubtedly one of the evils which numbers of tea planters have to contend with is this: they are not able to sell in the best market; they are not able "to hold." "How does this arise?" our non-business readers will ask. The answer is simple enough. So many men on entering a business with a fixed sum of money at their disposal, representing all their available cash, are far too prone to invest too large a proportion of this sum of money in the machinery, or the land, or the mines, or the goods, as their trade may be; in other words *start on too large a scale.* Take for instance a man who buys a new empty mill. Say he has capital sufficient to fill two-thirds of it with the best cotton machinery and leave him a handsome balance for working expenses. Now numbers of men instead of doing this, and filling up the mill as their business increased, would fill the whole of the mill with machinery at once and, if sufficient funds were not left to carry on the business, they would obtain an over draft from the bank, or an advance in the shape of a mortgage on the property. This overdraft or this mortgage too often forms an incubus that can never be shaken off. The advance from the bank (readily enough given in most cases), is probably negotiated when trade is slack and money cheap, and the borrower thinks that trading with money borrowed at, say, 3 per cent. is a good business (we are here speaking of English mills which we have taken as an example of our meaning of "over buying"), but when trade revives and money becomes dear, the unfortunate borrower finds his debt to his banker (which cannot be wiped off all of a sudden, however great a rise may occur in prices) bearing interest at, say, 6½ or 7 per cent. or even more, and cutting a large hole into those increased profits he was building his hopes on. In the same way a tea planter, too, often "over buys" or "over grows" the amount of land he should purchase or the number of acres he should put under cultivation, with his capital. Consequently, as the time approaches for the tea to be gathered and dried, he finds the cash in hand or at his bankers running short, when in comes the curse of the trade, the insidious "middleman," who offers either an advance on the crop at an exorbitant rate of interest, or, if the planter be poor enough and weak enough, he buys the crop in advance from him; of course to considerable profit to himself. Now the curse of these middlemen is that they bolster up the weak men of the trade (we are now looking at the subject from a planter's view), and having bought at a low price from the impecunious producer can afford to sell under the market rates and so lower them. A trader is always entitled to a fair profit on the money he has invested, and he would always obtain it, were his fellow tradesmen all men of sufficient *available capital* to be able to afford to hold their goods until they could dispose of them at remunerative prices, but as there are in all trades, men whose business are too large for them (and therefore who are weak men) the buyer can always obtain the goods he wants from one of these men who cannot afford to keep a heavy stock. They must have their money turning over and over to keep going. Now if these weak men had only been content to start on a smaller scale, they would have been among those who could afford to wait for remunerative prices, without altering the amount of their capital; if they had bought less land and had less under cultivation their expenses would have been smaller and their available cash balance greater.

To those then starting a tea plantation we would say:—"Start in a small way and keep a good balance at your bank for working expenses, avoid all commission agents, middlemen, and loan givers as you would the father of evil; use the strictest economy compatible with *thorough* efficiency; sell your very commonest tea or any rubbish you may have with as much care as your very finest; do not be in a hurry to plant new ground and extend your business until thoroughly satisfied that it is worth it, and you are able to afford it." To those in the hands of middlemen of any sort, to the little men with the big business we would say: "Throw off the man you are in debt to, at all costs, if possible, even by selling, if you can, part of your estate; once out of the hands of moneylenders, keep out."

To prosperous men who owe no man anything and who know not what it is to feel short of capital, we would offer no advice beyond this, which we offer to all tea planters.

Combine, if necessary, and rid the trade of those useless agents, &c., who stand between you the producer, and the public the consumers, of your produce. You cannot get rid of them all; you can get rid of some; when your tea passes through so many hands you do not know what may or may not happen to it, and the fewer hands your tea passes through the better for it, the better for you and the better for the public, who would probably get a better article, at a less price, and yielding better profit to its producers than at the present day, if some of these go-betweens could be done away with and the producer and consumer brought nearer to one another.—*C. & M. Gazette.*

MINERALOGY.

It is surprising that the mineral wealth of India should have been so systematically neglected for a long series of years past. The reader of Indian history does not need to be told of the importance of gold and silver mining in ancient times, and in fact the remains of old workings testify yet to the energy displayed in those days in the prosecution of this industry. India was known as a land of gold and silver; now it has become a land of poverty; where, too, are the famous diamonds for which this country had such a name, and where the justification for the now almost obsolete phrase "the wealth of India?" We are now on the eve of another effort to recover our lost ground in this respect, and we hope that the mania which has taken possession of us for gold-mining will not entirely blind us to the more valuable coal workings all over the country. It cannot be doubted that the East Indian Railway Company is largely indebted to its cheap and plentiful coal supply for its profitable working. Doubtless geographical position and careful management in its several departments have something to do with this success, but that a large percentage is due to cheap coals cannot be denied. From a recent return we find the average cost of coal per ton to be as follows:—

	£.	s.	d.
East Indian Railway	0	5	5
Bombay Lines	1	10	0
Madras Lines	1	15	7
Oudh and Rohilkhund	1	9	11
Sind, Punjab, and Delhi	2	2	8
Average of Guaranteed Lines	1	7	7
" State Railways	1	11	7
General average of all	1	9	7

A glance at this table will show in a large measure why the East Indian Railway working expenses are 34·91 per cent. of gross earnings, while the average of all the guaranteed lines is 52·73, and of some of them as much as 76·05 per cent. We may be told that the coal which India yields is not good, and is usually in out-of-the-way regions. The quality is certainly not nearly so good as that of English coal, but it is sufficiently good to be perfectly practicable where space is not a material object. It does not last so long as English coal, and much larger quantities have to be carried. This is not so great an objection on railways where short journeys can easily be arranged; but it is objectionable for steamers, especially when long voyages are the rule. Nevertheless many steamers use it mixed with equal portions of English coal. In some parts of India we have a coal repeatedly said to be in all respects equal to English. This remark refers particularly to the rich veins known to exist in the Khassiah and Jynteah Hills of Assam; the only objection to the working of this coal hitherto having been its distance from the places of consumption. This difficulty is, however, in course of removal. The extension of the Northern Bengal State line towards Dhoobree has reduced the difficulty materially and the ultimate extension of this line eastwards towards the Upper Assam district will further reduce it, while the opening of the proposed extension of the Eastern Bengal line to Mymensingh, and ultimately to Cachar, will entirely remove it. Besides, if it be considered unprofitable to bring that fine coal to Calcutta, there can be no doubt that a large quantity will find a market on these two lines, as well as on the steamer lines on the Assam and Cachar rivers. Nor must we forget to notice the discovery that two districts in Madras have been found to abound in copper ore, which on analysis yields an abnormally high percentage of pure copper, the actual figures being 42½, as compared with 5 per cent. obtained from Cornish ore, and 20 to 30 from Cape copper.

Encouraged by the success of the pioneer company, another has been brought out, called the Indian Glenrock Gold Mining Company, with a capital of £100,000, to acquire and work 3,000 acres containing reefs of auriferous quartz, which adjoin the property of the South Indian Company; and, in order to give the project every chance of success, the two companies are to be united under one management, saving both expense and loss of time. Writing on the 27th ultimo the London correspondent of the *Bombay Gazette* says: Although the prospectus of the Glenrock Company was only issued a day or two ago, I believe its shares are already virtually subscribed, and they will assuredly go *pari passu* to the same premium as the South Indian Company's. The Bombay people must know pretty well what these properties are worth, and I do not pretend to be able to tell them anything new on the subject. All I can do is to report what is passing here, and therefore I point out that,

assuming Mr. Brough Smyth's opinions as an engineer to be sound and to bear the test of actual mining, there is some chance of furor for Indian gold mining shares here during the next month or two. Of course spurious schemes may be started to profit by the popularity of the sound ones, but so far as the South Indian and the Glenrock Companies are concerned their success is assured, and they have every prospect of a brilliant future.

As an instance of the way in which recent discoveries have affected the value of land in South-East Wynaad, the Ooty correspondent of a Mofussil paper states that he knows of an instance in which one landed proprietor made a small fortune in a very short time. "He sold a coffee estate for Rs. 50,000, where perhaps he would not have realized a fifth of this sum but for the land being rich in quartz. This same gentleman very recently bought one piece of land for Rs. 500, and in less than half-a-dozen months sold this identical land for Rs. 18,000! There are now in Wynaad to my knowledge two or three planters, who, as soon as this gold mania assumes a tangible form, will become millionaires. Meanwhile the sensation continues, and with every succeeding day the price of land continues to rise."

THE GOLD-MINING MANIA.

THE Commercial Correspondent of the *Times of India* says:—

The Indian gold-mining mania shows no signs of cessation, so far as the London Stock Exchange is concerned, and whatever assistance can be afforded by brokers and jobbers to encourage it is certainly not wanting. One of the most influential of the circular writers connected with the Stock Exchange, hugs himself in that his anticipations though lately regarded "as savouring more of romance than reality are now" amply realised. "There is abundant testimony as to the extraordinary richness of the gold deposits which are only waiting the introduction of capital to develop." It would, we are assured, be "impossible for any report to be of a more favourable character than that of Mr. Brough Smyth," who "in consequence of his vast Australian experience, was specially engaged by the Indian Government to examine and report upon these properties." When the official documents are made public, Mr. William Abbott thinks the shareholders or the existing companies "will be proud of their position as pioneers of this great enterprise which cannot fail to benefit our Indian Empire, and galvanise our home markets into fresh life." The subscriptions for the capital of £100,000 of the Indian Glenrock Gold-Mining Company amounted to £700,000 from nearly 4,000 applicants. It is asserted that some large purchases have been made on behalf of capitalist, in Bombay, Calcutta, and Madras. "When," says the writer from whom I quoted above, "it is remembered that the merchants in those cities are possessed of enormous wealth, and that they are at all times quite ready to employ it in a speculative venture, it need not be a matter of surprise if these shares, and those of the South Indian Gold Company should advance to a very high price."

There seems to be very little cessation of the Indian gold-mining mania. A good deal of dissatisfaction has been expressed this week at the manner in which the allotment of the shares of the Glenrock Gold-mining Company was made; and it is said that some applicants for shares received more than others in proportion, and some received no allotment at all. An advertisement appears in the London daily newspapers inviting disappointed applicants to take united action for redress. But while it is only natural that some vexation should be felt, the allotment of shares is matter entirely within the discretion of the directors, and in the present instance there is no need to suppose that favouritism or undue influence was exercised. The business of the directors of a new company is to place the share into the hands of a strong and stable body of *bonâ fide* investors, and if, in the endeavour to weed out the professional speculators who only seek allotments to sell immediately at a premium, an occasional mistake is made, the general public will recognise and make allowance for the situation. The prospectus of yet another company has been issued this week. "The Gold Company of Southern India" has a nominal capital of £100,000 in 100,000 shares of £1 each; and its stated objects are, to purchase hire, lease, or otherwise acquire mines and mineral properties, lands, or hereditaments, in India and elsewhere, which may be deemed necessary or advisable for the purposes of the company. No promotion money, bonus, or founder's share of any kind are to be paid, and it is said that "this company starting unfettered by contracts and unburdened with promotion money, the directors believe that, with a careful selection of properties, a future equal to that of the most successful companies is before it."

GOLD MINING IN WYNAAD.

INDIA was long reputed to be *par excellence* a country where wealth abounded. This reputation was made by travellers who visited the country some centuries back, and all those who wrote about India, previous to the present century, have invariably extolled the country for its wealth. In recent years a notion has become prevalent that India is a poverty-stricken country and that the wealth so much spoken of in former times was the creation of the poet's fancies. But Mr. Brough Smythe's exhaustive report on the gold fields of Wynaad leaves little room to doubt that the untold wealth of former days was not fiction, but a plain reality. It has been ascertained after careful investigation that of all known gold-bearing tracts none is comparable to the Wynaad for its extent and productiveness. These mines which were worked long before the Christian era appeared exhausted. But, in reality, the richest veins yet remain untouched. It is now generally accepted that, whereas the cheaper metals which are lightest are found close to the surface of the earth, the more precious ones which are heavier are found lower. The old native system of working the gold mines consisted in sinking shafts of which a very large number are now to be found all over the Wynaad. This is too expensive a method for deep mining and, therefore, tunnelling is required. The prospects of a Gold Mining Company are so far very good, but Mr. Brough Smythe fears that the first enterprises may be unsuccessful for want of skilful management. That the public entertain a very high opinion of the Wynaad mines may be inferred from the fact that seven times the amount of money required to start the Glenrock Gold Mining Company was tendered as soon as the prospectus was issued in London. This company has a capital of £100,000. The Wynaad is not the only place in Southern India where gold is available. This precious metal is also to be found near Kolar in the Mysore territory and in various parts of the North Arcot district. Considering the abundance of gold and of other valuable metals in many parts of this presidency, Government have taken a step in the right direction in notifying that, in future, all puttahs granted for waste lands shall contain a clause reserving to the Government the mining rights to the land. Referring to the production of the Wynaad Gold Mines Mr. Smythe says:—

'Tippoo Sultan procured large quantities of gold from some source and was possessed of great wealth. It is stated in *Maxwell's Life of Wellington* that amongst other conditions, exacted from Tippoo by Lord Cornwallis, he was to pay three crores and thirty lakhs of rupees in gold mohurs, pagodas and bullion: equal to nearly £3,300,000. On one occasion Tippoo sent thirty eight camel loads of money to Scindiah with the hope of securing him as an ally; and from the estimate of treasure and property taken at Seringapatam in 1799 there appear two items that clearly show to what extent the Sultan, in a comparatively short space of time and notwithstanding very heavy demands on his treasury, had been able to accumulate wealth. Of specie there was 16,740,350 Star Pagodas, and of jewels, gold and silver bullion, 25,000,000 Star Pagodas. His throne was sold unbroken for about £2,500, the gold not included in the purchase producing nearly 25,000. Those facts and the knowledge we have of the enormous costs incurred by this Prince in supporting armies, constructing forts, and in procuring munitions of war and stores, sufficiently support the conclusion that he must have had ready means of procuring gold; but whether to any large extent from the mines of Southern India can only be conjectured.

One fact not generally known about gold is that it is not usually pure in its native state. The Wynaad gold seems to be largely mixed with silver. In some samples forwarded by Mr. Smythe to Melbourne gold and silver were alloyed in the proportion of 57 to 43. The general average however seems to be 90 to 10.—*Madras Standard.*

FORESTRY.

THE FOREST SCHOOL.

STEPS are at last being taken to utilize the forest school at Dehra Doon, by the selection of young native gentlemen of good position and education to be admitted as probationers in the Forest Department. A resolution of the Government of India, containing the terms and regulations under which such appointments may be made, has been forwarded to all Commissioners of divisions, with instructions to make known its conditions amongst the native gentlemen of position in their respective divisions. The Forest Department is divided into three great branches, *viz.*, first, officers of the controlling staff in charge of forest divisions; second, officers of the executive staff in charge of forest ranges; third, officers of the protective staff in charge of beats. Promotion may take place within each grade, and also from one branch to another. The controlling staff is mainly recruited at present by the appointment of officers who have received a professional education in Europe, under the arrangements made for that purpose by the Secretary of State; but henceforth the sons of native gentlemen and other well-educated natives of India may obtain access to the controlling branch of the Forest service by two modes: either by passing the entrance examination at the India Office, and going through the prescribed course of professional education in Europe; or by obtaining admission to the executive staff, and afterwards earning their promotion to the controlling staff by distinguished service as executive officers. The central forest school has, therefore, been established, chiefly to make it easy for the sons of native gentlemen, and of youths of other classes who have received a good education, to acquire, within a comparatively short time, that amount of practical skill and theoretical knowledge which constitutes the professional training necessary for the executive staff. No apprentices will, as a rule, be received at

the forest school, who have not proved their fitness for forest work by service in the subordinate staff of the department during a period of not less than six months. The Governor-General in Council states that "A staff of trustworthy and efficient forest rangers is the first condition of effective local forest administration, and the chief object of the forest school at present is the training of such a class of officers. In the course of their service, forest rangers will learn by actual experience that *honesty is enforced and rewarded, and that without honesty and probity, efficiency is impossible.* This plan must, however, be aided by professional education. It may be urged that probity and professional skill are two things apart, which have no necessary connection. But professional education will have this advantage, that it will increase a feeling of self-respect." The italics are ours, but the sentiment thus expressed is, indeed, excellent, and its expression here only excites surprise in so far as it might be assumed without saying that Government has a liking for honesty in all branches of its service, and not merely in the gay greenwood.—*Pioneer.*

WOODLAND IN DIFFERENT COUNTRIES.

THE proportion which the woodland bears to the whole area of each country in Europe is said in the *Statistical Atlas* of André and Peschel to be somewhat as follows :—

In Sweden	Woodland occupies	39 per cent.
„ Russia	„	31 „
„ Austria and Hungary	„	29 „
„ Germany	„	25·5 „
„ Switzerland	„	19 „
„ Greece	„	18 (?) „
„ France	„	17 „
„ Italy	„	16·9 „
„ Belgium	„	15 „
„ Spain	„	8·9 „
„ Portugal	„	7 „
„ Holland	„	7 „
„ Denmark	„	5 „
„ Great Britain	„	2·4 „

These figures can only be taken as approximately correct ; but even if there should be considerable errors in some of them, it is particularly noteworthy that Great Britain has such a small percentage of woodlands. Those who only look on the surface of things tell us that Great Britain is over-wooded at the present moment, and some go so far as to say that to this cause is to be ascribed the excessive rainfall, and consequent bad seasons, from which the country has suffered so much in the past few years. A greater fallacy could not be promulgated. According to such theorists every country in Europe ought to have from double to sixteen times as much rainfall as Great Britain! The fact is, the moistness of our climate arises chiefly, if not altogether, from natural causes over which man has no control, and upon which the present wooded state of the country can have at the most but the slightest modicum of influence. However, there are many parts of Great Britain and Ireland, the latter particularly, in which the *want* of woodlands seriously affects the prosperity of the inhabitants, and the miserable crops they laboriously try to cultivate. The want of trees, and a proportionate breadth of woodlands, to shelter crops and stock from the cold wet blast, is the greatest evil which the farmer and cottager has to contend with in far too many parts of our country. The agriculturist strives in vain against the combined evils arising from exposure to wind and rain, unless his crops are protected and matured by the ameliorating influences of trees in judiciously laid-out plantations. Examples of the beneficial effects of plantations are to be seen on every progressive estate in the country ; although on far too many properties are seen the storm-swept, stunted crops, and starved, lean-looking stock, which are the natural result of the want of woodlands. Bleak wastes and hungry moorlands of the most worthless nature, have been transformed in a few years into rich pastures and smiling fields of waving corn, by the genial protection given to them by a well-arranged system of plantations. Thorough drainage and judicious planting are the two great factors in land improvement, in such a variable climate as we possess. Ten times the amount of woodlands which we now possess would not prejudicially influence our climate, but, on the contrary, they would add immensely to the general welfare of the community, if judiciously planted in those parts of the country where their presence is most wanted, or where their produce can be most profitably turned to account.—*Journal of Forestry.*

AMERICAN FORESTS.

FOR some years the attention of Americans has been forcibly drawn to the rapidly diminishing supply of produce from the indigenous forests of that vast continent, and which at a very recent period were popularly considered to be inexhaustible. Nor has that attention been given a day too soon to this most important factor in the futue welfare of the United States and Canada. The axe of the lumberman is plied with injudicious vigour in the sweeping away of the forests, but the fresh settlers in forest tracts are also proverbially wasteful and destructive of the forestal wealth around their homesteads. Their chief object is how to get rid of the timber with the least trouble and cost, so as to grow corn in its stead with which to supply the markets of the world. This is undoubtedly a laudable object, but when another important necessity in the wants of man is utterly wasted in the process, and the climatic influences dangerously tampered with, it behoves the Government of the country to take effective measures for the prevention of this enormous waste of the economic products of the land. All over North America the same evil has hitherto prevailed, almost unchecked by any laws, or if laws have been promulgated they have been systematically ignored ; sometimes through their impracticable nature, but more often from the want of a direct superintendence by the Government of the country, and the employment of duly qualified officers to see the laws obeyed, and the spirit of their enactments carried into effect.

However, there is a prospect of better regulations being initiated ere long for the preservation of the forests of the United States. Public opinion is being roused on all sides to the urgent necessity of immediate action being taken for the protection and proper management of the extensive and valuable-timbered areas which still remain of the vast forest tracts of earlier times. Many earnest workers are in the field, each striving to enlighten the public upon the vast importance of the subject, in a national or economic point of view, or treating of some special point, deemed of primary importance for carrying out a well-regulated system of State forest management. Among others, Professor Sargent, Dr. Warder, and Dr. Hough have all done eminent service to their country. Of the more recent writers, Mr. S. V. Dorien displays a zeal that is most commendable. In a pamphlet recently issued by him at New York on the "Protection of Forests" he treats in an able manner of the *necessity* for *at once* protecting what remains of the noble primeval forests of America. He goes over the many well-known instances of the ruinous effects which have been produced in different European countries by the wasteful and ruthless destructions of their forests, and conclusively proves that America is in imminent peril of suffering seriously in wealth and prosperity from the same cause. He rightly argues that "the forest is a part of universal nature. We cannot do without it. As water is a necessary constituent of our earth, so is the forest. It was handed down to us by our ancestors, and must be transmitted to your descendants. If we acknowledge the indispensableness of its existence, the duty of its preservation is but a necessary consequence; nor can it be doubted that if individual owners neglect the care due to the woods, the representatives of the body politic are not only entitled but obliged to interfere." With these evils so clearly brought before them the people of America cannot fail to see the danger ahead, and to strenuously insist upon measures being at once adopted for the conservation and economic management of their indispensable forests.—*Journal of Forestry.*

GARDEN.

STRAWBERRY CULTURE.

IN an essay on the above subject read before the Indiana Horticultural Society, Mr. Ohmer said :—

For field culture, I plough and harrow as for any other crops. I plant in rows three feet apart, and twenty-four inches apart in the row. I cultivate with a one-horse cultivator that will not go too deep, nor throw up ridges, then use hoes to cultivate in the rows. I allow the runners to take root in the rows, making what is called a matt ed row. The hill system can be practiced in field culture, as well as in a garden, which is done by many of our best cultivators, in which case, plant closer, say fifteen inches apart in the rows, and cut off all the runners as directed for garden culture; in either case, it is absolutely necessary to keep the ground free from grass or weeds. Cultivated in matted rows, your cultivator should be narrowed, so that when done the matted rows would be about twenty to twenty-four inches wide, leaving an uncovered space of about one foot wide, so as to enable the pickers to get through to gather young fruit without tramping on them. I mulch in field as described for garden, one inch deep with clean straw. I don't mean one inch solid but loose, merely to cover the plants from sight, which is all that is necessary. In spring I do not disturb the straw, but let it lay, the plants will come up through nicely. I do nothing to my strawberry field in the way of cultivation in spring, except if they are too weedy, to cut (not pull up) down the weeds. After the berries have been gathered, I cultivate thoroughly between the rows, leaving from six to ten inches wide of plants

which cultivation must be repeated as was done the season previous. Two crops are all I think profitable in this manner on culture, as new plantations can be put out at less expense and produce more and better fruit than an old bed. One hundred and seventy-five bushels per acre is the most I ever gathered grown in this manner, and these were Wilson's. This amount can be largely increased if what has been said of the Crescent is all true.

TEA.

THE tea industry seems to be on the eve of a crisis. The last number of a contemporary devoted to that industry, contains a review of the operations of several companies, and if its conclusions are correct—and we see no reason to doubt them—this crisis is being brought on by bad management, either on the gardens or in the agencies' chambers. For instance, we find one company the making of whose tea has cost as follows: —1877, 11 annas 11 pies per lb; 1878, 12 annas 10½ pies per lb.; and in 1879, 13 annas 9¼ pies per lb.; while the article sold as follows:—1877, 13 annas 3 pies; 1878, 14 annas 2 pies; 1879, 10 annas 10½ pies per lb.

The selling price was unusually low last year, but this steady increase in cost is inexcusable; some gardens, similarly situated, turn out their tea for 9½ annas. Another instance is mentioned of a company with a capital of 9½ lakhs, earning a gross dividend equal to Rs. 19 more than was paid for "Directors' and Auditor's fees and commission to Secretaries and Managers." We suspect the Managers did not get much of this lump sum, and we do not see that they deserved much, as their out-turn was only 153lbs. per acre, a result of which any manager should feel ashamed. If we are not to lose our tea industry altogether, we must contrive to conduct it on such principles as are consistent with ordinary prudence and common-sense. The habit of putting the "sisters, cousins and aunts" of managing agents and directors in charge of the garden, must give place to the more sensible one of putting properly qualified men in charge, and Government must be induced to remove the terrible incubus of Act VII. of 1873 (B.C.) which sits on the industry like an old man of the sea.

CONCERNING tea prospects, Messrs. Moran and Company have the following remarks in their circular of 21st ultimo: "We regret that again this year we are not in possession of sufficient data on which to base an estimate of the coming crop. It is evident, however, that the increase will be very considerable. Regarding last year's crop we calculate, from latest advices from London and from the Calcutta Custom House returns, that the total out-turn of season 1879 was about 40,000,000 lbs., of which about 39,000,000 lbs. were exported. As this quantity was in excess of the demand in London, stocks there have enlarged, and this, together with the expected increase in production, must induce a lower range of prices, and planters will find it to their advantage to make up for this by turning out a better quality of tea. We are glad to see signs of this improvement in the samples which have been sent down of this year's make.

"Weather reports during the last fortnight are not very favorable. Sylhet has been visited with heavy storms, accompanied by partial floods, which have done considerable damage to some estates. Hailstorms are reported from Cachar, but gardens appear to have suffered but little harm. In Assam, planters in Debroogurh are well ahead of their estimates, but from other parts of this district reports are not so promising. Darjeeling gardens are doing well, but rain is wanted in the Dooars, as also in Chittagong and Hazaribagh."

INDIAN TEA.

From a Tea Traveller's Point of View.

NOTICING in a recent number of the *Mail*, some account of the way in which Indian tea sales are conducted in Mincing-lane, it occurs to me that those of your readers who, from pecuniary or patriotic motives are interested in the subject, may like to learn something of the reception of the tea by the retailers when presented for their approval by the humble agency of the class of which I am a member. The grocers are the real masters of the situation, and it is only through their co-operation that Indian teas can be successfully brought into general use; therefore, if the trade is to be expanded, it must be by making tea such as will gratify the grocer. It follows, then, that it will be more profitable for the tea planter to study the taste of the smallest and most illiterate retailer rather than the cultivated palate of the most dignified and financially potent "rooster" of the Commercial Sale-rooms. For the former can extend the drinking of Indian tea to the whole of the consumers who deal with him, while the latter has no direct power to increase the consumption, and so that he makes his profit when the tea passes through his hands, cares little whether the public be pleased or poisoned.

Unfortunately, we travellers have to deal with clients amongst whom are many knowing little of what constitutes the best tea. Uneducated in the trade, the only criterion of value is the individual fancy. Unlike the broker, the commercial traveller has to take into account temperament as much as tea. The traveller is not perched on a rostrum, surrounded by eager buyers, but has often to trudge many weary miles to effect a sale, and then must find sufficient energy to convince a probably ignorant client that a certain kind of tea is the best, for which labour, in the end, he very often gets more kicks than half per cents. Dealing with a fictitious estimation of value, proof is not possible. Moreover, the question of the value of a tea depends, in many cases, upon the traveller who offers it, and not upon its intrinsic merit. Should you be on terms of intimacy with your customer; above all, should you be regarded with a favourable eye by your customer's wife, or should you display judicious solicitude anent the teething of his youngest, then the way is easy, and whatever you offer will be cheap and good, and whatever is offered by anyone, not thus happily circumstanced in the family affections, will be dear. This class of buyer is, I take it, the salvation of bad tea growers, for by no other means could their tea get into consumption, unless offered at prices which would not be remunerative. The pressure of competition is, however, rapidly remedying this state of affairs, and there is now an intelligent attention given to tea by the retail trade, formerly unknown. Many grocers test the samples submitted to them with much more care than the "roosters," whose lives are made burthensome by the number of small lots they must daily taste, and whose only hope of safety—in the hurried liquoring, and consequent unsafe buying—lies in the diversity of tastes, and in the ignorance of their customers, allied with the confidence with which their "selections" are received by the letter. First and second water; how the tea takes the milk; how it blends with China tea; these are all details carefully studied by the educated retailer.

It is only the opinions of the latter class which can be of value to the producer of Indian tea. It would be casting pearls before swine to set about manufacturing tea to please the first described kind of buyers because their pleasure in the matter is an unknown quantity at the mercy of every traveller who ingratiates himself into favour, not by the cheapness of his samples, but by his own dearness to his client. I may mention, with regard to Indian tea, that I have usually found it receive most attention from those retailers who, in their knowledge of tea and the art of tea-mixing, are furthest advanced.

The great majority of grocers use India to back up and strengthen China tea, and the minority in order to flavour it; but, except in Ireland, only a fractional number make Indian tea the staple of their canisters. Neither of these purposes, I opine, are what the interested lover of Indian tea, or the disinterested lover of his country, would wish to see. They look forward to the day when the British Empire shall be self-supporting in the matter of tea—when, metaphorically speaking, we shall sit under our own tea shrubs and draw refreshment from the grateful leaves. They do not want our own tea to be used merely as a prop to support the weakness of the China. But at present this is practically the use to which it is put, and there are some good reasons, which I will mention why this is so.

With great care in selecting, and in graduating their customers to the change, some grocers have got so far as to make their mixtures half China and half Indian, or even with a preponderance of the latter. But in such a case the task of selecting and *matching* the Indian teas, the smallness of the parcels when found, and the consequent need of more frequent and heavy tastings make the work one which, if the ordinary run of grocers were to attempt it, would usually result before long in driving away many of their customers; because having other work to attend to, they would be compelled to buy in the usual haphazard way, without tasting many samples. With Indian tea this system would not answer. In China tea, on the other hand, price is some guide as to quality and sort, but in Indian it is next to none, and the produce of different gardens, sold in Mincing-lane at the same price, would make or mar the retailer according to the chance of his choice. With China tea there is no such peril in its use, and consequently it is felt to be safer to "go on" a large quantity of it in a mix and only throw in a small portion of Assam or Darjeeling to give strength or flavour. The average admixture is about one pound to six of China tea. Often in urging a man to buy some specially *useful* parcel of Indian tea, and to put a larger proportion in his mixtures I have been met by the reply, "What is the use of altering my mix, I won't be able to follow it." This illustrates what I have said, that the enormous diversity in Indian tea makes it unsafe for the retailer to use it extensively, unless he gives to the subject a disproportionate part of his time. Variety is pleasing no doubt, but in Indian tea it appears to have been over-studied, and if the planter would save the labour he bestows in dividing the produce of his precious acres into so many distinctive sorts, from Flowery Pekoe to earth-flavoured siftings, and lump the whole together—giving only so much attention to appearance as that it be not a "straggly" leaf,

fairly even, not too brown or too large. In fact, somewhere between a China Saryune and Moning—and then concentrated all his attention upon the liquor, he would probably be a step nearer ousting his Chinese rival than in preparing teas which are usually either too good—at any rate, too strong—or too bad to be taken without a pinch of Congou. One of the chief reasons why China tea continues to keep in favour, despite some of the more brilliant qualities of its rival, is probably owing to the fact that it possesses a roundness and mellowness in liquor which for the most part is wanting in Indian tea. This causes it to thicken and assimilate with milk. Pungent Indian teas fetch very high prices because the idea is that they please prudent housewives by giving to the second brewing additional strength, indeed it is this second cup which is constantly in the mind of the grocer in his use of Indian tea. But I am inclined to think that these pungent teas simply spoil both first and second cup by their disagreement with the milk. As ground for this opinion, I have noticed that among the most careful blenders of tea the demand is less now for pungency and more for thickness, fullness, or roundness of liquor. In short, as the end of all tea is its drinking and as ninety-nine in every hundred people use milk in doing so, it follows that the action of the latter ought to be observed most critically. The majority of Indian teas, as I have said, do not assimilate well with milk, becoming herby, or throwing off a foreign weedy flavour, while China sorts, except the most worthless all improve under its influence, and please the average tea-drinker. The three things which seem most required to popularise Indian tea are greater uniformity of quality in leaf and liquor; breaks as large as China teas—and the one of course almost necessarily entails the other—and last but most important, the utmost care in securing a *general tone of thick mellowness*, even at the expense of the more prominent qualities, such as pungency, distinct flavours, and the much over-estimated leaf. In small quantities such attributes may ensure Indian tea a higher price, but as supplies become larger it will end in its general depreciation, for it is thereby debarred from universal estimation, because, regarded as a drink, it is not palatable. A comparison of the present state of the China and Indian tea markets points this moral, for the inflation of the one appears to be no help to the other, and Indian teas could never be bought cheaper than now, simply, as I believe, because, beyond a certain quantity, they are found to be unsuitable owing to the present mode of preparation.—*Home and Colonial Mail.*

J. A. J.

THE CHINA TEA TRADE OF 1879.

In their annual review of the tea trade in China, Messrs. Little and Co., of Shanghai say:—

The year under review is remarkable as being, apparently, the turning point in the last period of the alternating series of years of arrested and of excessive production, and of overtaking consumption which culminated in the unexpectedly moderate crop of the past season.

Ever since the year 1871 when the production of Congou in China jumped from 150,000,000 lbs. in the previous year up to 172,000,000, and since the year 1872 when Green Tea rose from 29,000,000 to 34 000,000 lbs., the home markets have been constantly furnished with an annually increasing supply from China contemporaneously with rapidly augmenting yields from other competitive countries, chiefly India and Japan. The result has been that, in the face of a fast increasing consumption in all quarters, a decline in value has been steadily proceeding throughout that period, until at length a level was reached at which tea could no longer be packed for the Western markets without heavy loss; although prices in China which, with some disturbing fluctuations, had been tending persistently downwards, never fell so low as they did in London and New York, yet the fall was sufficient to render the picking of leaf in many of the less favourite districts unprofitable, and so fresh plantations meanwhile constantly coming on retain the yield at last at a nearly stationary figure. The overtaking consumption was thus enabled to come up with the production, and an enormous and sudden advance in prices in all the consuming centres re-acted upon China but too late, fortunately, to render an increased supply possible this season.

We have thus just reached the end of one series of increasing, followed by stationary, production, and are about re-entering another. We shall start this coming season with a full supply, which will continue increasing year by year until we again send forward so much tea as to bring about the inevitable collapse by which the production will be again temporarily arrested.

It must never be forgotten in endeavouring to form an estimate of the probable yield (as a basis of probable value) of the tea-plant in China, that relatively only a small portion of the total harvest is gathered for the purposes of export. In a country in which no collection of statistics is attempted, and in which the merchants keen as they are rarely look beyond their own immediate circle and despise rather than attempt to copy our Western enthusiasm for figures, it is impossible to estimate with any degree of certainty what is the relative proportion of home consumption and export, but as a guide to friends at a distance who may be willing to make the attempt, we will enumerate a few facts as data upon which to form a conclusion. We may premise in regard to the third fact that we have (after the devastation of the Green Tea districts by the rebellion of 1860-64) never known the leaf so scarce in the country that the poorer portion of the population were reduced to hot water as their beverage, but as the tea districts are now, and have been for a long period free from disturbance, and as they are outside the area of the famine which has recently depopulated the north-western portion of the empire, there is but scant chance of the recurrence of such a contingency in the immediate future. The facts are these:—

1.—The population of China and dependencies is 250,000,000, to 300 000 000.

2.—The population of Western tea-consuming countries (England and Colonies, Russia and United States of America) is 160.000,000.

3.—The beverage morning, noon, and night, of every Chinaman who can afford it is tea (wine being only drunk exceptionally and cold water never).

4.—In Western tea-drinking countries, apart from alcoholic drinks, coffee takes an equal place in the consumption.

5—The area of unoccupied land suitable for teaplanting is practically unlimited: of the tea already planted much remains unpicked every year when the price of common Congou is too low to be remunerative.

6.—The cost of picking, firing, packing, inland freight and duty, export duty and freight and charges to London or New York is not less than 8*d.* per lb. upon tea sold at home; at this figure nothing is left for the producer—or, seeing that he picks no leaf that he cannot sell—the price paid to him (never less than 8*d.* per lb.) for the raw leaf, is all lost between the native packer and the foreign importer

From this it will be seen that there is an *unlimited* reserve of tea for export in the supply retained for native use, provided the price foreign shippers are willing to pay is sufficiently high to pay the extra charges for packing and duty over and above the lower expense of preparation for native use. In the season just past prices until October (six months after the bulk of the crop was picked), ruled so low that native buyers were able to lay in large stocks all over the eighteen provinces; when the rise came, the tea had been already so far distributed that the getting it again together in quantity to make chops for export was impracticable. Had the rise come three months earlier the export would have been enormous. As it was, our first crop was a very heavy one, but it realised such low figures that a large proportion of the tea men had no funds left wherewith to return to the packing of a second and third crop, which was hence freely diverted to native use. We thus have this paradox to deal with each season: either low prices at the beginning, short yield and probable large profits, the expectation of which would seem to justify fair rates being paid, such as competition to buy ensures; or, fair prices at the beginning, a heavy subsequent yield, and almost certain loss in prospect, such as should lead to low prices and absence of competition. How it has been met hitherto we all know. Is it likely that it will be met with more sagacity in the future?

The recovery in trade in Great Britain came too late to make much impression on the consumption of tea in 1879, notwithstanding which the deliveries in London show an increase of four million pounds on the previous year's, leaving the stock of Black Tea in a much improved position.

COFFEE.

THE prospects of coffee in Ceylon appear to be anything but favourable. Considering the amount of capital invested in that industry, the outturn seems very small. From the commencement of the season, on 1st October 1879 to 5th April 1880, the total exports have amounted to 429,525 cwts, as against 535,596 cwts for the corresponding period of last year, showing a decline of 20 per cent., and we are sorry to see that the proprietors are not taking the proper means to recover themselves. We note that they are discharging their assistants right and left, and from a correspondent in Ceylon we learn that 400 planters are now in the island idle. It may be, however, that the proprietors cannot help themselves, and that the coffee industry is on the eve of a crisis which will result in the ruin of a large number of proprietors, and possibly afterwards in a more healthy state of the industry. In 1864-66 the tea industry passed through such a crisis, and is perhaps not far from another. After the former, many errors arising from ignorance were corrected. It had been the habit to look on the possible profit as something over, and never to be under, 100 per cent., and all outlay, including managers' salaries, was based on this assumption. Under this delusion vast areas of land were brought under cultivation in the most perfunctory manner, and it was subsequently found that the companies had not sufficient funds to cultivate these tracts until they came into bearing. Consequently all concerns so conducted failed, and were taken over by new proprietaries at prices—in most cases—considerably under their real value. With the coffee industry we imagine the cause must be sought elsewhere. We apprehend it arises from the fact that few of the companies or proprietors are at liberty to sell their produce in open market, and the industry will never be healthy until this is changed. A

garden, we will say, is mortgaged to a firm in Colombo or in London; all the produce must therefore go through that firm, and such a state of things results in what are known in America as "rings" which are fatal to free trade. With ordinary cultivation, we do not see why coffee growing should not pay. The expenses should not be so much per acre, while the value of the gross produce ought to be as high as with tea; but until the owner can arrange to sell his crop in the open market, he need never expect to reap the fruits of his labour. A large commission sticks somehow to the fingers of all through whose hands his crop passes, and he will never get rid of these ruinous commissions till he is able to place himself in direct communication with the open market.

MESSRS. KOLFF AND COMPANY of Batavia, have published an interesting pamphlet entitled "Historical and statistical notes on the production and consumption of Coffee," by N. P. Vander Berg, LL.D. (the President of the Java Bank), translated into English by Mr. G. G. Batten. In a short sketch, of about 90 pages, the author reviews the gradual increasing or decreasing crops of the producing countries, and from data, carefully collected and sifted, estimates the total annual amount of the fragrant bean offered for sale in the whole world at 490,000,000 of killos, or 482,280 tons; whilst the consumption, calculated in the same careful manner, is put down at 489,070,000 killos., or 481,370 tons, leaving a small balance of 910 tons to meet eventualities. It would appear, according to these statistics, that the Dutch are the greatest consumers of coffee, 8·12 killos. per head; next the Belgians, 4·14, then the Norwegian, 3,96, whilst the French consume only 1·38 killos. a head, the English 0·45, the Russians 0·10—or in other figures the Dutch consume 17¾lb against the Frenchman's 3lb., the Englishman s 1lb., and the Russian's 3½ ounces.

COFFEE CROPS, PRICES, AND WEATHER.

THERE is at the present moment much cause for anxious thought and speculation as to the course of the home coffee market, and the outcome of the present season on the ensuing crop. We have so frequently directed attention to the causes, apart from the extent of our own shipments, influencing prices in Europe, that we need not repeat them. We see our lessened exports reaching home to realise lower prices, and the moral of this is a strengthening of the oft repeated argument in favor of selling upon the spot. Considerable sales of plantation coffee were made during the month of March at from Rs. 54 to Rs. 56, free on board, but not a few preferred shipping their crops at the risk of the market, rather than accept Rs. 55. Since they refused that price, the home market has declined seven shillings with no early prospect of a revival. That prices at home will recover when the existing heavy stocks are reduced we do not doubt, but before that can take place, a good deal of produce, will be sold at a sacrifice that might have been avoided.

Just now the outlook is not what was anticipated a month or two ago with coffee at upwards of 100s. in the London market, and a favourable weather forecast promising as some sanguine spirits anticipated, a large, if not a bumper crop. But we are already realising the uncertainty of everything dependent on seasons, for having passed through a third of the month of April, which was to realise our fondest hopes, we are compelled by the strange freaks of weather, to modify our calculation and bring down our anticipations to moderately paying crops, which is admittedly all we dare to hope for. Leaf disease the once dreaded enemy of the coffee plant, has, thanks to some atmospheric influence, diminished to small proportions; trees which in former years wore a poor and attenuated appearance, are now densely loaded with bearing wood and healthy foliage, and are willing and ready to do their part in regard to a plentiful show of blossom, but that the adverse season has hitherto forbidden it, and even at this critical moment holds every attempt in abeyance waiting only the advent of a warm and forcing sun.

The break of the "little monsoon" has been attended by indications rarely encountered at such a time. Nearly all the rainfall has taken place amidst a dead calm, being rarely accompanied by wind: moreover, such wind as blew fitfully and faintly, has been from all points of the compass, and this added to the unusual abundance of electric phenomena, leads to the belief that the "little monsoon" has come upon us by means of the centre of a mild cyclone. The absence of wind explains the slight extent to which the weather has rescued interior where it appears to have been scarcely felt, with every probability that it will exercise no prejudicial influence on the blossom.—*Ceylon Times.*

LIBERIAN COFFEE.

THE advantages of growing Liberian coffee, over the ordinary descriptions, are so many that it is very satisfactory to find it has been successfully cultivated in this province. A writer in the *Ceylon Observer* says that an estate of 20 or 80 acres of Liberian coffee well looked after would yield as much as one with 200 or 300 acres of coffee Arabica or Ceylon coffee. The Liberian coffee berries are big as plums and the unprunned coffee has no leaf disease. The flavour of the Liberian description is said to exceed in excellence the best description of Arabian coffee, so that high prices may be expected for the crop. It is said to grow equally well in estates at Ceylon in the neighbourhood of the sea and in those at a considerable distance from it. The first crop is generally only a few berries but the tree goes on increasing until it becomes capable of yielding 20, pounds of berries. Some old trees have yielded as much as 24 pounds each. It grows to a height of between 20 and 80 feet. Some cultivators top their trees, other let them grow *ad libitum*. Trees that are topped are more conveniently picked, and other things being equal, give a large crop, whilst when the trees are tall they are frequently injured by the climbers picking the berries, as the trees ripen their crops and blossom for the next year at the same time, and much blossom and young fruit is rubbed off unless great care is used; whereas the low trees can be picked whilst standing on the ground. A Ceylon coffee planter who went to Liberia says he has seen trees forty years old flourishing in all the vigour and verdure of young and bending down under their weight of berries. The Liberian coffee plant is not a shrub but a handsome forest tree. Some of the old trees when cut down shoot up rapidly and more vigorously than when first planted from the seed. Mr. W. Bull, of King's-road, Chelsea London, supplies established plants of this Liberian coffee which can be safely despatched by the direct steamers from Glasgow to Rangoon in one of Mr Bull's patent plant cases many of which have been sent to India. We are glad to hear good accounts of the trees planted in the Agri-Horticultural gardens in Rangoon by the enterprising Superintendent, Mr. J. C. Hardin, as well as those in the Soldier's Gardens Cantonment by the indefatigable Colonel Hawkes. The Forest Department should have a plantation of these trees at Magayee and at Toughoo. It would pay better than the Cinchona, which from all accounts is not a success.

Even if we cannot become a coffee exporting country, which under the present illiberal system of giving land to planters is not probable, we might surely make ourselves independent of imports from other countries. The price of coffee at present in Rangoon is about Re. 1-8 per viss or not much under a shilling per pound. If every person with a garden at or near Rangoon grew half a dozen of these trees, they might render themselves independent of bazaar supplies of this refreshing drink whilst others whose land was more extensive could not do better than try an acre or two with Liberian coffee.—*Rangoon Gazette.*

COFFEE CULTURE IN GUADELOUPE.

AFTER sugar—the principal agent in the prosperity of Guadeloupe—coffee takes the first rank among the secondary products. It was formerly the first among our staples. Without occupying ourselves now with the causes which led to the abandonment in too many parts of the colony of this culture, so flourishing before 1789, let us take as a point of departure the year 1815, the date at which France retook possession of the island, which had been subjected for the second time since 1810 to the domination of Britain.

In 1815 the coffee crop produced no more than 284.135 kilog., but starting from the succeeding year and on to 1830, it assumed considerable proportions. Guadeloupe during this period of 15 years exported 15, 6 ,050 kilog. of this valuable berry, being a mean annual export of 1,019,6.2 kilog.

2nd Period. 1831 to 1845—During this period the cane cultivation greatly extended. The handsome prices which sugar then obtained in the metropolitan markets, whilst fortifying the courage of the sugar planters, strongly excited the cupidity of the owners of the coffee plantations, who saw with a jealous eye, or rather with a greedy eye, the growing importance of the sugar estates of the colony. Without a thought to the deceptions which the future might be preparing for them, they saw nothing but the splendours of the present, and, no wiser than the frog in the fable, substituted the sugarcane for the coffee trees on their properties.

Tout bourgeois peut batir comme le grand seigneur.—The export tables are the faithful reflex of what took place in this second period. The quantity of coffee exported diminished by half, and sugar shews a larger output. It is thus that instead of 15 millions, the colony exported no more than 8,613,631 kilog. of coffee at this period, being a mean annual export of 574,578 kilog. It is right to add that it was at this period that the coffee disease appeared and caused such grave anxiety among the planters.

During the *3rd Period*, from 1846 to 1860, the decrease in the coffee production was even more appreciable. It is true that about this time we had emancipation, whereupon the blacks located on those coffee estates which had not yet been converted into sugar plantations on account of their topographical situation, abandoned the heights to fix themselves on the sea coast, which had all their preference. The total exports at this period a e not more than 3,663,720 kilog., giving a mean annual export of 244,247 kilog.

4th Period: 1861 to 1875.—Though in smaller proportion than at the first period, the exportation of coffee increased at this time by more than a million kilog It was in effect 4,747,069 kilog., giving an annual mean of 316,477 kilog. We feel here that immigration has furnished hands to the coffee estates, and that the work of production has become more systematic.

The results of the three years, 1876, 1877, and 1878, confirm us in this opinion. During this short period the colony exported 1,332,695 kilog. of coffee, giving a mean of 444,276 kilog. per annum.

That coffee is destined to further extension by retaking at certain points excellently suited in soil and climate to its habits of growth, the place which it has ceded to the sugarcane, we are well assured. We know a

sugar estate which, under the intelligent direction of its new proprietor, has again become a *cafeiere*. The revenue which the new culture gives yearly affords him no reason for regretting the change. His example we have no doubt, is one which will sooner or later be extensively followed.—*L'Echo de Guadeloupe.*

COFFEE IN BRAZIL.

Kern, Hayn & Co.'s Annual Market Report.

RIO DE JANEIRO, 1ST January 1880.

THE year just closed has to Brazil in most respects been an agreeable contrast to the previous one; while during the year 1878 prices for coffee as well as rates of exchange declined steadily almost during the entire year; the reverse was the case during 1879, consequently the country has witnessed an improvement in the export as well as in the import trade. The latter, especially, was, as far as we can judge, conducted on a sounder basis than during the previous year; a good deal of illegitimate competition fell to the ground by itself and the rising exchange of course favored importers very much.

COFFEE.—This article has again during the year under review presented most interesting features; whereas prices during the year 1878 declined $1,800 to $2,000 per 10 kilos for "Ordinary first" and 950 to $1,100 per 10 kilos, for "Good first," the year 1879 witnessed a still larger advance in prices, the difference between the lowest and highest point in price for the same two qualities being respectively $2,150 per 10 kilos, and $1,4 0 to $1,450 per 10 kilos., the lower grades, say "Good second" and "Ordinary second," presenting a still bigger price difference. In the f. o. b. cost the difference between the lowest and highest point is comparatively still larger than in currency prices, as will be seen from the beneath table which circumstance was called forward by fluctuations of exchange. It will be seen from same table that the lowest point in the f. o. b. cost was on the 23rd May, say a cost for "Ordinary-first" in the Channel of 47s 8d. to 49s 1d. per cwt. and a cost for "Good-first" in the United States of 1290 c to 18 16c per lb., whereas the highest point was on 6th December (not counting 23rd December, when prices were nominal) with respective costs of 11s. 77d —74s 6d., and 17 71 c.—17 93 c., the difference between the lowest and highest point thus amounting to 27s. 3d —28s 5d. per cwt in the Channel and 4 75 c.—4 81 c. per lb. in the United States In 'Ordinary second" the difference between the extremes is as large as 8 s per cwt in the Channel and 6½c. per lb. in the United States, the lowest range of prices for this quality being at the beginning of the year and the highest on 6th December.

It is rather interesting to see the extraordinary difference between the extremes of stocks witnessed during the past year; the smallest stock was 200,000 bags on the 7th January, and the largest 403,000 bags on the 16th December, and it is rather characteristic that prices were about at their lowest point when the stock was smallest and about at their highest point when the stock was largest.

The quality of the 1879-1880 crop shows a crass contrast to that of the previous crop. It will be recollected that the 1878-1879 crop was inferior to what any previous Rio crop had presented, "superior" so to say not existing at all, and even "Good-first" being very sparingly represented, whereas a considerable quantity of the very lowest trash was on the market almost during the entire season;—the 1879-1880 crop, on the contrary, until lately offered so to say no "Ordinary-second" at all, and then only limited quantities, "Good-second" has been pretty scarce, and at times it even was difficult to obtain "Ordinary-first" alone.—The 1879-1880 crop show a good-sized bean and more cleanliness of the coffee than usually, under which circumstances we at the beginning of the season adhered to the hope that the selection during the present crop would be kept very strict, but we are sorry to say that several times with a rising market we have witnessed pretty slack selections.

The total export from Rio de Janeiro during the year 1879 amounted, as will be seen from the table below, to 206 827 tons against 167,210 tons in 1878 and 162,105 tons in 1877, thus showing the considerable increase of 39,087 tons on 1878 and of 44,222 tons on 1877, and it will be seen that almost the entire increase falls upon the United States. If however we compare the shipments of the last two years during the second semester only, we find that those of 1879 show a decrease against those of 1878 of 4,184 tons, so that the increase in the total shipments of 1879 against 1878 falls upon the first semester, same actually showing an increase of 43,221 tons; as will be seen from our report of 8th July, the shipments during the first semester of 1879 amounted to the heavy figure of 101,208 tons (1,714, 994 bags), so that during the year 1879 the shipments were about equally divided between the first and second semester, a very rare case.

In our report of 8th July 1879 we stated that with regard to the extent of the 1879-1880 crop, most estimates then varied between 2,500,000 and 3,000,000 bags, and that according to our opinion it was likely to be nearer the latter than the former figure. Let us suppose it to have amounted to about 2,800,000 bags, in which case with the stocks on 1st of July 1879 of about 90,000 bags in Rio and of about 1,000,000 bags in the interior we would have an available quantity for shipment from 1st of July 1879 up to 30th June 1880 of about 3,900,000 bags, of which quantity about 1,300,000 bags were exported from 1st of July to 31st December 1879, so that with a probable export during the present semester of 1,500,000 to 1,600,000 bags, we would, on 1st of July prox., remain with a quantity of coffee left over 500,000 to 600,000 bags.

With regard to the 1880-1881 crop we have to state that the prospects for same are so favorable that at present there is reason to believe that a large crop might be expected, but it is not unlikely that the crop may be a late one; to name a figure with regard to the probable extent of the same is at this time of the year entirely impossible.

SHIPMENT OF COFFEE FROM RIO DE JANEIRO.

From 1st January to 31st December.

	1877. Tons.	1878. Tons.	1879. Tons.
North of Europe... ...	39,705	44,526	47,188
Mediterranean	20,474	18,300	18,434
Europe	60 179	63,826	65,622
United States	96,100	95,585	131,900
Cape, Sundries and Coastw....	5,826	8,829	8,805
Total ...	162,105	167,210	206,827

From 1st July to 31st December.

	1877.	1878.	1879.
North of Europe... ...	21,440	27,691	17,728
Mediterranean	10,462	12,076	9,711
Europe	31,902	39,767	27,439
United States	57.182	64,448	74,882
Cape, Sundries and Castw. ...	2,924	5,038	3,098
Total ..	92.008	109,253	105,119

FROM SANTOS.

	From 1st Jan. to 31st Dec. 1877. Tons.	1878. Tons.	1879. Tons.	1st July to 31st Dec. 1877. Tons.	1878. Tons.	1879. Tons.
Europe ...	36,000	54,423	55,850	21,020	25,879	23,426
United Sts.	5,881	10,310	12,113	2,231	6,775	8,307
Total ...	41,881	64,733	[illegible],972	23,251	32,654	31,733

CACAO.

COCOA (OR CACAO) IN TRINIDAD AND IN CEYLON.

(Communicated.)

THE fellow creatures, and brother planters, of the author of the "wee bookie" on cocoa in Trinidad owe him thanks for communicating what has cost time, trouble, and money to obtain; though some of them may regret, that he should have gone so far, and brought back rather little.*

He tells us that the Trinidad planters reject for seed the small nibs at both ends of the pod; we shall probably follow this good example, when we are able to purchase it at a lower price than seed now commands, but in the mean time, as we are pretty certain to lose a large proportion of our plants, we must not throw away the chance of even the weak seeds it is planted in nurseries first, not more than "two-and-a-half inches deep," and afterwards transplanted. We have sown it in nurseries here and afterwards transplanted it to the field with the result of losing a large proportion of our plants extending in some unfortunate cases to saving none. We have found the plant resenting removal even to death, and at the best maintaining a protracted struggle to counteract the shock, especially, where it had to encounter dry weather.

* Our correspondent is a little hypercritical, and the following remarks of the author will explain the object he had in view:—"In that little cocoa pamphlet that was sent to you from England the other day, there are one or two mistakes in the printing, but the one specially to be noted is that the engravings where *stove* is printed for 'store.' I do not doubt but that some will think that the book is too small, but none would do so who have had any experience on a 'cocoa walk,' as it is a well-known thing that there is very little done in the way of cocoa cultivation, as it takes care of itself to a great extent. And so beyond giving a good ground work on the subject there was not the slightest use in raising questions that probably not one Ceylon planter out of a 1,000 would believe in, so having dispelled an idea common in Ceylon that cocoa requires washing, which process simply means *destruction* with regard to value, I intend to keep to myself the other peculiarities which I have learnt for my own private use, and time will prove who is right and which is the best principle. Just fancy my trying to persuade Ceylon planters to wait patiently for five years and not allow their trees to bear, or how could I press on a man that if he uses seeds from a tree of three years old, his produce will not be a good tree, or that without fail a tree should never be allowed to have more than three boughs at the start, and not four, and heaps of other things besides. If ever you should require more copies and would like a little more added, I will do so, but we will see. Cocoa is not the subject that offers is for a book, and that I will maintain against all comers."—ED. C. O.

before it was fairly settled. We did not sow the seed two-and-a-half inches deep, not even one inch; yet we have lost largely from the force of growth being insufficient to extricate the seed from its bed. The stem comes up in the form of a bow, held firm at one end by the root, at the other by the seed; as it lengthens the curve narrows, the tension becomes too great for the delicate tissue, and it snaps asunder, leaving one-half of its length attached to the root, and the other to the seed; then if the midday sun should shine on it, while in this condition, for one hour, it is irretrievably lost. Therefore the seed should not be covered even one inch, and never with any substance that will become stiff under either wet or dry weather. The best coverings are coir dust, cinnamon scrapings, sawdust, or loose sand.

In Ceylon, a good deal of seed has been sown in bamboo joints, but the inside of such pots being of equal width from top to bottom, the ball of earth cannot be taken out entirely, and there is great danger of breaking it up, in splitting and removing the bamboo in pieces, therefore the plan of planting without removing the bamboo has been tried, but not found satisfactory. The taproot soon gets beyond the pot, but the taproot is not a feeder, the plant is starved, when the food contained in the pot is exhausted, and death ensues; merely because the roots are confined to a narrow space, and cannot spread, and forage the surrounding soil.

Sowing at stake will probably become the common practice in Ceylon, but this method has its dangers, as well as others; the sowing should be done at the commencement of the wet season, and with the heavy rains likely to fall, then there is danger of silting, and the seed getting too deeply buried. Covering with baskets draws up the plant so rapidly, that it has been found nine inches high in less than a month from sowing, but with a stem as slender as a darning needle, and quite unequal to resisting the wind, when the covering had to be removed, to allow of vertical extension. Wind is the first and most persistent enemy to the young plant and, to guard it against that during the first year, is the first study of the planter. Many plans have been tried, but the latest and the most successful is cut bataliya into two feet lengths, and in a circle one foot wide, round the spot where the seed is to be sown, drive seven of these six inches into the ground, then with split bataliya work basketwise into them up to the top. This protection will prevent silting and excludes an injurious amount of both wind and sunshine, while it admits enough of both for the health and vigorous growth of the plant. In the mean time, the land may be planted with some crop, that while temporarily occupying the large vacant space and affording shade or shelter, will have a value of its own, and that will help to pay the expense of the operations. Plants that may be used for this purpose are castor-oil, cassava, pigeon pea, cotton teosinte, Indian corn and others, that may suit special soils and climates.

One whose experience is not sufficiently extended to render him an authority should write modestly about permanent shade (which is implied by advising that forest trees should be left for this purpose), but there are principles which require no special experience to understand and vindicate. Shade must have one or two objects in view, when deliberately provided for a cultivated plant; it must either be unable to thrive under the measure of sunshine furnished to the climate in which it is cultivated; or it must, when at maturity, throw too little shade, on its own account, to protect the soil it occupies from the too rapid evaporation of moisture. There may be arborescent plants, that thrive better under shade than fully exposed to the sun, but the writer hereof has not in fifty years found any such plant cultivated either in its own habitat, or in a similar climate. It may be freely conceded, that few if any cultivated arborescent plants can survive through several months of tropical drought without either shade or artificial watering during the first, and, in some cases, even the second year of their life; but this is merely because the roots have not reached a greater depth, than that reached by the drought: not that the sun kills them, but the lack of moisture; they would not only stand all the sunshine, but thrive the better of it, if moisture within the field of their roots did not fail them. When the roots have penetrated deeper and spread wider, they will survive a proportionately increased period of drought, without a leaf losing its gloss from sun heat. If a cultivated arborescent plant, that has reached the fruit-bearing age can only survive by a screen being maintained between it and the sun, it is a sure sign that an attempt is being made to cultivate it in an unsuitable climate.

It is claimed for the system of allowing weeds and brush to grow freely under the shade of cacao, that it keeps the soil cool and moist. The theory is urged by the Sinhalese, in defence of a dirty cocoanut estate, but when the undergrowth is reduced to pasture grass, a decided improvement takes place in the cocoanut crop, and a still further improvement follows the ploughing or digging into the soil of the pasture grass. It is probable that the theory in both cases has been invented to justify the slovenly practice. There are cases in which a cultivated plant may benefit by overhead shade, but in no case can the trash that grows under its own shade do it anything but harm. Everything that grows on cultivated land, besides the cultivated plant, robs the latter of some part of its food, and instead of keeping the soil cool and moist, it continues to abstract moisture as long as it lives. In truth, the only way it can serve the cultivated plant, is in digging and being buried. The Ceylon planters already know that weeds are injurious to coffee, and that to keep a plantation clean from the first is much cheaper than a rough weeding three or four times a year. They may be pretty certain that what is true of coffee will not be false of cacao, though not the same type of tree.

We in Ceylon have been taught to believe that soil is rich or poor, according to the proportions of phosphates, nitrates, potash, lime, and soda, it contains, and that the plant cultivated on it will exhaust it, just in proportion to the amount of those elements removed in its crops. That a plant will make its own soil is to us a new experience, whether or not it covers a new idea, it is hard to say. If taken literally it contradicts the whole system of agricultural chemistry, but if the meaning be, that this particular plant thrives tolerably on soil of indifferent quality, it might be more clearly expressed. There can be no doubt that cocoa will take out of the soil certain elements that will ultimately impoverish it, if not replaced, like every other plant; yet it may grow on soil that will refuse to grow some other plant, in the elements of which it is poor. We should get analyses, to let us know what the plant requires, for it is likely that if we know what to use, we shall manure oftener than once in six years, and with something other than its own husks.

The system of opening estates by contract, has never been practised amongst European planters in Ceylon, but it is worthy of consideration, by those who propose to plant cocoa, or Liberian coffee, in the low-country. It would probably succeed in the hands of a European contractor, but no native would work to specifications that debarred him from a crop of kurakkan.—*Ceylon Observer*.

CINCHONA.

CINCHONA CULTIVATION.

A VERY important paper by Mr. David Howard (nephew of Mr. J. Elliot Howard) is referred to as follows in the *Journal of the Chemical Society* for March. It will be observed that he arrives at most important conclusions, among the rest, that mossing does not improve the quality of the bark, and that unlike officinalis, the succirubra bark deteriorates in quality after the tree has passed a certain age. What that age is, has yet to be decided, and it may probably vary in different districts and climates.

NOTES ON CINCHONA BARK.—By D. Howard (*Pharm. J. Trans.* [3], 10, 181).—The author has been enabled to compare the proportion of quinine and other alkaloids contained in the "natural" bark and in that formed by "renewing," *i.e.*, growing after the artificial removal of the bark. This renewed bark is termed "mossed bark," because the tree, after being stripped of its bark, is usually protected by a covering of moss, while fresh bark is being formed. The natural bark was found to be generally inferior to the mossed bark since it had been collected either from the upper stem, or from inferior old trees, whereas the mossed bark represents the product of the main stems of the oldest trees.

As far as the effect of age was concerned, it was found that both the quinine and total crystallisable alkaloid steadily increased in quantity with the age of the trees; this is probably due to the greater maturity of the trees. The trees from which the bark was taken were specimens of *Cinchona officinalis*. The author, on the other hand, confirms from recent experience an opinion previously expressed, that the bark of *succirubra* deteriorates in quality when the tree has passed a certain age. Root bark shows a marked tendency to develop the dextrogyrate alkaloids. A sample of renewed bark, which had been formed without "mossing" or any kind of protection, was also examined, and was found equal in quality to the best mossed bark; hence it appears that the only advantage of mossing is to enable the tree to form bark again with a minimum injury to its health; the process does not appear to improve the quality of bark formed. The author also compares the proportions of alkaloids contained in outer and inner bark; the outer bark not only contain a larger quantity of alkaloids, but these contain a larger proportion of quinine; hence it has been suggested to shave off only the outer layers, without cutting quite through the bark.

CINCHONA CULTIVATION IN CEYLON.

YESTERDAY'S rain was certainly somewhat more than seemed desirable, but examination of berries set and of blossom in spike on the ends of branches does not disclose any harm done. For the tea bushes and for cinchonas especially the pricking out of seedlings, the weather has been and is all that could be wished. It is curious how opinions differ about the best mode of planting cinchonas. When a Neilgherry planter, lately returned from a visit to Java, was informed that dibbling by means of an alavanga was now the favourite mode, he said "I believe you will find the plan a mistake, and that the proper mode includes large holes and terracing. On the Neilgherries we terrace and in Java Government make it a condition in sales of land that terracing shall be resorted to." It was objected that terraces on our Ceylon soil were so apt to be washed away, the very carefulness with which we weeded being against us. We had personally seen terracing on the Darjeeling tea estates, and we had noticed that the lower edges of the terraces were bound with living grass,* "So it

* What we call *illuk* in Ceylon, and what in India they, curiously, term "jungle."

is with us" was the reply, "and so it is in Java I do not wish to condemn a system which has answered so well in Ceylon, that of clean weeding. But while we do not adopt hand weeding or removing weeds, we resort to *high cultivation* by digging the soil thoroughly three or four times a year, burying the weeds in the terraces or arranging them on three outer edges." We expressed the fear that our Ceylon soil were not generally equal to the support of both plants and weeds, besides which our prevalent weed was not so much any species of grass, as the dreadfu ageratum with its indefinite power of flowering and seeding, drawing from the soil the same principles as required by coffee, while it was useless as a binding material for terraces.

Our *one* difficulty in Ceylon is the *comparative* poverty of our soil or its stiffness. In regard to climate, labour supply, means of communication, &c., we have the superiority. Our visitor fresh from the Ledgeriana plantations of Java confirmed us in the belief that some hundreds of plants growing along the path to Nuwara Eliya and in a patch at the top of the estate were of the very best types, including what had given us anxiety: the forms with rich purple on the backs of the leaves. We had feared an admixture of micrantha. Our visitor quite re-assured us, and Dr. King's report confirms what he said. By our visitor's advice we certainly shall dig, terrace, and manure round those plants, taking cuttings and grafts from them (the latter to be grown on succirubra stocks) and resort to glass for propagation. To the latter suggestion we offered the objection, founded on our reading, that "where cinchonas could not be cultivated without glass they had better not be cultivated at all." Mr. Liddell (for I think I am at liberty to use this very intelligent and practical gentleman's name) smiled and said, "My superintendent objected to glass until I settled the point by providing it. Now he is an entire convert to the practice, finding not only that a larger proportion of plants grow, but that they grow so much more luxuriantly that at least six months of time are saved."

As the local charge for a glass frame is Re. 1·62 per square foot, so that with carriage the cost will be Rs. 40 for 6×4 feet, it is obvious that the expense is only justifiable where a rare and precious kind has to be propagated. As for our two leading species, *C. succirubra* and *C. officinalis*, I suspect we have been going to too much expense even in ordinary shading, and now that seed is becoming so plentiful, I do not see why broadcast sowing in the open may not be resorted to. If the weakly plants perish from exposure, and if those which survive grow more slowly, so much the better perhaps. The proportion of root to top will be great, and the plants will be hardy, bearing transplantation well. I do not forget that many planters are now just sowing cinchona seed in spots or rows amongst coffee, so that some plants can be left to grow as they stand, while others are "pricked out." Cinchona nurseries, or self-sown seedlings, by the "million" are now common, but the losses in planting out act as a corrective. All this granted, however, and the tendency to "die out" at all stages taken into account, it seems clear that within from six to ten years from the present time Ceylon will be sending enormous quantities of "bark" into the markets of the world. It is on the cards that local manufacture of the alkaloids may be resorted to, on behalf of Government or otherwise. Readers of Dr. King's report will have seen that one of the principal plantations of Ledgerianas is situated 5,300 feet above sea-level. Our own plants at two years old are doing well at from 5,800 to 5,900 feet. But there seems little doubt that, although 5,000 feet indicate the zone of calisayas in their native habitat, they are yet likely to flourish better in the eastern world at altitudes considerably lower. Our own experience with calisayas grown from Neilgherry seed is that many of them get shaky and die off between their third and fourth year, at 5,000 feet and over, but this, as in the case of *C. officinalis*, may be mainly owing to stiff cold subsoil? To give fair play to cinchonas, it seems certain, our soil must be naturally free, or it must be made so artificially. The expense is the difficulty, and any man with experience of the cost of the most ordinary trenching would never be guilty of the insanity or worse of proposing to planters that they should and could afford to move away from their land every stick and every stone and convert the whole surface into walled "rain gauges." Instead of Rs. 20 per acre, or the revised estimate of Rs. 1,000 per acre, Rs. 5,000 would not suffice, or even Rs. 10,000, or any conceivable sum. Ceylon planters never had and certainly have not now rupees to throw away on impracticabilities.—*Ceylon Observer.*

THE YIELD OF CINCHONA BARK.

THE utmost diversity prevails in the experience gained by cinchona planters in Ceylon of the yield of bark per tree in respect of both the crown and yellow description. That different districts and varying altitudes should give different results was to be expected, but even in the same district and under somewhat similar circumstances we have been surprised to learn how great has been the discrepancy between the returns got from trees of nearly the same age. It is evident that the proper age for stripping bark will vary considerably at different altitudes, and nothing but the collection and comparison of the available experience throughout the country, can enable fair and reliable deductions to be made for the guidance of both planters and merchants. There is no doubt that valuable property is lost if not destroyed through premature coppicing and stripping, and yet, on the other hand, we have reason to believe that in some instances trees are left too long to secure to the fullest advantage from their crop of bark. A planter at a high elevation the other day informed us that he meant to cut down a large number of officinalis trees, five years old, to satisfy financial demands in this year of depression, but on experimenting with a few trees he found that instead of three-fourths of a pound of dry bark per tree as he had hoped for, the return was not likely to average much more than one-fourth pound per tree. Now in such a case it is very probable, considering the altitude, that the growth of two more years would double, if not treble, the average crop of bark. Lower down the case is very different, "What do you think,"—writes a Kelebokka correspondent to-day—"of 7¾lb dry crown bark from a 5½ year old tree (large-leaved variety)?" We can only say that we suppose this return is the maximum yet experienced in Ceylon of crown bark for the age mentioned. Our correspondent should have said whether root bark was included. We suppose not. The largest return of red bark reported to us was that obtained by Mr. Chippindall from an old tree in the Nliamber district which made up—with roots, stem, and branch bark—the grand total of 60lb. when dry, but we have since heard of three trees on Durrawella estate, Dikoya, yielding an avarage of 62lb. each, and of another tree on New Forest cut for the third time, the total of three crops including root bark being over 60lb.! In Dalosbagie, Mr. Blackett not long ago cut down a 13-year old tree from which he got, we believe, 28lb. dry bark. It is only by bringing together such varied experience that reliable data can be framed as to the prospects and value of cinchona cultivation in different districts. The large number in our planting and mercantile community who are interested in this important industry, will therefore be glad to learn that in connection with the preparation of a "Ceylon Cinchona Planters Manual" (which has been placed in competent hands) we have arranged to have all the valuable information in the *Observer* files and directories collated and a circular issued to obtain the results of experience gained in different districts in regard to a number of doubtful and interesting points.—*Ceylon Observer.*

CINCHONA IN TINNEVELLY.

FROM Colonel R. H. Beddome, Conservator of Forests, to J. H. Garstin, Esq., C.S.I., Acting Secretary to Government, Revenue Department, dated Ootacamund, 22nd September 1879 No. 859.

* * * * *

13. I carefully inspected all the cinchona on the Tinnevelly hill in accordance with G. O. No. 1140 of 23rd May last. There are only two small plots, one in the Government forests above Papanasam, the other at Chinna Kulerati on hills six or seven miles to the south of Courtallam.

14. *The Papanasam Plot.*—This is a small piece of ground of about half an acre cleared in the midst of heavy forest at the eastern side of the Payar Shola; the exposure is north-east and the situation very moist; the elevation about 3,400 feet above the sea. The plants were sent from the Neilgherries and put down by Mr. Athol MacGregor in 1866 the site was then fenced in and probably left to Nature; though I believe that a hillman was supposed to look after it in its infancy, it was under the Revenue authorities, and was never, I believe, transferred to this department; the fences have long since been destroyed by wild elephants, and there were recent traces of these animals all about the locality. There are now standing twenty-nine large trees of *C. Succirubra*, all much the same size, the bolle tall and healthy, but few or no lateral boughs, and those mostly broken, and very poor heads; in fact, altogether deficient in leaf, having much the appearance of having suffered from a violent hurricane, but it is possible that they may have been injured by black monkeys, which were very abundant about the vicinity. I measured three of the larger trees with the following result :—

		FT.	IN.
No. 1.	Height	50	0
	Girth at base	2	6½
	Girth breast high	2	8
	Girth at half length	1	6½
No. 2.	Height	49	9
	Girth at base	2	8
	Girth breast high	2	0
No. 3.	A double stem from close to the base ...	...	...
	Height of larger stem	52	7
	Girth near the base	2	8
	Girth breast high	1	11
	Girth at half length	1	8½
	Height of smaller stem	42	0
	Girth breast high	0	10½

Besides the twenty-nine planted trees there are numerous self-sown saplings 18 to 20 feet high; these are very close together, without room to develop properly.

In addition to the *C. Succirubra* there are a few trees of *C. Officinalis*, but these are all of very poor growth.

15. *The Chinna Kularati Plot.*—The elevation of this site is 2,800 feet above the sea; there are only eighteen C. *Succirubra* trees standing 5 to 6 feet apart on two terraces at the edge of a native coffee estate close to dense forests; they are all about the same height, 30 to 40 feet, except one, which is stunted and of poor growth from being densely overtopped by a forest tree; they have straight clean bolls with no lateral boughs and fine healthy heads; they are, however, all too much in the shade of the forest; the largest tree was 37 feet 2 inches high, 2 feet in girth at the base and 1 foot 5 inches breast high. They are evidently looked after by the owner of the coffee estate. The climate here is nearly as moist as on the Papanasam hills; the trees were said to be ten years of age, and certainly looked much younger than those in the Papanasam block, but by G. O. No. 2362 of the 8th October 1867, they appear to have been planted at the same time.

* * * * * *

(True Copies and Extract.)

(Signed) C. A. GALTON,
Acting Secretary.

SERICULTURE.

SILK IN DEHRA DOON.

THE Superintendent of Dehra Doon reports most favourably upon the silk-worm breeding experiments, which he carried out last year, on behalf of Government at Dehra. The chief merit which commended itself to the local Government, and induced it to attempt sericulture in that part of India, is the facility, which is afforded by the proximity of the elevated station of Mussoorie to which silk-worm eggs can be sent in the cold weather in order that they may not be hatched until the mulberry trees produce their new leaves. Besides, the conservation of the eggs in the hills prevents a weakly breed of worms, which is the result of hatching in the warmer climate of the plains. The eggs, for the first experiments, were brought down from Mussoorie in 1879 as soon as the new shoots appeared on the mulberry trees. Unfortunately a frost occurred shortly after the eggs were hatched, and this destroyed the young leaves, in consequence of which numbers of the young worms died from starvation. The Superintendent, however, succeeded in rearing a number of caterpillars, from which he obtained some 500 cocoons, 100 of which were sent down to Calcutta to be reported upon. The following extract from the letter of a firm of brokers, at Calcutta, proves, what had already been hoped, that finer cocoons can be produced under this system of preserving silk-worm eggs on the hills, than under the system which has to be followed in Bengal. The extract to which we refer runs thus:—

"Could we get these cocoons in a good state of preservation, we could make silk from them far superior to anything we are at present able to turn out, and if such an article could be forwarded to Europe, in large quantities, Bengal silk would gain a prestige in the markets which it has never yet held." We may mention that the instruction of natives, near Dehra, in silk-worm breeding, has commenced, and that an offer has been received by Government from a German firm to undertake an extensive filature business in connection with the Dehra breeding establishment. There is some prospect, therefore, of this pioneering enterprise which Government have undertaken leading to the establishment of a silk-working industry on the hills.—*Indian Herald.*

SERICULTURE IN CEYLON: WHY NOT UTILISE THE CINCHONA CATERPILLARS?

(*To the Editor of the Ceylon Observer.*)

SIR,—If I am not mistaken you see regularly that most valuable publication, the *Journal of the Society of Arts*, and it has therefore surprised me somewhat not to have noticed in your paper ere this any allusion to the very important papers which have appeared during the last 12 months on the subject of ser iculture. I refer to the following: *Journal S. A.* for 10th January, 9th May, 6th June, 6th February, 13th February 1879, and 15th March 1880. I think it worth while to call your attention to these articles in connection with the war which is being waged at present against the poochies. Very considerable expense is being incurred in searching for and collecting and destroying the caterpillars which infest the cinchonas. The last operation is popularly supposed to add practically nil to the cost of collection, but the question arises as to whether this wanton destruction of what has cost money and time to collect is not a very wasteful and short-sighted policy. Having collected these caterpillars, might I suggest the advisability of rearing them to the chrysalis stage on the fair chance of getting a return from the cocoons? I have been shown some recently, which were collected from the branches of cinchona trees and which, to my unpractised eyes, bore much resemblance to the valuable tusser cocoons described in the articles before referred to, and which are known to exist in Ceylon.

It might, perhaps, be thought a hazardous experiment thus to take so malignant an enemy of what promises to be one of the most valuable products of Ceylon under our protection, but I think it can be shown that by this course we are really benefiting the cinchona by placing the breeding of these worms, as it were, under inspection. Let us suppose for instance, that we have our cocoons, and that the moths are about to emerge; it is easy to distinguish the sex by the antennæ, which, in the male are broad, and in the female narrow. I learn, moreover, from Mons. Wailly and others, that the moths of this large race are extremely quiet, allowing themselves to be taken by hand and placed anywhere, pairing readily and for a considerable time, a most improtant thing, and the females laying their eggs for several days without even damaging their wings.

The following is an extract from a letter from Major Coussmaker to M. Wailly, dated 27th July 1879: "My system of rearing is very simple and methodical. I keep all my seed-cocoons in a basket, with the pedicles uppermost. At intervals, between 6 and 11 P. M., I look at them, and if I see any moist at the top, I tie them on to a branch of any tree or shrub in my garden, and at daylight I find that the females are paired in the vicinity of their cocoons, while the males have gone away to seek for mates.

"They are left in that condition all day, and at sunset, or when I am going out for walk, I take the females, let the males fly, and put the females to lay their eggs. The next morning I take the eggs away, and put them in a small box, or something of the kind, safe from rats mice, and ants.

"In nine days they hatch out, and I put them on to shrubs, over which I put screens of split bamboo. As the worms grow, they eat the shrubs quite bare, while I move the screens as necessary. To facilitate this moving, I have planted my shrubs in hedges, and now it is only a matter of the food and number of worms.

"From a month to six weeks, according to the moisture and luxuriance of the foliage, the worms take to make their cocoons, and, as far as I see, success seems certain. The plants I use are the varieties of lagerstrœmia, zizyphus, terminalia, and carisea. I am not aware as to whether any of these trees can be obtainable in England, or whether the worms will hatch out there. The moths paired and laid eggs in 1874, but did not hatch. I hope that you will be more successful."

Major Coussmaker resides, I believe, at Poona, and has been very successful in his efforts to develope sericulture in India, more especially that of the tusser moth; and under such regulations as his, I think, there would be no danger in multiplying the breed. But the next thing to consider is their food. I understand that they readily feed on the leaves of lagerstrœmia, a shrub well-known in Ceylon, also on the castor oil plant. Then there are the cinchonas themselves; at the rate we are planting them, I imagine that the mere prunings would go a considerable way; and there is practically no limit to the production, especially if we bear in mind that the secretion of alkaloids is known to be stimulated by all such expedients as tend to check a too great luxuriance.

As an indication of the importance financially of the subject, I may mention that whereas a short time ago mulberry silk was almost double the price of tusser in the London market, owing to the difficulties in working it up and dyeing; since the difficulties have been successfully overcome by such persevering workers as Mr. Thomas Wardle and Messrs. Clayton & Co., the relative position in the price has been reversed. It is of course better, if possible, to reel the silk before the moth emerges, but machinery has now been constructed by which the silk from broken cocoons can be utilized; if desired, however, the contents may be destroyed without damage to the silk by boiling. The fine silk from a single tusser cocoon has been found to measure over three-quarters of a mile in length.—Yours faithfully,

FOR CEYLON COMPANY, LIMITED,
C. W. HORSFALL, MANAGER.

April 3, 1880.

TOBACCO.

INDIAN TOBACCO.

ANY scheme which promises to increase the revenues of India without pressing too hardly on the means of the population, is naturally always welcome, and a communication which has reached us from an English correspondent, describing with a good deal of force a plan for this most desirable result, commends itself to our attention at once.

The writer, observing that the people of India undoubtedly prefer indirect to a direct taxation, and instancing the tax on salt, necessary, and on opium, drugs, and spirituous liquors which are luxuries, as the great sources of revenue on this system, proceeds to suggest that by encouraging the cultivation of tobacco all over the country, and imposing a tax upon its growth at the same time, a very handsome addition to the national income may be secured without forcing even a semblance of hardship on the people. Tobacco, he says, which is almost universally taxed in other parts of the world, is not taxed at all in India, though nearly every man, woman, and child above ten years old smokes it in some form or another.

The scheme he suggests is analogous to that in practice with regard to opium growing. He notices that an abortive attempt to tax manufactured tobacco was once made, but the plan was speedily abandoned. He recommends that all tobacco cultivation should be sanctioned only under license. The plant should be grown in plots of ground of not less than an eighth of an acre in extent, so as to be easily discernible on the ground, the crops when grown to be purchased by the Government at a fairly remunerative rate to the cultivator; the leaf when gathered in to be stored in central depôts and prepared for use under due supervision and management. Afterwards it would be saleable the writer observes, on account of Government to wholesale dealers at a very handsome profit to the State. He would advocate the distributing of good foreign seed among the cultivators and the giving of rewards for the best crops; the cultivation and production

would thus be stimulated and improved, superior manufacture would be insured; and we are certainly inclined to agree with him when he declares that there is reason to suppose that India could produce tobacco quite as good as that of Manilla or Havanna to an extent which would allow of exportation in great quantities. Taking the present average price of native grown tobacco in the Indian bazaars at three pence per pound, he estimates that after acquiring a monopoly of its sale, the Government could make a profit of four millions and-a-half pounds sterling per annum, by raising the price to sixpence per pound. Here, however, he is clearly at fault in making no deduction of all the expenses of depôts, manufactories, and establishments, and his figures are obviously fanciful when he assumes that there are twenty millions of families in India, each consisting of ten persons, who consume between them two pounds of tobacco monthly.

It is true that he suggests the utilizing of all the Government jails, as central depôts, and the employing the prisoners, especially the females, in preparing the leaf for the market. But the creation and maintenance of great industries are not usually to be accomplished without great expense. To start one is often a very costly and doubtful experiment. The present consumption of tobacco is no doubt large, but we have no means of ensuring that it would remain so if the price of the article were doubled. The consumers are exceedingly poor to begin with. The cost of the production of the leaf at present is infinitesimally small. The cultivator has usually a small plot of ground probably close to his hut. He grows in this a few herbs and vegetables for his own consumption, and in one corner of this little plot he has a few tobacco plants which supply his needs. But if this sort of cultivation were forbidden, the measure would undoubtedly appear extraordinarily harsh and oppressive, and might, if not evaded, suppress the taste for tobacco altogether. The ordinary ryot, accustomed to get his supply for nothing, would not, and could not, go into the market to purchase the luxury at a high price.

On the other hand it is probable that tobacco cultivation on a great scale and accompanied by improved methods of preparation of the product would under active supervision and in the hands of private enterprise, develope into a highly lucrative business, from which the Customs Department might look eventually to considerable profit. In any case, some statistical informations might be easily obtained as to the consumption of tobacco generally by the population, as to the different qualities of it now grown, and the prices they have in the market, the probable cost of improved manufacture and preparation, and a variety of other points connected with the subject which would materially aid in the formation of a just conclusion on the merits of our correspondent's suggestion.

The development of a very extensive trade, both export and domestic, in tobacco, which is certainly not beyond the bounds of probability, is a sufficient inducement for inquiry at all events.—*C. & M. Gazette.*

TOBACCO CULTIVATION.

In a recent issue we indicated tobacco cultivation as a new career for educated natives, in which they might earn an honest and decent livelihood without any considerable capital outlay. We now proceed to give some practical hints on the culture of this plant taken from the annual report of the Madras Agricultural Department for the year ending 31st March 1878. The writer of the report points out that tobacco was brought into India, most probably by the Portuguese in the commencement of the seventeenth century. He thus describes the value of the plant:—"Although tobacco has lost its fame as an universal remedial agent in sickness, it still holds a high reputation among medicinal plants. Its chief use, however, is as an article of luxury. The consumption of tobacco increases every year. To satisfy this demand, the production of this plant assumes annually larger dimensions; it has become a staple product of several countries; whole nations find in the cultivation, manufacture, and trade of this article, the means of their support, the source of their affluence and wealth. In many countries the revenue is chiefly derived from tobacco; prohibitive laws have made room for decrees encouraging and facilitating the production and manufacture of this commodity: agents are appointed to instruct the cultivator how to raise the best plants, and how to produce the heaviest crops; schools have been founded to initiate the rising question into the art of treating the leaf after its production. Everywhere it is recognised that, in the development of tobacco cultivation, there lies a source of wealth expanding in proportion as intelligence guides the undertaking."

Experience has shown that a warm moist climate is favourable to the production of good tobacco; and that of the many conditions affecting the quality of the product the most important is the climate. The superior quality of Cuban and Manila tobacco is mainly due to their particular climate. But we are told that tobacco cultivation is often very remuneratively carried on in countries possessing an unfavourable climate. In such cases the deficient climatic conditions are "partly compensated for by making the other conditions which can be controlled by the cultivator, the most favourable for the production of this commodity." Next to climate the soil affects to a great extent the quality of tobacco. The writer of the valuable reports before us says: "The tobacco plant thrives best in a soil rich in vegetable mould. The vegetable mould is however not so much required to supply the necessary plant food as to keeping the soil in a good physical condition. It may be said that no other plant requires the soil in such a friable state as tobacco. A light soil, sand or sandy loam, containing an average amount of organic matter and well drained, is considered best adapted for raising smoking tobacco; such a soil produces the finest leaves. The more organic matter a soil contains the heavier is the outturn; the leaves however become thicker and the aroma less. As in tropical climates the physical properties of the soil play a prominent part in its productive capabilities generally, and the presence of organic matter in the soil tends to improve these properties, it will rarely occur that in such places a soil will be found that contains too much humus. The more clay a soil contains the less it is adapted to the production of fine smoking tobacco, on account of its physical properties being less favourable to the development of the aromatic principles in the leaf which becomes also generally thick and coarse, but the outturn on such soils is generally heavier than on a mere sandy one. A clay soil however possessing a great amount of humus may, if properly tilled, produce an ordinary smoking tobacco, and may even, if great attention is paid to the selection of the variety, &c., produce leaves for cigar wrappers. By deep ploughing and heavy manuring tobacco may be successfully grown on poor soil. Even the best soil does not in its natural state possess the elements of plant food in such a form as is most conducive to the production of a fine tobacco leaf. Any deficiency of the necessary plant food must be supplied in the shape of suitable manure. Fold yard manure may suffice when tobacco is cultivated in proper rotation, but the application of special manure like *carbonet of potash, sulphate of potash* &c., will greatly enchance the value of the outturn. The element most needed by the tobacco plant is *potash*. To supply the *potash* required by the tobacco plant 200lb. of good saltpetre per acre would be sufficient, in most cases a proper rotation of crops is advantageous in the cultivation of tobacco as of many other crops, though it may be grown successfully on the same land in succession under special circumstances. Cereals and pulses are recommended as very well adapted for cultivation in the course of rotation. We learn from the Report of the Madras Agricultural Department before us that "by digging over his rich alluvial soil 2 feet deep, and manuring at the rate of 25 tons per acre and paying the utmost attention to his tobacco the Dutchman is is able to compete successfully with France and Hungary, and receives as much as Rs. 44 per 100lb and a gross income of Rs. 700 per acre planted with tobacco." The soil intended for a tobacco nursery should be broken up to the depth of 1½ foot some months before the sowing season, and a drain should be dug round the nursery, the earth thus obtained being utilized in raising the surface. The soil of a tobacco nursery cannot contain too much organic matter. About 7,260 plants are required for an acre, and to raise this number of plants an area of 50 square feet would be required. But as the plants are apt to be injured during their first growth and in process of transplantation, the cultivator is advised to raise double the number of plants actually needed. Nearly 7 acres could be planted with the seedling raised from one ounce of tobacco seed which contains about 100,000 grains; as, however, even the best tobacco seed has not a very high percentage of vitality, between half an ounce and an ounce of seed is generally sown to produce the number of plants required for one acre. The plants will appear about a week after sowing, and during the first stage of their growth they require very careful treatment; any weeds appearing must be removed and insects injurious to the plants must be killed. In about seven or eight weeks after sowing, the plants will be fit for transplanting. The land intended to be planted with tobacco should receive several deep ploughings not less than 9 inches deep. We read: "No other crop will better repay the expense of proper preparation of the soil than tobacco. The fineness of the leaf, and the aroma of the tobacco depend to a great degree on the preparation of the soil. The land should be ridged immediately before planting. The distance apart at which to place the ridges depends on the quality of the soil and the species of plant to be raised. One species has large leaves, another has short ones, the leaves of some varieties stands at an acute angle and of others more nearly at right angles to the stem, thus occupying more or less space. With good soil the ridges must be made further apart than in a poor one, because a good soil produces larger leaves." The planting tobacco should take place only in the evening or at night. But if the weather be cloudy, the operation might be performed during the whole day. The planting is nearly the same as with cabbages, but requires more care, the plants being more tender. The plants must be watered immediately after they are planted and they should also be shaded during the first few days. When the weather is dry, water should be applied twice a day, *viz.*, morning and evening. When the plants are 6 to 9 inches high they should be hoed. Some weeks afterwards another hoeing is necessary. Frequent hoeings are needed to keep the soil loose, friable, and free from weeds. Insects which attack the tobacco must be killed at once. The plants will commence to flower about two months after planting, when from 2 to 7 feet high. When the flower buds appear, they must be broken off, and with them the top and also the bottom leaves. The plants commence to ripen about three months after being planted, this is indicated by the leaves assuming a marbled appearance and a yellowish green colour. The leaf being matured, it should be harvested only after the dew is off the plants and not on a rainy day. There are two modes of harvesting—gathering the leaves singly and cutting down the whole plant. For India the latter mode is better adapted than gathering the leaves singly. For cutting down the plants a long knife or chopper should be used. During bright weather the plants should

not be allowed to lie exposed to the sun on the ground or they will become sun-burnt and lose in value. The plants should be left one day in the field; and if a very dry wind should be blowing some mats or other covering should be laid against plant most exposed to it. The next day the leaves should be removed to the drying-shed in a cart supplied with a frame-work so that the plants may be hung. While, in the drying-shed the leaves must be examined carefully every day, some plants dry quickly, others more slowly, some tobacco is fit for smoking a few weeks after drying, whereas others burn very badly at that time, but nevertheless sometimes becomes a good burning article after being stored for several months. To improve smoking tobacco, a flavour is sometimes given to it artificially by the manufacturer. It should not be forgotten that the value of a cigar depends, not only on the intrinsic value of the leaf, but to a great extent on the mode of manufacturing the article. An inferior tobacco which often would not find a market, is sometimes so much improved by artificial means that it can compete successfully with the genuine fine article. The manufacture of tobacco is, therefore, quite as important as its cultivation. This should always be very carefully borne in mind.—*Hindoo Patriot.*

ADVERTISEMENTS.

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.

Calcutta, 1st Feb. 1876.

CONTENTS.

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.

CORRESPONDENCE.

THE AWAH ESTATE.

TO THE EDITOR.

SIR,—Will you allow me to note a few remarks with reference to your article on Agriculture in the North-Western Provinces in your May number?

When discussing the improvements that are being carried out on the Awah estate it should be remembered that the estate is not compact or uniform, to be classed as one tract or district: it is scattered over more than four hundred villages lying in five several collectorates, within points one hundred miles apart from east to west, and fifty miles apart from north to south. No such general statement as "Awah is a district where canal water is not to be depended upon" can apply; much of the estate gets canal irrigation, but there are parts devoid alike of canals and wells.

For my own part I see many difficulties in the way of legislation about cattle breeding; and I am inclined to think that in those few parts of the country where breeding cattle for the market is systematically carried on, and where it is the interest of the people to secure good young stock, that alone should prove a sufficient incentive for them to use only superior sires when such are placed at their disposal. What mischief is at present done, is caused principally by allowing the cows to be served by the ordinary working plough cattle, and this occurs mostly where there is no good village sire, or 'Brahmini Bull' as you call him. Where there is a village sire, he is out grazing with the cows all the year round, and they are ordinarily served by him: a working bull is only turned loose at certain seasons of the year, when work is slack, and he can be spared to pick up his living by grazing. To let loose a "bijjar" or Brahmini bull, is simply the native fashion of setting aside a bull for breeding, as distinguished from working purposes; but as the bull becomes thenceforward public property, and the donor derives no pecuniary benefit from him, it is only a well-to-do man who can afford to devote a bull to this purpose, and that only when incited by the pious desire to honour the memory of a deceased parent. Sometimes meanness induces a cheap conformity with the requirements of piety, and an inferior animal is turned loose, but I do not think that this is generally the case, and in localities where the boon will be appreciated, the young 'bijjar' is carefully selected. On the other hand he gets his liberty at, generally, too early an age: this arising from the necessity of setting apart a bull that has never been ringed for labour. When you have him, the 'bijjar' is the best sire that at present is procurable; he is set apart for breeding, does no work, and should by custom get ample grazing, as all alike should let him graze on their lands, even if he trespasses on cultivation. In closely cultivated districts, however, and where crops are worth much more than cattle breeding, he often gets roughly driven off, and voted a nuisance, and in this state of things is often annexed by the Mussulman butcher, or the Branjara cattle dealer, there being no one master or owner to protect him. A system which shall secure that only suitable young bulls be turned loose 'as bijjars,' and which will also protect their well-being when at large, seems to be the simplest method of improving cattle breeding.

But, as you say, cattle of superior quality will require better feeding; and here is the great difficulty even if the ordinary cultivator had (which he has not) the means to purchase superior plough cattle, he is not able to feed them properly: poor men with small holdings cannot afford it; while well-to-do men with large holdings already do as much as they can. This great difficulty of the poverty of the tenant, and the system of such holdings, is constantly cropping up in the face of improvements; there is no economical gain in having an improved plough and better team of oxen, that can do work more expeditiously and effectively than the ordinary grubber with its miserable cattle, unless the tenant's holding is

large enough to give the new team full work; let alone his having means to buy and keep up the stock. I would note, by the by, that you seem unaware that the Cawnpore plough has been fitted with a single handle; it was so fitted when working at the Aligurh district show in March last, and similar ploughs are on trial at Awah.

The case as to the use of the agency of *bunnias* for distributing improved seeds is simply this—The *bunnias* are the seed and grain dealers of the country: they buy up the grain produce from the producers who are their regular customers, store a certain quantity for local wants, and dispose of the surplus for foreign consumption in the best market they can find. When seed time comes, they supply their customers with advances of seed grain from their local stocks, to be repaid at harvest. The business is regularly organised, and is one of great detail; there must be a grain dealer, principal or agent, in every village of any size, who knows all his customers, distinguishes the sound from the unsound, and watches what use is made of the advances. If a landowner is to distribute seed grain himself, he must create an organisation of this kind, take the business out of the hands of the existing local dealers, and in fact become himself the *bunnia* working through a number of agents. Having driven out the existing trade agency, he would himself have always to stand in its place for future. It is extremely doubtful whether he could carry on this business with any profit to himself, and with only increased benefit to his tenants. Hence the advisability of using the existing agency for distribution, the landowner simply going to the expense of supplying the seed merchants with improved seed in place of the inferior stocks they have in hand. Once introduced, the seed will multiply itself, and year by year there will be a larger stock for distribution; and if the seed proves a success, the old inferior seed will be no longer used. Apart from this, it is to be remembered that the *bunnias* are alive to their own interests, and that they will be the first to realise what profit is to be derived from the higher prices the produce from the improved seed will command in the foreign market. If this result is not achieved, the experiment fails. The only danger, is, of course, the seed-merchant's tendency to foist off as bad seed as he can on the farmer: which on the other hand the needy farmer tries to get it as cheaply as he can, and will not pay the price that carefully selected seed demands. Apart from this danger, I should hope to improve seed grain by careful selection, cleaning, and winnowing on the part of the seed-merchants, more readily even than by trying to introduce these processes to the producer; while I feel certain that in the matter of preparation of grain for market, the grain-dealer is the first person on whom the advantages of cleaning and winnowing should be impressed.

W. BENSON.

21st May 1880.

BAMBOO PAPER-STOCK.

TO THE EDITOR.

SIR,—In my last letter I enumerated some of the different varieties of bamboo which I considered most suitable for paper-making material, available in the southern districts of India, quoting specially Arrakan, Burmah, and the Tenasserim Provinces, those districts being more peculiarly adapted to the industry I desire to introduce, due to two causes, *viz.*, climatic influence, continuously elevated temperature combined with great moisture inducing prolific growth, and possessing extensive tracts of jungle or native forest already occupied with vast existencies of bamboo growth, affording a practically inexhaustible supply. Such districts, moreover, being mostly within a moderate distance of the coast, and all accessible by navigable streams affording floating facilities, water carriage being notably the cheapest means of transit.

Assuming, then, that pending the formation of regular plantations, the jungle or native forest has to be resorted to for the supply of bamboo, it may be well to note the most practical and readiest means of collecting and storing so very bulky a commodity as bamboo, bearing in mind that my programme involving the employing of young, so-called season shoots only, and these at a very early stage of their growth, it follows that such collection from the native forest must of necessity be limited to a very short period—lasting only some weeks, and this during the rainy season.

At this early stage of growth, cutting down a stem of bamboo is a very simple operation, one blow of a heavy knife (the native *dâh*) being sufficient, and as the young shoots have no lateral branches, so soon as cut and divested of their tops, they can be made up into rafts, launched into the adjacent stream, and floated to a station, where having arrived, the raft can be towed into a pond, and there kept to await its turn for crushing.

In previous communications I have stated that the young shoots should be crushed when fresh and green, or as soon thereafter as possible, inasmuch as containing from 60 to 70 per cent. of moisture, if allowed to dry before crushing, the moisture alone evaporates, leaving deposited in the corpus of the dried stems, the sappy constituents consisting of silica, sizein, and other compounds, which if the shoots are crushed when fresh and green, will to a great extent be expressed with the sap, whereas, if the stems are allowed to dry, not only is the crushing operation more difficult, and the subsequent chemical treatment then required infinitely more costly, but the quality of the ultimate fibre much deteriorated, being harsh and woody.

Although I believe the young stems of the bamboo may be kept submerged in water for a considerable time, without material injury, it is desirable they should (for the reasons stated) be crushed as speedily as possible after cutting, and as in a moist, hot climate, especially at the wet season, when the young shoots would be cut and crushed, fermentation followed by decomposition, in other words rotting would rapidly ensue; it follows that artificial drying must be resorted to, this operation, however, is simple and inexpensive, and the crushed and dried stems would be roughly baled up for storage and conveyance to the Central Stock Factory at convenience.

I must, however, repeat my former observations under this head in your columns; that even this treated, the bamboo being so bulky and light a comodity, cannot support the cost of carriage for long distances, and therefore in this crude condition cannot become an article of export or merchandise. The position indeed is similar to that of a farmer in this country who can only send his hay or his straw to market, governed by the distance of the said market from his farm. Thus the collection of bamboo from the jungle or native forest must be governed by the cost of carriage to the Central Stock Factory.

Such difficulties become minimised with plantations in immediate proximity to the stock factory, and disappear so soon as the bamboo is converted into the finished paper stock, a "tow" like fibre in which condition it will press-pack-like cotton, jute, hemp, or similar articles of commerce, and be conveyed to this country at low cost.

THOS. ROUTLEDGE.

Claxheugh, Sunderland, 28th April 1879.

THE CULTIVATION OF TREES.

TO THE EDITOR.

SIR,—I shall feel much obliged by your telling me the meaning of the word "Chalkmark" as used by *Observer* in para. 2nd, line 4th, of his communication to the *Madras Mail*, quoted by you in your this month's issue, page 127.

Will the same "Chalkmark" do for the rest of the life of the tree, or must fresh ones be made every year?

INQUIRER.

TEAK SAPLINGS.

TO THE EDITOR.

SIR,—In my letter to the *Indian Agriculturist*, on the growth of teak plants and which appears in the May issue of that paper, the average height to which the plants, attained in 12 months, is put down at 6' 9" instead of 8' 9", which was stated in my original letter.

R. R. E. BROCKMAN, CAPTAIN, R. E.

Tanjore, 11th May 1880.

CINCHONIDINE AND CINCHONINE.

TO THE EDITOR.

SIR,—Have any of your readers tried the two new sulphates? *viz.* *sulphate of cinchonidine*, and *sulphate of cinchonine*, if so, will they kindly tell me through your columns with what success; at the same time, giving particulars as to doses, &c.

Both the above—especially *cinchonine*—are far lower in price than *sulphate of quinine*, and, if found as efficacious, especially with estate coolies, will prove a great boon.

EGLANTINE.

INFORMATION WANTED.

TO THE EDITOR.

SIR,—I have been advised to apply to you by the Editor of the *Ceylon Observer* for information on some subjects of agriculture. The products I propose cultivating, are as follows:—Sago (palm) Indian corn, Manioc, span trees for dye, ground-nut for oil, also cotton seed, castor seed, sesame or gingelly, poppy seed, and some plants for fibres, pepper vanilla, &c.

If you could send me or recommend any books on any of the above subjects, I should be exceedingly obliged.

R.

THE FOREST DEPARTMENT.

TO THE EDITOR.

SIR,—The letter of a Forester in your April number, has the merit of plainly expressing the writer's meaning, which is to urge that all posts in the Forest Department should be open to competitive examination, after a training at the Dehra Doon Forest School, and that no previous experience of the work in the forests should be required from candidates, and that the expense of the training should be borne by Government.

I will leave without further comment the bad taste of the writer's reference to Mr. Brandis, to whom, in the first place, the great progress made in the department of late years is due.

The Forester criticises the admission of apprentices to the Forest School whose only qualification, besides a six months' experience of work in the forest, he stigmatises as a smattering of their own vernacular. But the qualifications required in the Forest Code for apprentices are as follows :—

I. Ability to read fluently and to write correctly in their own language.

II. Arithmetic to decimal fractions and vernacular accounts. A knowledge of English is considered an advantage.

If we had there, a knowledge of land measuring, as practiced by revenue subordinates, these qualifications would seem to be all that is required for subordinate appointments in the Forest Department, when supplemented by two years' training in the Forest school.

It is, however, very doubtful whether men of the apprentice class except from Oudh or the North-West Provinces would go to the Forest school at all; and whether they cannot acquire all the knowledge necessary for a Forester's post, for which they are fitted, and not for that of forest-ranger, in their own province.

Classes for their further instruction in accordance with a system drawn up in the Forest School might be held at the head quarters of each province, in the rainy season, without interfering with the proper work of officers. As pointed out by the Forester, there is an unfairness in giving the same Forest-ranger's certificate to these apprentices, and to probationers whose intellectual qualifications are much more extended.

Men of the Forest-ranger class should certainly be trained at the Forest school, and only in exceptional cases should Foresters be appointed to this class which Government has recognised as the most important for the success of the department.

The salaries of Forest-rangers range from Rs. 50 to 150 a month, and for this pay men of considerable ability and education are always available.

The Forester asserts that the hopes of Government to induce men of good family to enter the department, as sub-assistants, are not likely to be realised.

Such men, he says, would shrink from any service, and far more from that of the Forest Department.

Only middle class men would be available, and they cannot afford to pay for their education, nor even to stay in the department six months without pay until they have shewn their fitness for the work.

But I have good reason to know that already the post of Forest-ranger is sufficiently attractive, and numerous application from educated men come in at the merest rumour of a probable vacancy.

Why, then, should such men be bribed with the appointment of sub-assistant, which should only be the reward of exceptional merit, or long service.

In Europe, men of the best families join the Forest Departments of their native countries, on stipends inferior to that of the lowest grades of Forest-rangers in India, and after a long professional training at their own expense. If men of good family here will not join the department, there is certainly no necessity to bribe the middle classes to do so, by putting them into the superior grades at the outset.

Socially, the appointment of Forest-ranger should be highly considered, as the men are classed, in the printed lists of the department, as members of the executive staff.

Europeans have been appointed at once as sub-assistant conservators, as a European training has been considered necessary, and men who possess it cannot be engaged on less terms.

The out-door work of the Department is admirably suited for a large class of Englishmen who dislike under work, and prefer the exposure and freedom, and even the hardship of the forests, whilst the 'Forester' admits that natives of India dislike the work exceedingly.

The term native of India is very vague and deceptive, and in newspaper correspondence may be taken to mean, in the East of India at least, an educated Bengali.

Bengalees are not natives of the tracts of country where forests are found, and the simple inhabitants of these tracts, not yet qualified for such appointments, would far prefer an Englishman to any other foreigner as the *jungally sahob*, who is to restrict their former free run of the forests.

In other parts of India, doubtless, a similar preference exists. Too much training for subordinate posts renders men above their work, and I have heard a Bengali Executive Engineer complain, that his subordinates from Roorki are disgusted with the simple duties they are called upon to perform. Thorough professional training of probationers, however, will always be of great value, and will give us a class of Forest-rangers and assistants, who will put new life into the executive work of the department.

But the previous six months' training in actual work in the forests is indispensable, as by this alone can the qualifications of a candidate be approved, and men unfitted for the work can thus be spared the waste of time involved in training for a department for which they are constitutionally unfitted.

W. B. F.

Dubri, Assam, April 20, 1880.

THE PRESERVATION OF SILKWORMS' EGGS.

TO THE EDITOR.

SIR,—The preservation of silk-worm eggs is a great point in these parts with sericulturists. So much so that not five per cent. of the eggs, hatched from the stock at the ensuing season. They attribute this failure to the heat of the climate, and those who have the means transport them to the Himalaya during the hot months. But a circumstance has occurred within my observation lately which makes me think that bad treatment has most to do with the addling of the eggs. The plan followed in these parts is to stretch a sheet suspended by strings and put the moths on them where they to copulate and lay eggs ; the eggs of course adhere to the cloth, and when the people collect them they disengage them from the cloth, by a spoon or knife, and I fancy wound the delicate shells which ultimately leads to the death of the embryo.

A friend of mine recently got a sheet of eggs from China. The sheet of paper was covered with eggs with hardly any spaces, showing that the people put moths down on vacancies to lay their eggs. The sheet of paper was of loose but thick texture, like native Indian paper, and came from China folded up in a long envelope. The paper had 10,000 eggs or more on it, which all hatched, the failures were not two per cent. We here received a lesson, evidently the usual way of collecting eggs was wrong, it counteracted Nature, for the moths like all insects when laying discharged with the eggs a secretion which not only glued the egg to a spot, but which also acted as a preservative of it from heat and other accidents. This order of things was disturbed by our scraping the eggs off their place of deposits and huddling them up in an earthen pot as grain in a grainary. In laying on the paper it was never found that one egg was layed on the other, but the moth moved on, so that each egg had its place without being crowded by others. We followed the China method in the egg laying this year, we have sheets of paper with eggs, and unless the paper is not of a bad kind, we have every hope of our success. The China plan was to our present thinking so rational. The sheet had been transported several thousands miles in a ship and through heat and rough treatment with no ill results.

Gugrah, April 28th, 1880. W. BUCHANAN.

SEA ISLANDS COTTON SEED.

TO THE EDITOR.

SIR,—Can you let me know where I can get Sea Island Cotton seed, or another high class of cotton seed ?

F. DE. L.

INDIAN TEAS.

(To the Editor of the Englishman.)

SIR,—I have read with great interest your article upon Indian teas, and although I agree with the comments passed upon the action of Government in the labour question, yet I think that shareholders, capitalists, planters, and others interested in the great tea industry of this country should also turn about and ask themselves what they can do to place Indian teas upon a fair basis in comparison with teas shipped from China. First, then, I would say that the brokers' charges are far too high. Brokerage, lotting, and advertising form a very heavy item in a tea sale account, and I understand that Calcutta tea brokers get two per cent. brokerage out of tea sold in this market (1 per cent. from buyer and 1 per cent. from seller), and this I consider a monstrous charge, considering the insignificant services rendered, and I would ask for what purpose this brokerage, lotting, and advertising expense is incurred upon Indian tea in Calcutta, seeing that the same charges have to be gone through with again in the London market ? Clearly, the

total cost of the same must come out of the pockets of Indian producers.

No doubt we shall be told that better prices are often obtained by sales in Calcutta. All I can say is, that such an argument would tend to prove that Indian tea-growers have really no market at home—or anywhere else—and it is this that is at the root of the present critical position of Indian teas.

Up to about the present time fair prices have been realised for Indian teas for the purpose of mixing them with much China rubbish that is brought to London, and hitherto Indian teas have been almost exclusively absorbed in the London market for mixing purposes.

We shall perhaps be told that the British public would not drink Indian teas, and we will admit that certain pungent teas would not be suitable, but on the other hand the public at home have never been allowed to test the merits of Indian teas, except to a very limited extent. It is generally admitted, I believe, that Indian teas are far superior to the China article, independently of their greater purity, and what is really wanted for our Indian teas *is a market free from the tricks of trade.*

The planters in India should co-operate with the consumers at home, or at all events they should at least insist upon having Indian teas placed before the public, and a company could easily be formed for that purpose in London, having agencies in every town and village in the United Kingdom.

There can be no doubt, I think, that if the poorer classes were allowed the privilege of drinking Indian teas of fair flavour and strength, they would at once appreciate them, and it would be doubtful indeed if they would ever care again to touch the *China mixtures.*

The poorer people at home are buyers of high class teas.

Indian teas are admittedly superior to China, yet the fact remains that up to the present moment no one in India has yet shown himself equal to the great industry, no one has come forward to direct this industry into a proper channel of its own. Look at the prices quoted in the Calcutta sales of the sixth instant,—six annas—equal, in English money, taking exchange into account, to about seven pence.

Thus 7*d.* for tea, duty 6*d.*—total 1*s* 1*d.*—yet such teas cannot be bought at home for less than 3*s.* or 4*s.* 6*d.* per lb.

Why should not the planters come in for their honest share of the profits?

PEKOES.

THE DRYING OF TEA.

(To the Editor of the Englishman)

SIR,—Under date of 10th February last, Mr. Eugene C. Schrottkey, I observe, addressed you upon the subject of the non-keeping qualities of Indian teas of the present day as compared with their China rivals, and he suggests that there is a danger of increasing this defect by drying the teas with heated air instead of charcoal fumes.

Now without going into the subject of the antiseptic properties of the fumes from charcoal, I would ask a little of your space to draw attention to the well-known fact that "Green" teas keep quite as well as black teas. Exposure to moist atmosphere after a chest is opened does deprive green tea of its "bloom" a little, but its strength and pungency remains undeteriorated quite as long as with black tea under similar circumstances.

But green tea never knows the fume of charcoal throughout its whole course of manufacture, as it is dried over pans (usually iron) of graduated heats.

This, I think, conclusively shews that the keeping qualities of teas are not due in any way to the antiseptic properties which Mr. Schrottkey attributes to the fumes of charcoal.

In former times (10 or 12 years ago) Indian teas had not the character of deteriorating by keeping, but at that time it was customary to subject the leaf, during the process of manufacture, and while in the moist state, to roasting in pans, thereby raising its temperature to a very high degree, and while it was at this high temperature it was re-rolled to ensure the juices being all thoroughly subjected to the effect of the heat. The object of this process is analogous to the process of raising to boiling point, vegetables, or fruits in syrups, before being hermetically sealed in cases or bottles.

The high temperature renders the fermenting agents contained in the juices of the leaf completely inoperative, as may readily be observed by subjecting the leaf, while green coloured, to this roasting process, after which no matter how long the leaf may be kept in balls, even in the moist state, fermentation cannot again be perceptibly induced.

The roasting process has, however, been very generally abandoned with Indian teas, since about the year 1869; but China teas are still subjected to it in their manufacture, and herein, I believe, is to be found the true cause of the comparative non-keeping qualities of Indian teas of late years.

It is almost impossible, over charcoal fires, to give the leaf such a degree of heat as it can be subjected to in the pans while it is moist without liability to burning, for charcoal fires are so difficult to regulate that one time they will scorch the leaf if "forced," and then as readily die down again if not extra carefully attended to.

In this respect drying machines, in which hot air is used, have, I believe, an advantage over charcoal fires, because with the former the tea can be subjected to a high degree of temperature without the same risk of that degree being exceeded suddenly or unexpectedly. The entire teas of only a very few estates have as yet been dried by heated air, but those during last year which were so dried (notably Burkhola teas) have kept well and earned a good reputation for freshness of flavor with the trade here.

S. C. DAVIDSON.

Belavon, Strandtown, Belfast, 7th April 1880.

TEA DRYING.

(To the Editor of the Englishman.)

SIR,—In your issue of 4th instant I see a letter from Mr. S. C. Davidson, the inventor of the "Sirocco" tea drying apparatus, anent the drying of tea. I am very glad that he has brought forward the case of manufacturing green tea (which is never submitted to charcoal fumes) against Mr. Schrottky and others, who think that there are antiseptic qualities in charcoal fumes which are necessary for the perfect preservation of tea.

For some years I manufactured green tea, and, in the manufacturing processes of black tea, very strongly advocate the disuse of charcoal where it can be done economically. But, in my advocacy, it did not before strike me to bring in the case of the green tea, which, I think, is an argument that can hardly be gainsaid.

However, in searching for the cause which has given, unfortunately, the non-keeping character for the last year or two, to some of our Indian teas, I think Mr. Davidson also overshoots the mark, and I doubt if the reason he assigns will bear scrutiny. I am not quite sure what he means by fermentation, but it is very well known that tea leaves, subjected to the roasting process which he describes, will become *sour* if not as soon, very nearly so, as leaves which have not undergone that process. I have often proved this before discarding the roasting pans, and any one can soon satisfy himself as to its accuracy. And it is also a significant fact that, when roasting was the rule instead of as now it is the exception, far more sour Indian teas appeared in the London market. Sour teas are now hardly to be found.

I do not believe that any antiseptic is required in tea manufacturing, and I have had a considerable number of years' experience with rather considerable quantities of tea. I have also had a good deal of correspondence on the subject of drying in which appeared a great deal about antiseptics. But this word was, on a particular occasion, excluded for a more familiar one (I suppose to make certain, in case I should not possess a dictionary), and I was told to take great care that the "curing of the leaf" was properly attended to. This pulled me up, and my mind's vision would not resist bringing up salt herrings and Finden haddocks! And I thought, well, surely, if some sort of salting is required, a chemical could be found which would be cheaper and cleaner than having to burn charcoal in our tea houses.

And now I will venture to suggest a reason which, I think, is quite sufficient to explain why some Indian teas have lately acquired the non-keeping character. Within two or three years there has taken place a great change about "pakka-bhattying" and packing. Some people are in such a hurry to get the tea into the box the day that it is manufactured that one would think, as my imaginative friend said, it should be packed the day before! Generally speaking, it is practically impossible to manufacture leaf and have it packed the same day, yet many strongly go in for it, or, at least, say they do. In former years, 10 or 12 or 15 years ago, pakka-bhattying was a long and tedious process, about 12 hours being generally thought necessary to thoroughly desiccate the tea and make it fit for packing. Now, in these latter years, half an hour, or a few minutes, is thought enough to thoroughly dry tea and make it safe for packing. And here, I believe, is principally where the evil lies. Tea may appear perfectly crisp and dry after a few minutes firing, but, on careful examination, it will be found that it is not dried to the core. And though I think that the old system of pakka-bhattying may have been needlessly long, as a rule the present system is inclined to the other extreme. The old gentleman who taught me tea-making was most particular with the pakka-bhatty, and used to crack pieces of tea between his finger and thumb close to his ear, and bite bits, all to make sure that not a particle of moisture was left in the tea before he would allow it to be put in a box.

I know that arguments could be brought up against this explanation of mine, such as that the tea would go bad in the box on transit, and that the non-keeping character exhibits itself in the grocer's shop only, &c., &c. But it would be encroaching too much on your valuable space to combat these objections, and I would only now beg to recommend that

planters look carefully to their pakka-bhattying, and see that the tea is thoroughly dried before it is packed, and soldered down properly. If these things are well attended to, and the tea placed in the market free of moisture, I am satisfied that we will hear no more of Indian teas developing non-keeping character.

And, Mr. Editor, I would beg leave for just another word. I thoroughly believe in the Sirocco and in its working, as being an excellent and economical tea dryer, and would use it exclusively, but, eh man, its ower dear in these hard times.

NEWOTHA BILL.

Cachar, May 10th, 1880.

TEA DRYING.

TO THE EDITOR.

SIR,—Some correspondence which appeared in the *Englishman* on this subject, induces me to re-affirm in a more terse manner, what I have already said on this matter.

1. Complaints regarding the non-keeping qualities of Indian teas (more particularly Assam and Cachar teas) have been frequent of late, and were first made after drying directly over charcoal had been abandoned to some extent in favour of drying by heated air, not containing charcoal fumes.

2. These complaints have been supported by actual experiments made by scientific observers in England and on the Continent, and considerable weight must therefore be attached to them.

3. Such complaints had not been made previous to the introduction of tea-drying apparatus, doing away with the use of charcoal.

4. The fumes of charcoal possess certain well-known antiseptic qualities, absent in mere heated air.

Question arises :—

Is the loss in the keeping qualities of Indian teas (recently complained of) due to the now extensive abandonment of drying directly over charcoal, and to the use of tea drying apparatus not imparting to the heated air the same or similar antiseptic qualities which charcoal fumes are known to possess?

In the absence of evidence to the contrary, probabilities strongly point to the affirmative.

Mr. Davidson and the able writer in to-day's issue of the *Englishman* would answer it in the negative referring to the keeping qualities of green tea, which is dried in pans, and comes not in contact with any antiseptic fumes.

But I would venture to remark that no discussion, however able will clear up the point at issue. Positive and scientific evidence can alone dispose of it ; and I would therefore suggest that a series of samples of tea, manufactured under precisely the same circumstances, but dried, one series directly by charcoal fumes, the other by heated air not containing such fumes, should be submitted to some scientist at home. Thus alone, in my opinion, can this question be solved.

The reference to green tea does not bear on the point at all. Green tea has not gone through the same fermentative process, and its keeping qualities can, therefore, not be compared to black tea. Any organic substance that has once undergone a process of fermentation, though the same may be thoroughly checked at any particular stage, is, on the slightest provocation far more disposed to decomposition or further fermentation, than any other similar organic substance which has not undergone previous fermentation, but has simply been dried, as is the case with green tea.

The drying over charcoal has been necessarily abandoned in a great many tea gardens, but in case the above question is answered in the affirmative, science will tell the tea planter how to impart antiseptic qualities to the drying air that has been heated by more contact.

EUGENE C. SCHROTTKEY.

Calcutta, May 18th, 1880.

INDIAN TEA *vs.* CHINA TEA.

(*To the Editor of the Englishman.*)

SIR,—The remarks in your to-day's issue on the extract you quote from the Melbourne *Daily Telegraph*, are very much to the point, but the misapprehension you refer to, *viz.*, that of Indian teas being more expensive to the consumer than China teas, is, I think, even greater than you have shown. The Indian teas which are higher in price per lb. than China, are of better quality in other respects than that of merely going further. That implies mere strength. They are more pungent than, and have (in Darjeelings and Kumaons at least) a superior flavor to, China teas. This all round superiority leads me to urge the following considerations on those interested.

The fact must be faced and not ignored that a cheap but very inferior China tea is the ruling article in Australia, and that, for years to come, it will, in some form or other, continue to be so. To attempt to revolutionize this state of things at one blow, would be to raise up all manner of opposition on the part of the Australians themselves, and to court failure. The consumers and grocers must be enlisted on the side of Indian tea and not be arrayed against it. To do this and still gain our object, it seems to me that a double set of operations should be carried on simultaneously, *viz.*, (1) Give the Australians a tea suitable for mixing with China tea, and (2) send them a blended Indian tea ready for use. This would be a combination of sapping and mining with the blow direct, a succession of which operations from year to year would in time give Indian teas the first place. I see no good reason why this should not apply to London as well as to Australia.

It is an acknowledged fact that the Indian teas best suited for mixing with Chinas are least suitable for drinking by themselves.

No doubt there are mixers in Melbourne as elsewhere, or if there are not, it might be worth the while of the Representative of the Calcutta Syndicate either to do it himself on behalf of his employers, or to put the dealers there "up" to that very profitable branch of the trade.

MATT. DREWS.

May 12, 1880.

MR. ROBERTS' CINCHONA CALISAYA TREES.

(*To the Editor of the Ceylon Observer.*)

DEAR SIR,—You have made me say that the Calisaya trees grew on Pooprassie, while I distinctly wrote that they grow on Lemagastenne, I would ask you to correct this, as it is well known that the lowest portion of Pooprassie is over 3,000 feet, and I consider that the low elevation these trees grow and thrive at is the important feature in the analysis. As to their origin I cannot say ; I am told that they were planted by a Mr. Peries in 1872, who then opened Lemagastenne, while he was conductor to Mr. Agar of Wavendon and Poojagodde, from whom it is understood Mr. Peries got the plants.—Yours faithfully,

J. A. ROBERTS.

Pooprassie, 26th April 1880.

[Perhaps Mr. W. Agar will help us to trace the origin of the trees.—ED., *C. O.*]

ANALYSIS OF CINCHONA.

(*To the Editor of the Madras Mail.*)

SIR,—In reference to the enquiry about the analysis of the cinchona grown in the Papanassam Hills, I send the following copy of a letter addressed to Messrs. Jenkins and Phillips, which gives the required information.

Yours, &c.,
CINCHONA.

DEAR SIRS,—The following are the results of our analysis of the Government red bark grown at Papanassam :—

Quinine Sulphate	... 2· 6 per cent.
Cinchonodine Sulphate	... 3·21 „ „
Cinchonine Alkaloid	... 1·01 „ „

This is the finest yield of quinine from Indian red bark not renewed, we have ever seen.

Yours truly,
(Signed) THOMAS WHIFFIN.

Battersea, 8th December 1879.

THE OPIUM TRADE OF BOMBAY.

(*To the Editor of the Times of India.*)

SIR,—Your contemporary's leading article of Friday is a clear example of how a public writer may, on a point of fact, be "at sea" sometimes. The drift of the writer's argument appears to be that with an empty treasury the Government are blind to their interests in allowing the Central Indian ryot, or middleman, to amass colossal fortunes in the way they are now doing by the profits of the opium trade, and thereupon he chivalrously jumps up and suggests that the duty on each chest of exported Malwa opium be raised from seven hundred to nine hundred rupees, which he calculates would bring in a fabulous amount of revenue to the Government. All practical, sensible people, engaged in the opium trade, know full well that were an average taken of the revenue derived by Government from the duty on opium for years past, it would be found that in proportion as the duty was raised the revenue fell, for the simple reason, that this increased taxation only hampered the trade and prevented traders in the drug from operating on a large scale. This will appear still clearer when we come to see the large business done in Patna and Benares opium as contrasted with Malwa,

owing to the first named descriptions not being so heavily taxed. Then when we come to look at the place now taken by Persian opium in the China market—how that in quality it is little, if at all, inferior to Malwa,—for the reason that it can be laid down in China at about two-thirds the price of the Indian drug—when, I say, these facts are borne in mind, would it not be folly on the part of the Government to think of raising this already excessive, and almost prohibitive duty on Malwa opium, and thereby cutting at the very root of a trade which is the source of so large an income to the State?—Yours, &c.,

GOPALLDASS LADDOOWALLA.

ON THE ERGOTISATION OF WHEAT DURING THE YEAR 1879.

(*To the Editor of the Lancet.*)

SIR,—The peculiarly sunless year of 1879 has, amongst other things brought about an amount of ergotisation in the wheat crops that is, as far as I can learn, quite unprecedented. With the details of this subject I will not trouble your readers beyond mentioning the fact that the absence of sun favours the production of ergot in wheat in two ways—first, by making the wheat late in point of time in flowering, so as to approximate the flowering of the wheat with the maturation of the Claviceps sporidiæ more nearly than usually happens; and secondly, by retarding the process of fertilisation of the wheat, for it is at this time that the ovule becomes affected with the ergot-producing fungus. I have examined several samples of last year's wheat, grown in the vicinity of King's Lynn, and have found almost all those which were grown in the marshland or fen district contaminated by a considerable percentage of ergots, some more and some less. Upon the health of the general public I believe this will have no appreciable effect, because of the large quantity of foreign corn consumed by us. But in certain districts it is the custom for the labouring families to live a great part of the winter, at any rate as long as it lasts, upon the corn gleaned by them during the harvest, which they have threshed and dressed for themselves in the most primitive manner. In many of the samples I have seen that have been threshed and dressed by the most improved agricultural implements, a great number of ergots were not removed, so that a family subsisting for several weeks upon corn gleaned from a district in which ergot is abundant this year, and which had been threshed by a flail and winnowed by a current of air, would stand a poor chance of escaping some of the constitutional effects of ergot.

From the conversation I have had with agriculturists upon this subject, they one and all ignored the idea of these foreign bodies being ergots at all until they were demonstrated to them, the little black bodies being mistaken for the excreta of birds or of rats or mice. Not being aware of the presence of the ergots, nor of their poisonous nature, many samples find their way to the miller in a condition that the farmer could very considerably improve by more careful dressing.

Your obedient servant,

CHARLES B. PLOWRIGHT.

King's Lynn, Feb. 16th, 1880.

THE JACK FRUIT TREE.

(*To the Editor, Mysorean.*)

SIR,—Allow me kindly to answer the query of your correspondent regarding the quality of the fruit of transplanted Jack (Artocarpus Integrifolia.

If the practice of growing this tree should anywhere be sound in principle, it must be in the Mulnaud, where the best kinds are grown and where the fruit, I estimate to form about 1-20 of the total food of the population. The tree is as common in the Mulnaud as the Banian and the Arlé (Ficus Bengalensis and Ficus Religiosa) are in the midan.

The following is the mode of growing the tree as practised in the Mulnaud. Well selected seeds are buried in a basket containing earth and ashes in equal proportions, and watered until they germinate, and are then removed to nurseries, where they are well looked after till about a year, when they are transplanted into pits, dug in places where they are intended to stand. The best season for transplanting is the early part of June.

Two kinds of fruits are known.

Yours truly,

J.

Teothahally, 30th April 1880.

THE DELHI GOLD FIELD.

(*To the Editor of the Delhi Gazette.*)

SIR,—The Indian Government, the Secretary of State for India, and the British public, now admit that auriferous quartz reefs, not only exist in the Madras Presidency but are found to be rich in gold.

I believe it is a well-established fact that crystalline and crystallized quartz formations almost as a rule contain gold, and the presence of detached pieces and blocks of rock crystal, or crystallized quartz indicate that a quartz reef must exist somewhere in the vicinity, from which they have been separate.

I shall show presently that in the vicinity of Delhi ancient mines exist, from which lumps and blocks of rock crystal have been obtained, and as the supply is by no means exhausted, it follows that scientific examination of the locality will lead to the discovery of the parent quartz reef, and if that does not prove to be metalliferous as well as auriferous, a geological phenomenon will result.

So certain am I that a grand gold field is to be found for the seeking, at no great distance from the City of Delhi, that I have purposely kept back this paper, till the fall of Ghuzni was announced, and as that event has taken place reticence is no longer necessary. Further, as the Afghan war will not soon be over, and will require a very considerable sum of money to carry it on, the gold needed may, and I hope will, be drawn from the valley of Aurangpur.

The information given beneath is taken from Doctor Thompson's Report on the rock crystal mines, and was published in the *Punjab Gazette* at a time, when the existence of gold bearing quartz reefs in India was not known and our knowledge of crystallized quartz reefs and their value was yet in its infancy.

Dr. Thompson states:—The village of Aurangpur is situated in a small valley, surrounded by wells, and the road leading to it from all sides for a distance of three miles at least from the village, is impassable to any but foot passengers and cattle from their rocky and precipitous character. The mines themselves are situated about two or three miles, to the south-west of the village, and can only be approached by paths like those just described.

The crystal does not occur in its primitive position but in a secondary deposit of siliceous breccia very highly impregnated with iron, each crystal is encased in a sheath of hæmatite.

The deposit of crystal occurs in a small valley or basin among these hills, about two or three miles to the south-west of the village of Aurangpur. The valley is about five hundred yards long and from fifty to one hundred yards broad and dips toward the north, the only part of the deposit which has been worked is the south end.

The works have hitherto been carried on in two ways: first, open pits gradually sloping downwards; second, by wells and shafts. Of the former there are two, neither of which have been worked for many years. Neither is deeper than twenty feet from the surface. Of the latter there are three, the deepest of which was sunk by the late Raja of Ballabgurh, and is twenty feet in depth and about ten feet in diameter. From the bottom several galleries extend for a short distance, on all sides. The two wells are of much less depth.

The strata through the deepest shafts are not uniform, for more than the first half of the depth at first they are the same as I have described and highly ferruginous; subsequently the rock begins to lose the irons and a short way down is composed of small pieces of pure quartz, embedded in a matrix of almost pure white clay. I have not been able to ascertain in what way the crystals occur in these beds, but the *Lumbarders* of Aurangpur inform me that, it is here the largest and purest specimens are found. In the upper ferruginous beds, are layer, of red clay, which I consider originally to have been *Kaolin*, and subsequently impregnated with iron. In the upper strata many of the crystals are tinged with yellow from an admixture of iron.

At page 47 of "Punjab Products" it is stated that the rock crystals exhibited, were obtained from a place (? village) called Bhur, in the district of Goorgaon.

I have heard it stated that occasionally very small quantities of *gold dust* are discharged by the water of the *Sona* hot sulphur springs. Now *Sona*, is sanscrit for gold, whilst the *Gundhuck*, is the name for sulphur consequently some valid reason must have existed, in ancient times, for giving this very significant name to the sulphur spring.

The rocks and clay described by Dr. Thompson are evidently connected with a quartz formation, and as the small pieces (*crystals*) of pure quartz, have a history of their own, the deepening of the Rajah's shaft from 20 to 60 feet would throw considerable light on the subject, and if it be true that the *Sona* sulphur spring has thrown off gold dust (no matter how small the quantity), we have reliable evidence of an abundant deposit of crystalized quartz in the neighbourhood, and all but reliable evidence of the existence of gold in its purest form.

The season is now too far advanced for any *prospecting* to be undertaken, but in the mean time the rocks at and about "Sona" might be explored and a sharp look out kept for the smallest quantity of gold-dust to secure which, three or more sheep skins with the wool on should be so placed as to catch the water, as it issues from the spring.

In October Aurangpur will, I hope, be visited by professional men from the Madras gold field, and their practical knowledge will very soon lead to the finding of Delhi's auriferous quartz reefs.

DOUNSAL HALL.

Kotegurh, 28th April.

SERICULTURE.

To the Editor of the Delhi Gazette.

SIR,—I see by your columns that sericulture is attracting a good deal of attention in the Doon. My experience in that line may be of service to those interested. It may not be generally known that the Maharajah of Jummoo has a large silk factory, and that a Mr. Halsey has one at Puthan Kote; they have both been very successful, but I don't think it would prove a success in the Doon, as January being the month in which they are generally bred, I fear the temperature of the Doon would be rather severe in that month, and the worms would perish. Eggs can be procured at Lahore, and the easiest way to breed them would be a long building ventilated from the top with two doors, the longitudinal side of the building having tiers of shelves; the building should have a drain inside constantly filled with water to prevent vermin finding their way to the worms. About the 15th of January, or when the young mulberry leaves appear is the time for breeding, the eggs are exposed in paper trays to the sun, and in half an hour or so the worms appear, when they should be carefully put on the shelves which should be lined with paper, and fed with the young leaves of the mulberry. In about ten days they are strong enough to be handled for the purpose of cleaning the shelves, when they should be well supplied with leaves. In about thirty days they are ready for spinning, when light branches should be thrown on the shelves, and they should be left undisturbed, and as they finish the cocoons it should be removed and put into hot water to destroy the chrysalis except those that are required for breeding, which should be put away separately. When the butterfly will appear and commence breeding, the eggs should be carefully collected and kept carefully in a dry place for next year's breeding. The main difficulty is the unwinding of the cocoons, but I am inclined to think the hand reel used in France which could be procured would be the easiest and the cheapest as native women could be taught to unwind it. About 2,000 cocoons produce a pound of silk. I would be very happy in assisting any party desirous of trying the experiment in getting up a Joint Stock Company, but I think Saharunpore would be a good locality, the mulberry leaves might be procured by contract from the adjoining villages and hereafter the company could plant their own mulberries. There is little doubt but that the silk would meet with a ready market, and if the native women could not be taught to unwind the cocoons, there are plenty of poor Eurasian women and girls who would be glad to undertake it. The cocoon can be kept any length of time, so long as they are kept from damp, and unwound at any time. I would be glad to afford to those interested any further information.

PHILO.

THE JACK TREE.

To The Editor Mysorean, Bangalore.

SIR,—A writer to the *Indian Agriculturist* asks whether the Jack will bear transplanting, and says that he is informed by the natives that it will not. I can assure him that he is mis-informed. The Jack is extensively used on the lower slopes of the Neilgherry Hills and in parts of the Wynaad as shade for coffee, for which purpose it is admirably suited. Jack seed is planted in nurseries, and when the young plants have attained the height of about 12 inches, they are planted out between the coffee. On the Droog Estate I have seen the seed planted out in bamboos. The latter are cut into lengths of about a foot, and the tube filled up with rich loam into which a single jack seed is dropped. The lengths of bamboo are then buried in an upright position and watered in the usual manner. By this arrangement the roots are not disturbed in transplanting as the bamboo takes some time to decay. The roots find no difficulty in making their way through the bottom of the bamboo which in time moulders away.

A writer in the *Madras Mail*, the other day asserts that all Jack trees will bear fruit under ground, when aged. This I think is a mistake, as I have seen a tree in its fifth year bear fruit under the soil, and I have known many trees 20 years and upwards that showed no signs of fruit on the roots. The Burmans say that they are two different varieties, in fact they prize the kind that produces fruit at the roots, and such fruit sell at from 3 to 4 times the rate of the other.

Coonoor, 15th April 1880. PLANTER.

SOAKED *versus* BOILED GRAM.

To the Editor of the Madras Mail.

SIR,—With reference to the question put by your correspondent "R. R. E. B." in your issue of the 20th instant, on food for bullocks, I beg to state that horned cattle generally thrive and fatten much more quickly on raw than boiled horse gram, *Cooltee or Dolichos uniflorus*, and I have never known anything go wrong with cattle so fed. The only inconvenience if any that occurs, is that some animals will pass out a small portion of the gram undigested with their dung, and the gram so passed out being perfectly sound, will readily germinate if planted. To prevent this the gram should be broken up in an ordinary stone mill, such as is used for grinding raggy or other grain, or it may be pounded in a mortar, and be then steeped in water to soften, as is done to chunna or Bengal gram when given to horses. By breaking up the gram it will soften the more readily when soaked, and be better realised by the animals to which it is given. Cattle unaccustomed to eat gram will have to be coaxed to take it for a few days before they partake of it freely.

Yours faithfully,

Ercaud, 24th April. JOHN SHORTT.

MINOR REBOISEMENT IN THE PUNJAB.

(Communicated.)

SIR,—Professional business has necessitated my being obliged to traverse a good many square miles of country to the north of the town of Attock and to the west of the river Cabul—which at present is very barren and treeless, excepting in the immediate neighbourhood of the villages where a few trees still exist—and it has been a continual source of wonder to me, that the local authorities do not induce the zemindars to plant trees along the beds of the natural and artificial watercourses within their respective village bounderies.

Judging by the emerald colour of the grass on either side of the watercourses the ground must be in a very fine state of moisture and well fitted for the reception of trees that delight in moist situations, such are the Salicaceæ in particular; then we have the *shisham* (sissoo), *siriss* (siriss), *chinar* (plane), *tút* (mulberry), and many other useful trees which I need not here particularise, as they are too well known, or ought to be, to the local authorities.

The villagers have a lot of spare time on hand during each cold season, which could be turned to great advantage to themselves, the country at large, and the Government, if the latter were to use a little gentle pressure to induce the villagers—at the above-mentioned season of the year—to spend, say, half of each day in planting out, along the natural and artificial watercourses, some useful seedlings, which could be sent to them from the Saharanpore gardens, and from the Agri-Horticultural Society at Lahore, besides obtaining some few in the immediate neighbourhood of the few and small copses nearer home.

The ultimate benefit is to the villagers, as they would obtain the thinnings, loppings, and eventually the fallings of the mature trees as it became necessary to cut them down to prevent them from overcrowding one another.

I have seen the emerald grass, before written about, as far as thirty feet from the watercourses, showing what a large belt of arborescent vegetation could be raised along them with a little trouble in planting and keeping the cattle from grazing there for three or four years, or until the trees are old enough and tall enough to be beyond the reach of anything but wilful damage.

Villagers club together to cut an irrigation channel: Why should they not club together to plant belts of seedlings along those irrigation channels? and also along natural channels within the limits of their villages? The one (irrigation channel) is of equal advantage with the other (arborescent belt).

With the watercourses shaded by trees less evaporation would take place, and their irrigation water would supply a greater area than at present.

Other benefits in connection with tree-planting I need not mention as they are too well known.

Let the local authorities see what they can do in this matter in the ensuing cold season.

The "luar" (a tecoma), with its handsome orange-gold flowers, is now in blossom: so also the "gandere" (wild oleander), with its pretty bunches of pink flowers: the "siri" (siriss) with its white silky-looking flower, having a pleasant scent: the "kikar" (acacia farnesiana), and its yellow flowers nicely scented: mulberries "tút" are ripe and in great profusion, and are greatly eaten by the people; the fruit tastes rather mawkish: the "shisham" (sissoo) is already seeding: so the "verma" (rhazya stricta): the "goz" (camel-thorn) is in flower.

Barley and wheat cut, about a 13 annas crop; ground being prepared for sowing Indian-corn, joar, and bazri: onions grown in large quantities, being irrigated and weeded.

Grapes filling out: pomegranates the same but more slowly, strawberries were a failure.

In the Pitelian garden onions are being cultivated, also gourds of sorts: peas obtainable in small quantities.

Food grains continue high in price, due to the circumstance that every spare ounce is bought up by the Commissariat agents for the use of the Army gone to fix the "Scientific Boundary" between Russia and England.

Kund, April 28, 1880. G. P. P.

The Indian Agriculturist.

CALCUTTA, JUNE 1st, 1880.

CHARCOAL *versus* HEATED AIR.

When a subject like this comes before the public, and more particularly before that section of the public most interested in its careful discussion, we should think that the consideration of the entire question would be faced with the utmost desire to arrive at such facts and deductions as might reasonably be expected to conduce to a proper solution of the difficulty. Such has not been the case with this disputed point, and the whole discussion has been carried on in the various newspapers by a series of assertions more or less dogmatically made, but without any attempt to prove one of them either by a reference to experience or by logical reasoning. In one case a contemporary resorted to what might be called a quibble to assist in upholding a theory, and denied that charcoal, *viz.*, pure carbon, had any antiseptic properties. Surely it was well known that the term "charcoal" in this discussion was never intended to mean "pure carbon," but the common charred wood as used by planters under the general name of charcoal. There are unfortunately plenty of corners in this important subject on which to hang arguments, without having recourse to such a mode of meeting the views of an opponent. We will state the question clearly and in such a manner that no doubt need exist as to what is meant. We are not wedded to either side of the argument, although in common with every one who has studied the subject, we have our own opinions on it, but these being only theoretical, and to a very limited extent borne out by inductive reasoning, we are unwilling to adopt either side in the discussion, until the whole matter is made the subject of such a series of experiments as will leave little or no room for doubt. No amount of theory is worth a few fairly conducted experiments, and we have repeatedly asked that some planters in a position to do so, should submit the question to the test of such experiment. We shall first state the arguments *pro* and *con*, and then describe the nature of the experiments we would recommend. We may premise that it seems taken for granted that there is no room for dispute as to the drying properties of heated air, as used in the various machines applied to this purpose on the gardens, that the heat engendered does its work of drying pure and simple, as well as is done by the *dhools* and the charcoal fumes, but we shall have to take up this subject also, as we do not accept the assumption as proved.

Those, then, who argue in favour of charcoal fumes, submit, that apart from a more efficient drying, the tea is "cured" by the fumes of the charcoal being compelled to pass through the tea which is placed over the *choola*, the heat and fumes being prevented from escaping at the sides by the basket work of the *dhool*, which is lined with paper. There does not seem to be any dispute about these fumes possessing antiseptic properties generally, the question at issue is whether these are absolutely essential for the purpose of manufacturing a tea which will keep. Now, one powerful argument in favour of the curing properties of this charcoal heat is the fact that the Chinese have never used anything else for the purpose. The earliest records connected with the industry in that country, show that the tea has always been dried with charcoal fumes, exactly as it is to-day. It is no answer, say those who are in favor of charcoal, to tell us that the Chinese are a conservative race, and never change anything, because we find that while this may be true in a general way, it is not true of the Chinese agriculturists. We find that they have always been the first in adopting every new plan that promised the cultivator a better crop; and the result of all this is, that in China we have perhaps the most advanced cultivation in the world, and it is a fact well known to all, that the China tea merchant and manufacturer has only to know the wants of Western Europe, to adapt himself and his modes of doing business at once to suit them. Yet in all these centuries, he, with his proverbial ingenuity, has not been able to find anything better than charcoal fumes for drying tea. Another argument used is connected with this, and it is, that the complaints made in London about tea not keeping, do not apply to China tea, but only to Indian. Now, as we have said above, the China tea-maker sticks to charcoal. Then the third argument in favour of charcoal seems to us a particularly strong one. The complaint against the keeping qualities of Indian tea is a new one, and is contemporaneous with the partial adoption of drying by machinery. Still, though this seems to us a very powerful argument in favor of charcoal, it is at best a presumption, however strong it may be. These are the principal arguments advanced by the advocates of charcoal, and when we look at the other side, we cannot say the presumptions are so strong. The advocates of machine or hot-air drying simply deny the curing properties of charcoal, and affirm that tea properly dried will keep, whatever may be the process of drying: all that is essential is that it should be thoroughly dry. Now even if we drop the antiseptic idea for the nonce, and confine ourselves to the mere question of drying, the charcoal advocates say that the machines do not dry the tea thoroughly. And again they give a reason for the faith that is in them. They say that the tea is forced into a state of dryness, and that while it is to all appearance perfectly dry, it is in reality only dried outwardly—in the same way as a roast of beef may be perfectly cooked on the outside, by an over-brisk fire, while the centre of the joint may be comparatively raw; whereas a slow fire will cook it thoroughly throughout. In the same manner when a piece of toast is being made, if it is desired to have it thoroughly crisp, a very hot fire must be avoided, and a slow one used. On the other hand, the machine advocates advance three objections to charcoal drying, which all must admit to be real. The first is—the length of time which the operation takes. Exactly. The object is to dry the tea thoroughly and make it perfectly crisp, and hence it is done slowly, the heat of the charcoal fire and the other concomitant arrangements being admirably adapted to that end. A second objection is—the price of charcoal. It is costly and about one cwt. is required for every maund of tea made; and in a district like Cachar or Assam, where the primitive forest is fast disappearing, the price of charcoal must necessarily be rising. A third is—the difficulty often experienced in getting it at any price. These are fully admitted, but are not considered enough to counterbalance the advantage which is said to be given to the tea by the use of charcoal fumes.

Such, then, is the case, for and against. It will be seen that we lean to the use of charcoal, but we are not so wedded to our opinion as to be dogmatic. We simply affirm that until the subject is finally disposed of by a series of actual experiments, the presumption of evidence is in favour of the use of charcoal. A letter to a contemporary suggests a care-

ful experiment, and the results to be placed in the hands of a practical chemist for analysis. We do not think this would settle the matter, the results of analysis being so very unsatisfactory,—as we have seen in cases of the analysis of different soils, and the evidence of chemical experts at criminal and civil trials. Most of us remember the case in which it was sought to be proved that certain mildew on cloth was caused by tar from the wrapper and not from the sizing in the cloth, and how one set of chemists proved seemingly satisfactorily that it could only have been caused by tar, while the others were as clearly convinced that nothing but the sizing could possibly have produced it. We would prefer the test of actually keeping experimental samples, in the ordinary way, in order that they may be submitted to the test of actual use in the self-same manner in which the great bulk of tea is kept. What we would suggest, then, is this. Let a planter manufacture say 500 lb. of tea; let it all be made in one break until the final process is reached; then let it be exactly halved, one moiety being finished by machine drying, the other by the old charcoal *dhools*. Let the tea be packed at the same time, taking care to mark the charcoal tea differently from the other. These two samples, which would probably amount to three chests of each sort, should then be forwarded to Calcutta in one invoice, and at once sent to London. There they should be placed side by side in an ordinary warehouse, and kept carefully from the influence of damp. In fact, let the tea be treated exactly as an average chest is treated, opened for sampling, and closed in the usual way. Let the chests lie undisturbed for two or three years, and then have them opened in presence of a committee who shall be qualified to test the results in every possible way. Let this experiment be tried by, say, eight planters, situated in different parts of India. Experiments of the same nature might also be undertaken to ascertain the effects of under-fermenting, as practised in the manufacture of "rasping" tea. We feel convinced that one cause of tea not keeping will be found here. The fermenting process is checked at too early a stage, and it is well known that if an article is once submitted to fermentation, and the process not completed, fermentation will be resumed on the slightest opportunity presenting itself. It is no answer therefore, to the advocate of charcoal fumes, to be told by the opposite party that green tea is never dried by charcoal fumes, and that it keeps somehow. We all know perfectly well that the bloom so necessary to the appearance of green tea is extremely liable to wear off, and leave the tea with a nasty appearance. The fading of this bloom is a sign of damp, and would be fatal to black tea, but is not so detrimental to green for the two following reasons. If green tea is not dried by charcoal, it is most thoroughly dried by panning, and no one who has made green tea properly can fail to be aware of the excessive amount of roasting and drying it gets in this process. Again, green tea is not fermented, and hence is not so liable to be affected deleteriously by a trifling amount of damp.

EDITORIAL NOTES.

THE Bengal Government is taking the proper means of encouraging mule breeding. We observe that they are prepared to provide donkey stallions gratis, and this, we suspect will be the entire cost of the experiment to the Government. It is a great mistake to make these and similar experiments partake of an eleemosynary character. The providing of these animals gratis cannot be said to do this, as this is a thing which villagers could not well do for themselves, however willing they might be. The wisest regulation in connection with this remains to be noticed, and it is this. "Government will hold no lien on the mule produce." This is a wise concession. Having helped towards the production of the mules in the manner above mentioned, the Government might fairly have a lien on the produce; still, we think they have acted wisely in leaving the purchase and selection of Government animals to free trade and the ordinary operations of demand and supply. After a few years, when mules become more plentiful, Government will be able to get all they require by purchasing in the usual way in the open market. As we have said before, the natives of India are conservatives of old habits, but whenever such interfere with profit, the old habits go to the wall. The knowledge that the Government hold a lien on the produce would always tend to lessen the breeder's interest in his young stud, because this lien would not mean that Government would take the animal from him on its arriving at a certain age, but that, provided it was pronounced by a Government Committee as up to a certain standard, Government would purchase it, and failing that, it would be thrown on the breeder's hand as a "rejection," thus damaging its reputation for sale in the open market. The standard fixed by Government is a purely arbitrary one, and of course has special reference to their own requirements; consequently the rejection by the remount committee may not disqualify the "rejection" from taking a good place as a generally useful animal. The term "rejection," however, so generally lowers its value, that the lien held by Government really acts as a wet blanket on the praiseworthy efforts of breeders.

THE report of the Saidapet Farm for the year ending 31st March 1879 has just come to hand. It contains the record of not a few interesting experiments which would have merited a few remarks and a considerable amount of general attention had they been told us nearly a year ago. These reports are needlessly bulky, and what is here told us in 134 foolscap pages might have been condensed into six, and placed before the public twelve months ago. We had intended noticing a few of the experiments tried, but as most of them have been referred to in various forms during the last twelve months, it would be a waste of time to notice them now.

THE report on cotton cultivation in the Punjab for the year 1878-79 tells of a somewhat improving state of affairs. We may here ask why such an important document has not seen the light till fourteen months after due date? These reports, to have any value, ought to be issued with the least possible delay. The cultivation of this staple has been making progress in the Punjab, the acreage under crop having been

1874-75	...	711,312	acres.
1875-76	"	698,393	"
1876-77	"	686,716	"
1877-78	"	679,836	"
1878-79	"	803,480	"

The out-turn of the preceding year was abnormally low, and was so on account of scanty rain. We find the average outturn of cleaned cotton in 1877-78 to have been 58lb., while in the year under notice it rose to 81lbs. This although a great improvement, is still only a fourth of what it ought to be, and what it might easily be if the cultivators were able to manure and irrigate their land. We find that 41 per cent. of the land was manured, although we have no doubt the manuring was of the very lightest kind, and that 58 per cent. was irrigated. The use of manure is gradually extending, and we find from the trade return of India, that constantly increasing quantities of oil-cakes are being retained in the country to be used either as manure directly or as cattle food. In either case the land must get the benefit of it ultimately, and while this increase in manure is apparent, we should like to see greater facilities afforded for irrigation, it being found that wherever a good rainfall is supplemented by irrigation, the outturn of cotton can be depended upon. Thus in Montgomery where we find 91 per cent. of the crop irrigated, we have an outturn of 217lb. per acre, and the estimated value of the crop is fixed at Rs. 36. This is the nett value of the outturn. At this rate cotton would pay the cultivator. On the other hand at Hoshiarpore, where only four per cent. is irrigated, we find the outturn 46lb. per acre, and the estimated nett value of the crop fixed at Rs. 10. Perhaps when we get rid of our craze about "scientific frontiers" and "gates of India," we may find a little money to bring water to those needy cultivators to

prevent them from falling a prey to absolute starvation. The percentage of irrigated lands was of course less than in the preceding year, because while the land under crop increased immensely, the quantity of water available is ordinarily a fixed factor in the calculation. In the Hoshiarpore district we find that the hand-looms manufactured cotton cloth to the value of 5¼ lakhs of rupees from English twist, and it is a little surprising that the enterprising natives of that rising province, the Punjab, do not engage in the cotton manufacturing industry. In the Punjab many advantages exist. There is a reasonably cheap labour supply, cotton is plentiful, and there exists a good market for all that could be turned out.

MORE than a year ago a movement was made for the establishment of a company, having for its object, "to trade in rice, paddy, cotton goods, &c., between Colombo and India on the one side, and Jaffna on the other." The scheme met with favour, and several reliable men signified their wish to become shareholders. For several months little was heard of the enterprise, and some fear has been expressed of a failure. It appears, however, that the movers have had no idea of relinquishing it, but have been, in a quiet way, taking the necessary steps to secure incorporation. To this end, an application was sent, in August last, to the Government; and on February 23rd of this year the company was duly registered. So far as its recognition by Government as a regularly organized company is concerned, it may be regarded as established and ready to carry out its object. The nominal capital of the company is Rs. 20,000 divided into 200 shares of Rs. 100 each with power to increase the capital.

NEW rules for cultivation leases of small lots of waste land in the regulation district of Chittagong are published in a recent *Calcutta Gazette*. It appears that the lands are to be used only "for the purposes of ordinary native cultivation," are to be granted in lots of about fifty acres, and the leases to be disposed of by public auction to the highest bidder. The first lease is to run in every case to the general year of resettlement for the district, *viz.*, 1898 A.D., and the lessees will have a right of resettlement on such terms and for such period as may then be fixed, provided that the resettlement shall not be for a less period than 20 years.

NOTWITHSTANDING the nature of the rules under the Burmah Land Revenue Act, it is pleasing to note the rapid extension of rice cultivation in the province, some 200,000 acres having recently been added to the area under it. The splendid alluvial fields of the province should make it the granary of the East, and as over twenty kinds of paddy are raised by cultivators, there cannot be much difficulty in suiting the most fastidious market.

IT is estimated that 818,500 acres have been added to the cultivated area of the Punjab during the last five years. Considering increase of population, and other conditions, this enlargement in the area seems fairly satisfactory. Nearly 3,664,000 acres, formerly classed as uncultivable, are now entered as cultivable.

OFFICIAL PAPER.

CANE BORERS.

1. *Mauritius.*—In 1856, the cane crops there were ravaged by a borer which was believed to have been introduced into the island with a cargo of cane cuttings brought from Ceylon. This borer was identified as the larva of a moth *Proceras sacchariphagus*. The moth lays its eggs on healthy canes in the axils of the leaves. The young caterpillars soon eat the leaves "from the tender parts of the heart of the plant, destroying the cane in a frightful manner, by forming burrows in the stem filled with excrement, and which shortly have the effect of completely disorganising the functions of the vessels; so that crystallisation will no longer take place, and the cane is not even fit for the making of rum." Such is Professor Westwood's description of the ravages of this insect (*Gardener's Chronicle*, July 1856), and he suggests with the view of getting rid of the pest "the burning of infested canes, as well as every particle of the tops, leaves, and dry straw which have fallen on the ground, and do not pass through the mill." As a precaution the Mauritius planters at this time immersed the cuttings of cane tops about to be planted in a solution of "pentasulphide of calcium" in water, consisting of one part of the former to thirty of the latter. Professor Westwood finally states that the Mauritius borer is identical with that described by the Rev. L. Guilding, in the Transactions of the Society of Arts XLVI., 143, under the name of *Diatræa sacchari*, and that this is the same as the *Phalæna sacchara lis* of Fabricius.

2. *West Indies.*—In paragraph 6 of my letter, recorded in G. O. No. 22 of 6th January 1880, I promised to apply to the Entomological Society of London for a copy or abstract of Mr. Guilding's prize essay on the cane borers of the West Indian plantations, and have now to report that Mr. Distant, one of the Secretaries of the Entomological Society, has been good enough to send me an abstract of the paper. From this it appears that the chief enemies of the cane in the West Indies are as follows :—

Beetles	1	Calandra palmarum,	*Fab. Lam.*
		Curculio „	*Lin.*
	2	Calandra sacchari,	*Guild.*
Moth	...	Diatræa. „	

The following is the information abstracted by Mr. Distant from Mr. Guilding's essay as to the habits, ravages, &c., of the respective insects :—

"The Calandra palmarum is principally injurious to the plants lately stuck in the ground, to which the female is allured by the juices which are exuded. They do not seem to deposit their eggs in full-grown canes, when palms are abundant in the neighbourhood.

"Calandra sacchari confines itself principally to such canes as have been slightly injured, though it sometimes attacks the more vigorous plants, which it excavates to the very ground voiding its excrements in scarcely discolored grains, which fill up the passage.

"As regards the most destructive enemy, the grub of the moth which is most formidable in dry seasons, Mr. Guilding states, 'the object of the planters should be to prevent the insect from depositing eggs in the plants, rather than to kill those which have already begun their operations.'

'From long-continued experiments I have at last discovered that they may be almost entirely expelled from any quarter in which the canes are carefully stripped of the dry and useless leaves under which, as they become loose, the female borer deposits her eggs.

'The borers are observed to be much more fatal to planted than to ratoon canes, which should of course be often visited by the parties of negroes whose business it is to collect the trash.

'The myriads of ants which once infested, but have now disappeared from Grenada, committed indeed the most frightful ravages, but it was rather by excavating their little metropolis beneath the roots than by attacking the body of the cane. Were there little carnivorous agents less prolific than they are, we might encourage them as useful helpmates in the destruction of the borers, which they pursue and kill in their cylindrical labyrinths.

3. *British Guiana.*—At the present time the "sugarcane borers" are doing much harm to the crops in this colony, and the enemies are apparently the same as those described in Guilding's essay. The moth is a Proceras and "causes injury by attacking the young canes, and the treatment applied is to cut back the cane below the surface of the ground, covering the plant with mould, and adding a handful of lime. (Trans. Entomolog. Society, p. XXXIV., 1879). The larva of this moth penetrates into the heart of the cane where it drives galleries fifteen, eighteen or more inches in length. The injury done by this pest, however, "is said by one of the chief planters in the Demerara district to be as nothing compared with the effects of the *Calandra sacchari*, the orange-brown weevil." The larva of this beetle is stated to riddle the heart of the matured canes to an incredible extent, leaving only the outside rind, without killing the leaves at the head of the cane, so that in cutting away, suspected plants may escape notice. On opening a fair-looking cane the contents are found to be a mass of decayed and decaying matter, the greater part having been converted into excreta resembling sawdust. The injury inflicted is twofold, as not only are many canes lost, but others containing insects escape notice and pass through the mill, the result being a disclosed, sticky, and disagreeably smelling syrup. The third enemy, *Calandra Palmarum*, is much less destructive than the other two, and is believed to follow them and finally destroy bored canes. Long droughts and hot weather, preceded the invasion of the borer pest in Guiana and are said to have, in great part, driven from the fields the colonies of ants which are the natural enemies of the borers, keeping them in check by eating their eggs and larvæ. As remedies it has been proposed to steep the cane cuttings in water for forty-eight hours, or for ten or twelve hours in a mixture of 1lb. of carbolic acid to 100 gallons of water. The encouragement of ants is also inculcated, and the value or their presence is illustrated by the following extract from p. XXXIX., Trans. Entomolog. Society, 1879:—

"On week ending the 3rd of May, a twenty-acre field of canes was set fire to and cut down, after all the canes had been sent to mill; the rubbish from the field was also thoroughly cleared. Two twenty acre fields adjoining were also in turn, burnt and cut down; and two other fields near were next reaped after the canes had been ground. On the three fields which were burnt on the ground, the spring of canes in the first was weak and unhealthy, ants few, and canes attacked by Proceras; on the second and third, the spring was good, but ants similarly not numerous and canes attacked by Proceras; whilst the fourth and fifth fields in which the cane was reaped threw up healthy shoots, "an army of ants"

appeared on every bed, and there were no signs of any stool having been attacked by any of the borers.

"The writer from this draws a very correct conclusion :—

"It is evident that to burn fields in which the small red or black ants are to be found in abundance, is a mistake, as large numbers of the best friends of the canes must inevitably be destroyed by the fire. To entice ants and other insects known to be antagonistic to grub-life, is of vital importance, and no trouble should be spared in getting them into the cane-fields."

"From these notes it appears to me that a process of certain destruction to the natural enemies of the borers has, in some cases, been going on, by which the ants and their nests are swept off the fields together. In cultivation spreading over great areas, as in sugarcane culture, it is the natural balance that must chiefly be looked to for protection. Clearing off infested canes by every available means is most important, whether by cutting off, grubbing up, or any other means, and utterly destroying these infested pieces, including amongst them rotten cane thrown aside, which is notably attractive to Calandra. But though no way is so thorough as destruction by fire for the perfect clearance of these infested canes, they should not on any account whatever, be burnt on the surface of the fields. A few straggling ants burnt on the heaps, are of no account, but if the remains of the standing crop are burnt in the fields, so as to spread the fire over the surface, or in any other situation whatever, where the fire can destroy the ants' nests, it is a loss by each nest destroyed of so much skilled protection to the cane crop."

4. The chief remedies proposed for cane borers are therefore as follows:—

(*a*) To steep the cuttings in water for forty-eight hours so as to destroy the grubs.

(*b*) To steep the cuttings in a watery solution of some chemical, such as carbolic acid destructive to insect life.

(*c*) The removal of dry and useless leaves, the cutting out of all infested canes, and the burning of all these away from the cane fields.

(*d*) The encouragement of ants in the cane fields, they being the natural enemies of the borers.

Mr. Distant in his letter already referred to says:—"We have lately had several communications respecting the ravages of the cane borers in the West Indies, and I myself have had personal experience of the same when in province. Wellesley, Straits Settlements, some few years since. The best remedy, I believe, and the most efficacious one, is searching for the infested canes and *burning* the same." This is practically the same as the recommendation made by myself in my letter in G. O. No. 22, of 6th January 1880.

SELECTIONS.

THE INFLUENCE OF CLIMATE ON AGRICULTURAL CROPS.

DR. J. B. LAWES of Rothamsted favours us with the following interesting article :—

I have been quite lately occupied in writing a paper on the influence of the season of 1879 on the wheat crops at Rothamsted, in which I attributed much injury to the washing out of the nitric acid. I had just forwarded this paper for publication when I received an urgent summons to Scotland to record a vote at the present election.

In the course of my hurried journey to Argyllshire, my mind was directed towards the distinction between the system of agriculture, as practised there and at Rothamsted; and I asked myself how it was that, while the crops at Rothamsted were almost destroyed by an increase in the rainfall of from 26 to about 40 inches in the year, the agriculture of Argyllshire is carried on under an ordinary rainfall of about 80 inches, which in wet seasons may be increased to 100 inches.

If 40 inches of rain washes so much nitric acid out of the soil, what can be left in it when the rainfall is double that amount ? and can the plants in the two localities feed upon different compounds of nitrogen ?

The subject is one of considerable interest to those who possess Highland property, and more especially those who advocate an extensive conversion of pasture into arable cultivation. I have only twice visited Argyllshire in the spring, and on both occasions have observed that, in perennial vegetation, it was quite as forward as Rothamsted ; the larch was perhaps rather more forward at Dalmally, and the same spring flowers were in full bloom in both places.

With the summer and autumn climate I am tolerably familiar. Independently of the great rainfall, the air is essentially moist ; the temperature is never high in summer, but the nights are not cold; the winters are mild, and I should say that pasture grasses would grow, either above or below ground, over a much larger portion of the year in Argyllshire than at Rothamsted.

Compared with Argyllshire, the summers at Rothamsted are hot, and the air is dry. Our three principal crops—wheat, barley, and mangels—thrive in a dry soil and a dry atmosphere, and therefore could not be cultivated with any great success in Argyllshire.

At Rothamsted, our chief endeavour is to keep the land as free as we can from vegetation of any sort except that of the growing crop ; the result of this is that the land is practically bare of vegetation during the greater portion of the year. It is only when we take a clover crop, which may be once in from six to eight years, that the land is covered with vegetation during the whole twelve months.

At Dalmally, the land under the plough is cultivated as follows :—Potatoes with dung, followed by oats with seeds. Some years ago the large sheep farmers used to keep the land in grass for two or three years before it was broken up again ; but, within my memory, arable cultivation, as far as they are concerned, has almost died out, and at the present time it is confined to the crofters, who break up the land after it has been in grass one year.

Before I attempt to show why the increase in the rainfall at Rothamsted has been attended with such injurious effects, due probably to the washing of nitric acid from the soil. I must first make a few observations with regard to the compounds of nitrogen generally ; and further, must beg your readers not to accept my views as being established facts, but rather as an attempt to explain much which is still very obscure.

In all soils the great bulk of the nitrogen is found in combination with carbon, in a very insoluble form. When produced by the decay of an aquatic vegetation, it assumes the form of peat: while in ordinary soil the decay of land vegetation takes the form of humus. Here I may mention that, in the Highlands, the colour of the rivers is due to minute quantities of dissolved peat.

It is rather remarkable that Dr. Frankland, whose investigations, undertaken on behalf of sanitary purposes, are quite as valuable to agricultural science, found no nitric acid in the rivers which take their origin in the mountain ranges of Scotland. The Dee, the Don, the waters of Loch Lomond and and Loch Katrine, contain no nitric acid ; while the water percolating through cultivated soils contain it in abundance.

Dr. Frankland, I believe, considers that this formation of nitric acid has its origin in previous animal manures. The recent discoveries of Schlœsing establishing the fact that the conversion of ammonia into nitric acid is due to a minute plant would rather lead me to attribute to this plant functions somewhat similar to those of the yeast plant, which requires for its support alcalis and phosphates just as much as the crops we grow.

I should expect to find that lime, kainit salts, and phosphate, applied to a peaty soil, would produce a luxuriant vegetation, and that the water passing through it would contain nitric acid.

In any case I think, however, that whatever may be the operating causes, it may be accepted as a fact that nitric acid is constantly being generated in all cultivated soils, and that it is greedily taken up by vegetation with more or less rapidity, accordingly as the condition of temparature and moisture is favourable ; while any residue not so taken up is washed out of the soil.

Nitric acid, when once taken up by plants, becomes insoluble ; but a portion may soon again become the food of plants, as when succulent vegetation is ploughed underground ; while another portion may not again become soluble for years, or even centuries, as is the case when woody matter is buried in a stiff soil

Even weeds, inasmuch that they arrest soluble nitric acid, perform an important function in the economy of growth ; and thus the remarkable effort which Nature puts forth to clothe every bare spot upon the earth with vegetation receives its true explanation.

Quite independently of, and in addition to, any nitrogen received from the atmosphere in the rainfall or by condensation, we have a continuous formation of nitric acid, derived partly from the stores of nitrogen due to a vegetation, the origin of which must be extremely remote, and partly due to nitrogen supplied in manure.

The power of taking up nitric acid depends upon the plant being able to obtain the necessary mineral food. This being present, as the period of active vegetation in a corn crop is confined to a small portion of the year, it is obvious that much more nitric acid would be required in the soil for its support than in the case of a perennial crop ; as also that, under unfavourable circumstances, much more loss would be incurred by washing away—in fact it would almost appear as if the successful cultivation of corn was dependant upon an amount of rain which did not in summer wash nitric acid from the soil.

Having made the above preliminary observations, I will now go on to compare the arable cultivation as it exists at Rothamsted and in Argyllshire.

I have said that wheat, barley, and mangels are the principal crops grown at Rothamsted ; but in order to obtain a produce of from four to five quarters of wheat, or from five to six quarters of barley, it is absolutely essential that the soluble nitrogen in the soil should far exceed the amount we find in the crop. If from any cause the wheat or barley is unable to take up this soluble nitrogen, it is altogether lost, as there is no vegetation to fix it after the crop is once ripe.

Mangels have a longer period of active growth, and do in fact assimilate a larger amount of a given supply of nitric acid than the corn crops ; still the land under mangels is frequently without vegetation until the following spring. It will be seen, therefore, that this course of cropping is dependant for its success upon a comparatively small rainfall.

If an increase in rainfall, such as we have had in recent years, were to become permanent, a different system of agriculture would of necessity have to be pursued.

At Dalmally the potatoes receive the dung which lies outside the cottages, exposed to incessant rain. It may be rich in minerals, and may yield a

certain amount of soluble nitrogen by decomposition in the soil, but the chief source of the nitrogen gathered by the crop must be that already existing in the soil. The potatoes spread an immense network of roots through the porous soil of the district, and thus further arrest the continuously forming nitric acid before it can be washed away.

As seeds are sown with the oats, the land is never free from vegetation, except between the periods of raising the potatoes and of sowing the oats.

If we compare two periods of three years' crops at Rothamsted and Dalmally, it may be said that at the former place no vegetation of any sort exists during eighteen months of the three years; while at the latter there are only six months of the whole period which are free from vegetation.

But even with this rotation, so well adapted to the climate, I am yet disposed to think that if all the arable land at Dalmally were in the hands of one tenant-farmer, and cultivated by paid labour, there would be no surplus to pay rent or interest upon capital.

This, however, is quite a separate question, and the importance of perennial vegetation, in a climate where the rainfall is heavy and the temperature sufficiently high to permit of growth either by leaves or roots during a great part of the year, is clearly indicated.

A few years ago the Duke of Sutherland was kind enough to show me the magnificent operations for clearing land and preparing it for the plough, in which he was engaged on his Highland property.

I was disposed at the time to think that his labours would have been better directed towards the improvement of the pasture than its conversion into arable land; and at that time I did not know so well as I do now the great losses which occur upon arable land in a wet climate.

It is true that on the east coast of Scotland the rainfall is less than it is on the west; still, even a rainfall of from 40 to 50 inches per annum, combined with a moist atmosphere and a low summer temperature, does not furnish a climate suited for arable culture. I am therefore more than ever disposed to think that any extensive improvement in the Highlands must take the form of perennial vegetation.

The adaptation of climate to the system of cultivation and the crops to be grown has not received the attention it deserves.

Before concluding, there is one other point in connection with this subject on which it may be well incidentally to add a few words. I allude to peasant proprietorship. While many may wish to see a larger portion of the soil of Great Britain in the hands of peasant proprietors, and the habits of prudence and economy which such an ownership would enforce more widely extended, they ought not to be misled by the writers on political economy, who draw no distinction between the climate of Great Britain and that of other countries where cultivation by peasant proprietors largely prevails.

A system of cultivation which might be carried on successfully in France or the Island of Jersey, might be rendered simply impossible by the climate in less favoured localities.

Climate, then, is an important factor in all operations connected with the production of crops; though to what extent the climate of the British Isles is responsible for the accumulation of the land into the hands of so small a proportion of the population is a question on which I am not at present prepared to enter.—*North British Agriculturist.*

RICE CULTIVATION IN BURMAH

IN the Revenue Administration Report for 1878-79, the cultivation of rice, the staple produce of this province, is prominently noticed. The cultivation of rice, of late years, especially since the Bengal famine period, has received considerable impetus. Year by year large areas of land are being taken up for this purpose, cultivators being to a large extent encouraged by the abnormal prices which they obtained during the prevalence of scarcity in both Bengal and Southern India, to say nothing of the drain on our grain sources from the Upper Burmah side. The consequences of a steady foreign demand was to convert abnormal values into ordinary ones; and many a miller must, we imagine, sigh for the pre-famine times when the season used to open at Rs. 50 or 55 per hundred baskets of paddy. But there can be no doubt that, if present prices of paddy are not altogether attributable to the operations of speculators, the latter have at any rate helped to maintain them, seemingly not with altogether satisfactory results, since a re-action has of late been perceptible, which is indicative of a fall in prices for the future. Before pursuing this subject, it may be as well to give a few figures showing the position of this commodity during the year under review. The total area of land under paddy cultivation was 2,728,448 acres, which compared with 2,554,853 acres, in the previous year, shows an increase of 173,595 acres, or close on 7 per cent. The assessment for 1878-79, was Rs. 45,23,460 against Rs. 42,32,745, showing an increase of assessment of Rs. 2,90,715. Of this increase in cultivation Pegu claims 186,876, Tenasserim 24,005, and Arakan 18,214 acres. The gain to revenue has not been quite in keeping with the increase of cultivation, as new lands taken up are often exempt from taxation for several years.

In Pegu the enormous increase of rice cultivation, as compared with that noticeable in the other divisions, is no doubt "greatly due to the active demand and high prices prevailing for paddy, which induced many to abandon their old employments and take to agriculture as being more profitable." The Report, however, leaves out of account the great encouragement to cultivation by the increased facilities of carriage afforded by the construction of the Rangoon and Irrawaddy State Railway, without which the high prices prevailing could not be availed of in many districts.

There has been a tendency of late years on the part of Government to increase its imperial revenue by a higher assessment of the lands under cultivation. Although we do not say that this is not justified by the profits made by cultivators, yet considering the large tracts of land still uncultivated, it is a moot point whether for the present it would not be better to increase the revenue by encouraging an increase of cultivation, than by the enhancement of the land tax upon the area already under cultivation. However, much practice under modifying circumstances may be opposed to theory, it is incontrovertible that in principle the direct tendency of increased taxation is to discourage an increase of any industry on which such taxation bears. What is first imposed on the agriculturist will, we may be certain, have to be ultimately borne by the merchant and the consumer, whereas every encouragement we can give for an increase of cultivation improves the revenue at the same time that it helps to increase the population—a great desideratum in this country—and keep down prices of the produce, to the cheapness of which as compared with that of other countries so much of the prosperity of the province is due. We need not grudge the Burman cultivator the extra profit he may make in abnormal years, because it all comes back to Government in another form. The Burman seldom or never hoards his gains; he spends freely in silks and other European wares his profits, and on all these Government imposes a duty heavy enough to represent almost as much as the enhanced taxes would amount to. Besides, the Burman cultivator's gains are not so great as they may seem. In a great many cases the cultivator carries on his operations on borrowed capital, paying not unfrequently as much as 3 per cent per mensem for the accommodation, so that he has need to make a fair profit in order to stand such usurious interest, as well as to make a living and meet the Government demands, to say nothing of the losses he has to bear on the deaths of cattle and other causes. We know that in the year under review, when the rinderpest was prevailing, about 50,000 cattle must have died. It is something to be able to point to our cultivators, as being conspicuous for the absence of defaulters among them in the matter of the land tax. Our revenue is yearly and steadily increasing by something over ten per cent. Let us be satisfied to see the people happy, rich, and contended, trade and commerce flourishing, and our harbours full of shipping, which come to us because they can get our grain cheaper here than anywhere else, and because the people are rich enough to buy largely of the goods they bring instead of their being rackrented and needy, like the ryots in many parts of India, who are over head and ears in debt, from which nothing but death will ever release them.

Let us see what, according to the date furnished by the Report, the profits of a cultivator are—say in the Prome district, where seven different rates are said to prevail—for 10 acres, at a minimum yield of 25 baskets an acre (the maximum being 50 baskets). At the minimum price of Rs. 53 which ruled in 1872, 10 acres would be valued at Rs. 132-8-0, and the cost of cultivation as follows:—

	Rs.	A.	P.
One pair of buffaloes	15	0	0
Sowing, 25 men, for one day	12	0	0
Reaping ditto	12	0	0
Seedlings	10	0	0
Land-tax	15	0	0
Total ...	65	0	0
From value of gross produce	132	8	0
Deduct actual expenses	65	0	0
Minimum profits ..	67	8	0
Therefore for one acre the minimum profits in decimals would be	6·78		

The maximum profits would of course be just double this (Rs. 13·56) in the year 1872-73.

The highest market rate of paddy is shown to have been attained in 1877-78, viz., Rs. 109 the hundred baskets.

Assuming the yield to have remained the same, as stated in the above computations, the maximum profits for 1877-78 were Rs. 37, and the minimum profits Rs. 20·38 per acre.

In 1878-79 the price being Rs. 90, the maximum profits were Rs. 35·70, and the minimum profits Rs. 17·85.

These figures do not, however, allow for loss of cattle or interest at 3 per cent per mensem for six or eight months, or the loss by floods, which, although they may bring the cultivator a remission of the rent, will not perhaps recoup him for the outlay he has been put to, or the interest and principal due to the money lender. Even supposing all this were allowed, taking one year with another, and admitting the profits on one year on 10 acres to be Rs. 135, instead of Rs. 67, as in the foregoing calculation, surely a net profit of Rs. 13-8 per acre for a year is not so great as to warrant an enhancement of the rent. A family holding 100 acres would thus have left them Rs. 1,350 for a whole year's labour, on which to live, renew stock, &c. Sometimes in order to get advances a cultivator has to

mortgage his lands and cattle, and give an undertaking to deliver paddy at a low rate to the lender, all which naturally tends to lessen his profits a good deal beyond what the ruling rates would lead us to believe he really gets.—*Rangoon Gazette*.

ADULTERATED MANURES AND FEEDING STUFFS.

THE following report [illegible] Voelcker, submitted and approved at the Council meeting of the Royal English Agricultural Society the other week show [illegible] vigorous action taken by the Society when their chemist detects adulteration in manures and feeding stuffs sold to members. It seems a pity that the name of the manufacturer of the Norwich manure was not submitted to the Society. The report which details the proceedings of the Chemical Committee [illegible] quarter is as follows:—

1. A sample of nitrate [illegible] on June 9, 1879, by Mr R. B. Stafford of Bedford [illegible] purchased of Mr J. Brightman, Lower Staughton, St Neots, who [illegible] Mr Stafford that he obtained the nitrate from Messrs. [illegible] Colchester House [illegible]

On analysis this [illegible] following results:—

Moisture	3·65
Chloride [illegible]	56·50
Other impurities	1·59
Pure nitrate of [illegible]	38·35
	100·00

The nitrate was bought [illegible] according to the purchaser's statement, was verbally [illegible] contain 92 per cent. of pure nitrate. It will be seen that [illegible] by Mr. Stafford was adulterated with more than half its weight of common salt, and according to the price [illegible] it was worth only £5.8.6 per ton.

Reports of previous cases of samples [illegible] to have been supplied by Messrs. Hale & Co. have already appeared in the quarterly reports of the committee. To these it will be seen that Messrs. Hale & Co. repudiate all responsibility for anything done or said by or to their agents, never sell by analysis, and treat Dr. Voelcker's remarks with derision.

2. Another sample of nitrate of soda was sent on 8th July by Mr. Geo. Church of Bedford, who purchased it from the same vendor, namely, Mr J. Brightman, of Lower Staughton, St. Neots, the price paid being £14 per ton, with a verbal guarantee of 95 per cent. of pure nitrate. This sample on analysis gave the following results:—

Moisture	3·30
Chloride of sodium (common salt)	41·59
Other impurities ...	1·75
Pure nitrate of soda	53·35
	100·00

In reply to the usual inquiries and request [illegible] Mr. Church stated that 'there being a contr[illegible] credited my account with the [illegible] to this analysis, and the price [illegible] the sample sent by Mr. Church [illegible]

3. On the 20th of August 1879, a sample of [illegible] Mr. F. Monckton, The Cage Farm, Tonbridge, [illegible] received it direct from London. This sample yielded on [illegible] the following results:—

Moisture	5·[illegible]
Chloride of sodium	26·87
Other impurities	[illegible]
Pure nitrate of soda	[illegible]
	100·00

According to the statement of the purchaser, this nitrate was bought with a guarantee of 95 per cent. pure nitrate at £14.15 per ton, delivered at Tonbridge, [illegible] respectable firm in this neighbourhood, but received direct from London by South-Eastern Railway from the importers.

Mr. Monckton subsequently wrote —

'I have had transactions for years with the firm for cake, &c., and *particularly* wish their name kept from publication. It was at their suggestion I sent the soda to Dr. Voelcker; it was guaranteed 95 pure to them. I may add, I think it was a positive injury, as I applied the lot in question to stimulate hops, but having so much salt in it, and the weather following the application being wet and cold, the hops I believe would have been much better without it.'

The purchaser having complained to his vendors, received the following letter from the importers :—

'DEAR SIR,—We understand from Messrs.—— that you were the receiver of 1 ton nitrate of soda forwarded by us to Tonbridge station on their account on the 16th August last; also that you have had this nitrate analyzed by Dr. Voelcker, whose analysis shows a refraction of nearly 25 per cent. The writer of this was from home when the complaint reached us, but upon his return we wrote Messrs.—— fully upon the subject, and at their request we can only repeat to you the substance of our communication to them. We never in our experience knew of nitrate of soda *as imported* showing a refraction of anything like 25 per cent. This, coupled with the fact that the test of Messrs. Huson Bros., analysts for the cargo, only shows a refraction of 5·50, induces us to believe, either that some mistake has taken place in your sampling or in Dr. Voelcker's analysis.

'The nitrate which you received was delivered by the St. Katherine's Dock Company *from ship's side* to a public carman's vans, by which it was conveyed to the railway station. All this we can incontestably prove, and we are perfectly satisfied that nothing but nitrate *as imported* was sent to you.

'As mentioned to Mr.——, we are willing to go personally and see the article complained of, and sample it in conjunction with you; and if it is still in your possession, we leave you to fix a day for this purpose.

'We addressed a letter to Dr. Voelcker yesterday in regard to his analysis, informing him of the result of Huson Bros.' test, and asking him to look over his analysis.

'We enclose his reply, from which you will observe that he makes it a rule to correspond only with the *sender* of the sample. Kindly return his letter to us. * * *

In answer to further inquiries, Dr. Voelcker received the following letter from Mr. Monckton :—

'The Cage, Tonbridge, Sept. 20, 1879.

'DEAR SIR,—I should have written before, but was anxious to afford you as much information as I could. The sample I sent you was taken from two bags only, as the rest were in the field, and nearly all used. I have portions of two bags that were left after the men had finished sowing, and from which Mr.—— of the importer's firm, who came to my farm on Tuesday last, carried away samples to be analyzed. I enclose the analysis, which I received this morning, and at the same time an account from the firm I ordered the soda from, deducting 19s. 9d. from the amount first charged, £16.11-9 for 1 ton 1 cwt. 7 lb.—Yours obediently.

'Dr. A. Voelcker. FRED. MONCKTON.

CERTIFICATE OF REFRACTION.

'London Commercial Sale-rooms, Mincing-lane, E.C., and No. 1, Highbury Park, North, N.

Original. London, Sept. 17, 1879.

'We hereby certify that we have examined the refraction of the undermentioned nitrate of soda, and that the following is the result, viz. —

'Per "Tonbridge." 12lb per cwt. refraction.

E. F. TESCHEMACHER AND J. DENHAM SMITH.

Insoluble and moisture	4·25
Sulphates	·10
Muriates	7·65
	12·00

'Sample received, 16-9-79.'

This case is not without difficulty, and shows that some tampering with the cargo must have taken place, but the committee are unable to trace when this was done, and they publish the case to show that it is safer to buy by guarantee, and have all samples analyzed.

4. Mr. [illegible] Wallis, Home Farm, Dillington, Bradon, Norfolk, steward [illegible] W. A. T. Amherst, Esq., wrote on Jan. the 25th as follows :—

'DEAR SIR,—I have a lot of manure, I should like to have a sample of analyzed on behalf of W. A. T. Amherst, Esq., Didlington Hall (a member of the R.A.S.E.). May I request you to write me what your charges will be, and whether I may send it or not. It is sold at £5 per ton, as a mixture of rape cake, blood, and bones, for turnips. Will you give me an idea as to its value.'

The following is the analysis of this substance :—

Moisture	27·08
Organic matter ...	20·32
Phosphate of lime	2·49
Oxide of iron and alumina	1·50
Carbonate of lime, &c.	15·58
Alkaline salts	1·72
Insoluble siliceous matter	31·31
	100·00
Nitrogen	·74
Equal to ammonia	·89

In sending this analysis to Mr. Wallis, Dr. Voelcker stated that he would think twice about it before he decided to buy such stuff, if it were offered to him at £1-1 a ton.

The following communication was received from Mr. Wallis in answer to the usual inquiries —

'DEAR SIR.—I thank you very much for analysis received. I am sorry to say it is pretty much as I expected. I had hoped it would turn out better. I only purchased a small quantity from the maker. I have written him, enclosing copy of your analysis, and stating that I do not intend paying more than your valuation unless compelled, and claiming damages; I will let you know the result. I am not the only one bitten.'

Subsequently Mr Wallis wrote as follows ;—

'DEAR SIR,—The maker has receipted his bill for the manure you analyzed for me, without payment. I had some trouble with him.'

The maker's name is not published, simply because Mr. Wallis threatened to have it published unless the bill was receipted without payment. It was a Norwich production.

5. A sample of bone dust, bought as pure ground bones, at £8 a ton, was sent by Mr. George Rodger, Arden House, Altrincham. On analysis it yielded the following results :—

Moisture	22·45
*Organic matter	13·98
Phosphate of lime	13·75
Caustic lime	3·35
Carbonate of lime, &c.	27·11
Insoluble siliceous matter (sand and earth)	19·36
	100·00
*Containing nitrogen	1·02
Equal to ammonia	1·24

This sample, it will be seen, was very damp, and much adulterated with lime-rubbish, or mortar, sand, and brick-dust; and in comparison with pure bone-dust selling at £8 a ton, was scarcely worth £2 a ton. No particulars as regards the vendors could be obtained.

6. A sample of artificial manure, sent on May 13 by Mr. James Thompson of Anlaby, Hull, was bought at £6-2-6 on the following analysis :—

ANALYSIS OF MANURE ORDERED.

Moisture	11·3
*Organic matter and water of combin	21·1
Monocalcic phosphates	9·5
Equal to bone earth made soluble (15 per cent.),	
Nitrate of soda and potash	15·5
Insoluble phosphates	4·2
Sulphates of potash and magnesia	10·4
Sulphate of lime	24·0
Insoluble matter	3·0
	100·0

*Containing nitrogen equal to 6·8 per cent. sulphate of ammonia.

An examination of the sample sent yielded the following results :—

ANALYSIS OF MANURE RECEIVED.

Moisture	16·38
*Organic matter and water of combin	25·60
Monobasic phosphate of lime	7·12
Equal to tribasic phosphate of lime (bone phosphates) rendered soluble	(11·15)
Insoluble phosphates	9·78
Sulphate of lime, alkaline salts and magnesia	26·45
Insoluble siliceous matter	14·67
	100·00
*Containing nitrogen	2·05
Equal to ammonia	2·49

An examination of the preceding analysis will show that £6-2-6 is as fair price for a manure having the composition indicated in the analysis upon which the manure was purchased, while the sample analyzed by Dr. Voelcker was not worth so much by at least £1.15 per ton. In answer to inquiries, Mr. Thompson stated that his order of 8 tons of this manure was executed on May 9th in Hull.

Mr. Thompson subsequently wrote to the Secretary as follows :—

Anlaby, 7th January 1880.

'DEAR SIR,—In answer to your letter of January 5th, I beg to inform you that the correspondence was given up at the time the account was paid. With regard to the payment, the price I paid for the manure was the price Dr. Voelcker stated it to be worth. I may say that when the matter came to be looked into, it was found that a wrong manure was sent to me from the works by mistake; and although Mr.—— personally superintended the putting up of my lot, yet he did not superintend the delivery of it. When the mistake was found out, it was too lat to be remedied, as the greater part of the manure was then in the ground. This being so, it was agreed that I should pay the price put upon it by Dr. Voelcker, and so end the matter. As I believe this to have been purely a mistake, I must beg that if notice of this transaction appears in the *Journal* of the R.A.S.E., no names may be mentioned. In proof of it being my candid opinion that the manure sent to me was a mistake, I may say that it is my intention to purchase my turnip manure for this season from the same firm.—Yours faithfully,

JOS. THOMPSON.

'H. M. Jenkins, Esq.,

12, Hanover-square, London, W.'

7. The following case was referred to Dr. Voelcker by Mr. Sanday, of Wensely House, Bedale, Yorkshire :—

MILK SUBSTITUTE FOR REARING CALVES AND PIGS.

A cream-coloured meal, sold at 35s. per cwt., as a milk substicute for rearing claves and pigs. and described in the hand-bills as a preparation consisting of 'highly nutritious and flesh-forming substances,' and 'the most perfect soluble food in the world,' on analysis was found to have the following composition :—

Moisture	20·85
Oil	·40
*Albuminous compounds (flesh-forming matters)	2·87
Starch and digestible fibre	74·85
Woody fibre (cellulose)	1·03
Mineral matter (ash)	·50
	100·00
*Containing nitrogen	·46

The meal appeared to have been kept in a rather damp place, for it contained more moisture than ought to be present in meal. It consisted almost entirely of starch—probably potato-starch—coloured slightly yellowish. It was very poor in nitrogenous or flesh-forming matters in which milk abounds, and a most unsuitable substitute for milk in rearing calves and pigs.

The following is a copy of the hand-bill :—

MILK SUBSTITUTE
For Rearing Calves and Pigs,
Manufactured only by
SPOUNCER & SONS, GAISBORO.'

'This preparation consists of highly nutritious and flesh-forming substances, and is the most perfect soluble food in the world.

'Almost every farmer admits that if his supply of milk were greater he would rear more calves and pigs, and thus increase the number of his stock.

'It is an acknowledged fact that if a calf be given new milk until it is a fortnight old, it can be well and profitably reared on milk substitute without the use of skimmed milk.

'As the substitute does not go sour and derange the stomach, the calf will not be so susceptible of scouring, but will, as a consequence, be more healthy.

'The following is selected from a number of similar testimonials :—

"'Grove Cottage, Lenton, Nottinghamshire,
August 7th, 1878.

"'I am so well satisfied with your Milk Substitute, I would be glad if you will forward to me one of your 35s. bags to Lenton Station. I shall be glad to recommend it to my friends, feeling persuaded it is a most useful and economical substitute for milk, and am only sorry I did not hear of it earlier."

'Directions for use.—One measure of the powder to be mixed with cold water to the consistency of cream, then add three quarts of boiling water stirring briskly all the time.

'Sold by agents throughout the Kingdom, in bags at 4s. 9d., 9s. 3d., and 18s. each, or 35s. per cwt.

'Agent—S. Parr, Pharmaceutical Chemist, Nottingham.'

Dr. Voelcker strongly urged all purchasers of artificial manures and feeding stuffs not to use those articles until they had received from him notice whether they are of equal value to the guarantee which the Chemical Committee had so frequently recommended should be obtained at the time of purchase. The committee had considered Dr. Voelcker's paper on the comparative value of soluble and insoluble phosphates, and they recommended that it be published in the next number of the *Journal*, and that certain experiments named at the conclusion of the paper be carried out at Woburn, with the view of arriving at some definite conclusion on the subject. The committee had received and approved of the report of the Woburn Sub-Committee.—*North British Agriculturist.*

INDIAN *versus* AMERICAN COTTON.

As far back as 1858 we remember to have seen in the hands of Mr. W. F. Stearns, the founder of the firm of Stearns, Hobart & Co., some small sample bales of Indian cotton placed side by side with similar fancy bales of American cotton. Mr. Stearns had a very good opinion in those days of Indian cotton, and much has been done since then to increase the beauty of its texture. Even then "Fair Dhollera" seemed to hold its own against Orleans Sea Island cotton, the chief difference being found to be in the length of the staple. Since then several Bombay firms have had representatives in the cotton-growing districts, and it was in one of these districts that the late Michael Scott showed that great ability which afterwards made him so necessary to his firm. At the time of the American war the high price realized for Indian cotton made it well worth the while of the large Bombay firms to maintain an agency in the cotton districts. Though cotton has declined in price, these agencies have been maintained and their number has been increased. Dr. Forbes Watson has now shown in a report on the quality and cleaning of Indian cotton, that it rests with the people of India to greatly increase the marketable value of this commodity. The natives are sharp enough to discover what is for their own interest, and though opposed to what they consider innovation in industry and agriculture, yet when they see that some new plan of improved cultivation is for their pecuniary interest they adopt it very readily. The reduced prices of cotton at the present time have been discouraging to the enterprise of cultivators, the Cotton Frauds Act also held them back from sending their cotton to market, partly because they are naturally timid, and partly because, with all the care of the European and superior officers of the department, the Act was used by some of the subordinates in a harsh

and arbitrary fashion. The success that has attended European agencies in many parts of the country ought to encourage the prosecution of this system for the improvement of the industry, especially now that the Cotton Frauds Act has been abolished, and the officers sent to other work. In regard to cotton, as well as to almost every industry which has been developed in India, there is no reason why it should not be able to compete with other countries and carry of the palm. Dr. Forbes Watson in this report makes a comparison between the length, strength, and thickness of the fibre of the American and the Indian cotton, and on this comparison he places India in a much higher position than is usually given to her in her competition with America in regard to this staple. In measuring three hundred specimens of American and Western and Southern India fibres, it was found that the comparative main length of the staple of American cotton was 1·02 inch to 1·04 inch, while the main length of Indian cotton was ·92 inch to ·93 inch; the average difference therefore amounted only to one-tenth of an inch, the relative proportion of the two, as regards amount of the longer staple is the reverse, the one of the other; of 199 American samples, and 68 Indian samples, of the American 76 per cent. were above one inch in length, 22 per cent. below an inch of the Indian, 72 per cent. were below one inch, and 28 per cent. above. Dr. Watson, therefore argues:—"If the whole of the American and of the Indian samples were each divided into two equal groups, the inferior half of the Indian samples would be exactly matched as regards length by the superior half of the Indian samples, leaving only one half of the American samples as superior to the Indian cotton, and one half of the Indian samples as inferior to the shortest American cotton. We thus arrive at the important result that one-half of the whole bulk of American cotton imported into England could be matched as regards length of staple by cotton grown in India. "The investigation of the questions of strength and thickness are equally important. The average thickness of the American cotton is less than the Indian the former being one-thirteen hundredth of an inch, the latter one-twelve hundredth of an inch. The Indian cotton is in no respect inferior in strength to American cotton, the sample of cotton which contained the largest proportion of the strongest fibres was one from Coompta, its mean breaking weight was 163·7 against 83·9 for one kind of American Sea Island cotton. Indian cotton has a few minor disadvantages; but on the whole it stands a fair comparison with the best American cotton, and promises to reward any efforts made to improve it. Care in the production, care in the packing, cleaning, and ginning are required to place it on a par with the cotton sent to England from the United States. Dr. Forbes Watson expects that much improvement will result from the nearer approaches of Europeans to natives in the development of this industry, European energy will supplement the patient endurance of the native cultivator, and help him on the perseverance even in the face of obstacles. The only way in which Europeans can evince their gratitude to the great creator for the benefits bestowed upon them is—by making themselves useful to others, even to those who are unthankful for assistance and help rendered to them.

This country has large resources at its command which have never yet been developed: riches of agricultural, mineral, and industrial wealth which, if brought to the light, would make us cease to fear deficiency in our yearly budgets. Our agricultural model farms, though non-paying because of the expensive superintendence accorded to them, have taught us at least this lesson—that land in India, even inferior land if well developed, will yield at least four times as much as it is now doing. We need only give the cultivators a helping hand at first by the introduction of a sufficient water-supply and better implements, and they will soon find out for themselves which system of agriculture is most likely to be for their profit. Look how the manure of the cantonments and city is now considered so valuable, that contractors are glad to take the carting contract. Who could have prophesied a few years ago that such a revolution could possibly take place in the mind of the Hindus of Poona—a city the most unwilling of all the cities of Western India to introduce any new custom. We have only to show that any change will prove remunerative, and we shall find no difficulty in securing its introduction into India. It may be a slow process at first; but in the end success is certain. If this country is brought under the legitimate influence that must come from its being opened up to the progress of civilisation, its development in every department of production and industry must make astonishing progress. Those who help forward this development deserve to rank among India's truest friends.—*Deccan Herald.*

A NEW NARCOTIC PLANT.

MAJOR R. STUART, writing from Port au Prince, notices a very singular plant of that locality. The knowledge of the plant is confined to a few families, who transmit the secret as an heir-loom from generation to generation, and the heritage is highly prized, as it is looked upon as conferring the power of working miracles. In the hands of a skillful practitioner it will produce coma of any intensity or duration, and even death itself, if so intended. The plant, he assures us, is in many ways used in aid of solemn imposture, superstition, and even crime. The power thus used is called "wanga," a word that inspires the African with awe and dread, as he believes this power is obtained from the arch-enemy of mankind. The common method of showing its power, or, more correctly, the mode the wanga priest adopts to exhibit his power over persons, is to administer a little of the drug, by which the subject is thrown into a death-like sleep, and, knowing the symptoms of returning consciousness, he will make a show of recalling to life. If a burglary is to be committed, he can, by means of his art, cast a deep sleep on all in-doors; and one can understand how he can attain other forbidden ends in the same way. An experienced botanist could not fail to discover the plant, which, as an anæsthetic, would, no doubt, prove a valuable acquisition to medical science.

A NEW FIBRE.

IN the Paris Exhibition was shown a sample of a fibre named Malachra rotundifolia sent from Bombay. This plant is, however, only found in South America—at least so says Dr. King, to whom the supposed Malachra rotundifolia was sent for identification, and he states that it is Malachra capitata, not Malachra rotundifolia. As a fibre, be it what it may, it undoubtedly deserves attention, for it is said to be quite equal to jute. The following is the description given of it:—"The fibre is in length 8ft. to 9ft., has a silvery appearance, with a peculiar lustre, and is almost as soft as silk. In passing the fibre through the machinery damped with oil and water as is commonly done with Bangyl and Koukan jute, yarn was produced strong enough and nearly equal to that made from the second quality of Bengal jute. If the plant is carefully grown and well looked after, the fibre would then no doubt rank fully equal to Bengal and Bombay jute. Owing to the high prices ruling for jute in Bengal and elsewhere, the new fibre, if carefully prepared, would command a ready sale at Rs 3-12 to Rs. 4 per Indian maund." There appears to be no difficulty in growing this plant, which belongs to the natural order of Malvaceæ in Bengal, marshy places within the tropics being considered favourable to its growth, and there is, therefore, every reason why a fair trial should be made of its apparently valuable properties. The fibre is prepared in precisely the same way as jute, but requires to be steeped directly it is cut, as exposure to the sun dries and hardens the stems, preventing the easy removal of the bark from them, and rendering the fibre itself coarser in quality than it would otherwise be.

THE RUBBER TREE AND AFRICAN PALM.

A FEW years back many were supposed to be wasting money on cinchona plantations. Those who sneered and had doubts would, I dare say, be glad to possess a few acres. So in the same way there will be many who will regret that for the sake of a few rupees they did not experiment with other new products. The lands in the high regions of the country are now turned to use, even cocoa planting is making progress in the lower elevations of the hill country. It is very doubtful though whether the natives will take any interest in the products suitable to their lands. Rubber tree could be grown cheap, but what they will prefer would be the African oil palm, as the plant will grow with little or no attention. Of course the native gentry should give the impetus, instead of wasting time in the vain cry to Government to aid and secure prosperity for them. Both these products and even cocoa will cost them *less* than cocoa-nut planting, and give them more profit and in half the time! Of course intending growers should secure seed, and it is preferable to get them from the country they grow. There is a specimen of the palm nut at the Botanical Gardens and some are said to be in Jaffna, but a gentleman who has seen them, says they are not the best of the kind and are known as "bastard palm" growing wild like our wild plantains and wild sugar-cane. Of the rubber tree there was a specimen on the Academy grounds that yielded really good rubber; if the tree still exists the seed should be collected. It was a common practice when low lying coffee estates were opened up, to plant along the bounderies and roads and on the edges of ravines areca-nut palms and occasionally Kittul. It is hard to judge with what object, but the planting of the African palms by those opening Liberian coffee and cocoa estates in a similar manner would lead to profitable results, the first fruits would sell in the Island well as seed. In the estates I refer to, nearly all the coffee is abandoned, but the areca-nut and other palms are there, living and bearing as usual. Planters in Mulala Kallura, Kurnegalla and lower Dumbera ought to try their hands at planting these palms. The cost is very trifling.—*Correspondent in Ceylon Times.*

"OUR FOOD SUPPLY."

IN the report on the working of the Sydapet Farm for the year ending 31st March 1879, just issued, some interesting information is supplied of the experiments made there in the cultivation of different descriptions of grain and plants. Appended to it are few papers, one of which, "Our Food Supply," is worth notice. It was drawn up by Mr Benson and submitted to the Famine Commission, the President of which is writing his report in England. In the Madras Presidency wheat, paddy, cholum, cumboo, raggy, and certain descriptions of inferior pulses form the food supplies of the people, and it is calculated that the proportionate area of land used for the pulse crops is 19,931,000 acres. Some of these pulses are considered by competent agriculturists as "little better than unimproved weeds." To support the whole population of the presidency 150 million

cultivate opium, but the *Coree* caste are the most fortunate in their cultivation.

The outturn of the opium per *bigha* varies according to the soil. Very carefully cultivated land Mr. Turnbull says, will produce fifteen seers, but we have been given to understand that twelve seers is the most that can be hoped for. Fifteen is a rare maximum; twelve may be given as a fair outturn of the Benares agency, whilst that of Behar is somewhat in excess of Benares.

The Poppy cultivation can be traced in India to as far back as the sixteenth century. And Mr. Turnbull is of opinion that China is indebted to Nipal for the introduction of the Indian drug; and afterwards by the Dutch who purchased the drug for export long before the East India Company held power in this country.

We will conclude by extracting a small note made by Mr. Turnbull, showing the early date of the cultivation of opium in the Allahabad District. "I am informed in the *Ayeen Akbar* of Abul Fuzul, prepared during the after half of the sixteenth century, it is mentioned that the opium and saltpetre monopolies were in the Sirkars of Korah in the Fatehpur District, and in Allahabad, and in Ghazipur, and the produce of the opium monopoly was 1,000 chests."—*Indian Herald.*

OPIUM CULTIVATION IN BEHAR.

It would appear that opium cultivation is not so very profitable in Behar as is ordinarily supposed. During the year 1878-79, the average yield per beegah in the Behar Agency was 3 seers 15¼ chittacks, and though this average was a little higher than in the previous year, the yield represented in money, at Rs. 4-8 annas per seer of opium of the highest consistency, is about Rs. 18. The average yield in the previous year was 4 seers 5½ chittacks, which, in money value, repesents about Rs. 24-8. The average rent for poppy lands is Rs. 8 per beegah, and taking the cost of cultivation and other incidental costs to be Rs. 3, the profit left to the cultivator is only Rs. 4 to Rs. 5 per beegah. The risk and trouble, however, are great, and it is in some measure inexplicable why people take to the cultivation at all. One explanation suggests itself by reading the Government Resolution published in the *Calcutta Gazette* of the last week. For a people with whom chronic indebtedness is the rule, advances are great baits; specially as these advances are so timed that the landlord's arrears of rent can be met from these advances. The landlord classes in Behar, are, we suppose, most in favour of their ryots taking to poppy. It brings them higher rent, and the system of advances makes the cash rent easily recoverable. The advances and prices paid at the agencies to the poppy cultivator for the most part find their way into the pocket of the landlord, and the ryot does not find himself richer at the end for all his troubles and expenses. With a bad season there is some difficulty in recovering these advances, and we find that, out of the outstanding balances of 1877-78, about 2½ lakhs still remain to be realised, and in 1879, the outstanding balances in the Behar Agency amounted to Rs. 99,572. There is, however, some evidence to show that the cultivation of poppy is not popular. In 1879, the orders of the Government of India directed that efforts should be made to increase the cultivation in both Agencies, but in the Behar Agency the increase in the settlements was but small.—*Behar Herald.*

THE SAIDAPET EXPERIMENTAL FARM.

THE report on the working of this farm for the year ending 31st March 1879, has just been sent to us, and we are now at the end of April 1880. Thus, in one respect, the last petted child of Government has learnt, at a very early age, to walk in the footsteps of its brethren. We must not, however, blame the Superintendent in charge solely, for we see that his report is dated the 3rd May 1879, or just one year ago, save four days. Mr. Benson forwarded it to the Board of Revenue on the 16th July, who reported upon it on the 28th of the same month. On the 2nd of August, he appears to have sent to the Board the annual report of his department on Government Farms, and the members must have been taken aback on on seeing its bulk, for in their order they observe that "they take the opportunity to remark that the reports issued by the Superintendent might, in all cases, be condensed with advantage. The same amount of information could be given in a much briefer space." Brave! ye members of the Board. The fact is, as we have observed frequently, officials are far too fond of writing long reports. If they had really anything to tell the public of which it is not aware, a long report might be tolerated and accepted, even with thankfulness, but when they are made up of twaddle and extracts from previous letters and reports already published, it is necessary for some one to see that unnecessary expense is not incurred in their preparation and publication. The report before us deals specially with the working of the Experimental Farm. The Government order is dated 9th October last, *i.e.*, more than six months back. Shall we be considered too inquisitive if we ask, why it was not sent to us last November? If we were bidden to describe the nature of the order, we should say it is one of a negative description; unlike Balaam, the Government appear to have been inclined to bless, but their remarks partake very much more of the nature of a curse. For instance, we read that the success of the operations on the Farm was affected by a somewhat abnormal season. The crops suffered from fungoid diseases and rats, and it is suggested that the increase in the number of the latter may be due to the too great destruction of snakes. The outturn of the crops generally was not good. Again the Government very naturally observe with regard to the financial results, that, in the absence of all details as to the manner in which the estimate is arrived at, no opinion of the accuracy of the value of the estate and dead stock, which is estimated to have materially increased during the year, can be formed. The last para of the order we give in full:—"A serious falling off is again reported in the value of the farm cattle, and explanation must be afforded. The illness and death of the Australian cows is shown by Mr. Western to have been in all probability, due to preventible causes, and his remarks must be borne in mind, in the treatment of any foreign cattle that may hereafter be bought."

We presume that the whole and sole object for which the farm is kept up, is to prove to the native agriculturists how, with superior modes of cultivation, it is possible to increase the produce of the land in this country, without incurring any very great addition to the expenditure. If we be right in our surmise, then all we have to say is that the farm is a miserable failure. Indeed, whether we judge the working of the farm in accordance with the financial results obtained, or in any other way, it is impossible to, arrive at any other conclusion than that it is a sham and delusion. We have to test it by the rupee-test, but unfortunately we have not all the figures before us to enable us to do so thoroughly. We have, however, sufficient to show our readers what an absurdity it would be for any wealthy ryot to attempt to follow the example set him by the managers of the farm. On turning to the statement of the accounts for the year 1878-79, we find the receipts set down at Rs. 2,589, while the expenditure amounted to Rs. 12,181. A pretty state of things to ask our ryots to imitate, verily. But when we examine into the items of which these sums are composed, we have yet further reason for wonderment. There was spent for the purchase of grains and seeds Rs. 733. Now how much do our readers suppose was obtained in return from the land, which was treated in the most Scientific manner after the teaching of Cirencester? As they cannot possibly guess, we at once mention the amount, *viz.*, Rs. 217 The land does not appear to have given its natural increase, as we are taught to expect in a certain old book. On the contrary it yielded just about a third of the value of the seed put into it. About the Live Stock we shall have something to say presently. The expenditure under that heading is set down at Rs. 3,083, the receipts at Rs. 264!!! The total receipts and expenditures of the farm were in the proportion of five rupees spent to one rupee got. The figures connected with the valuation of the Farm, are equally significant and equally disappointing. We have nothing given us to show how much has been sunk in previous years. We merely find set down under the heading Estate, that the lands, buildings, wells and channels were *valued* at Rs. 66,230 on the 31st March 1878, and that they increased in value during the year by Rs. 470. But whether the increase of Rs. 470 is attributable to money spent on capital account is not stated. though we presume it was, as we find the value on the 31st March 1879 set down at Rs. 66,700. Under the heading Farm, we see it noted that the value of the cattle *decreased* by Rs. 990 during the year, and that of the sheep by Rs. 105; the pigs and poultry showed a slight increase. The one large increase observable in these accounts on the right side is Rs. 3,435 under the head, Fruit and Fuel Trees But what, in the name of wonder, has an experimental farm got to do with the cultivation of orchards? Why should the Saidapet Farm usurp the place so long and so well occupied by our Agri-Horticultural Society? By adding in this sum of Rs 3,435, whoever drew up the accounts had succeeded in showing an increase in the value of the entire estate during the year of Rs. 3,004. If it be omitted from the accounts then the farm, instead of improving, deteriorated in value during the year under review. In spite of what the Superintendent tried to prove, the season was not an abnormal one; at any rate if he chooses to describe it as such, perhaps, he will explain to us, why the ryots all around Madras succeeded in obtaining good average crops.

Let us take section four, headed Live Stock, and see what the farm did in the way of keeping cattle for dairy purposes. Two cows were purchased that had been imported from Australia. Rs. 900 was the price paid for them, or say double the price of Nellore cows. They were brought in December 1878, and they quitted this life, deeply regretted, in February 1879. Why they died no one knows; they were not poisoned, at least so says the Assistant Professor at the Medical College. During the time they were alive, they yielded 656 measures of milk worth Rs. 109 and cost for feeding and attendance fifty-two rupees, so that it would appear they were actually profitable so long as they lived. But this is not the kind of account the public cares for What is wanted is for the Superintendent to take a Nellore cow, let us say, to note the exact cost of its feed during a full year and the exact return it gives in the shape of milk, the value of its calf if it have one, and to find out what is the best and most economical mode of feeding it, so as to keep up its milk-supply as long as possible, or until after it has been got with calf. We have kept cattle for years, and if we were only to take the figures connected with their keep for the two or three months after calving, we could

show a first class balance sheet. As it is, though we are compelled to keep a man specially to look after two cows, though we have to purchase every blade of grass they eat, as well as straw, pottu, bran, and poonac, we can still show a small profit at the end of the year in addition to the value of a calf. We are almost inclined to think that the Government will not be justified in its support of the Farm, if things do not mend very considerably during the course of this year. It may be, of course, that it is conducted altogether on wrong principles to prove a paying concern; but that is just what it ought to prove if it is to be continued. Anybody can show wonderful results with an unlimited purse to go at.—*Madras Times.*

QUININE AS A FEBRIFUGE.

QUININE is admittedly the most valuable tonic and febrifuge ever discovered. Until a few years ago the world was dependent for its supply on certain naturally inaccessible and politically disturbed regions of South America, where the various species of cinchona trees grew wild. Many attempts have been made, sometimes successfully, to introduce this health-sustaining and important plant into different parts of the globe, and we learn that, in San Franciso, the prospects in favour of the successful cultivation of cinchona in the State of California are extremely favourable. The *Bulletin* says:—"The trees, after a start has been made from seeds, are increased by means of cuttings. According to Mr. Morris of Ceylon, returns can be obtained from cinchona plantation at nearly as early a date after planting as from coffee or tea. The best climate is one which has moderate winds and rains, and the tree does best on rich soils. It is reported that the cinchona plantations made by the British Government at Hakgalla, Ceylon, suffered last year from too much rain. An unusually wet season injured and destroyed a large part of the grove. This was partly owing to destructive floods, and partly to the water standing about the roots of the young trees, but many of these have grown again from the base." Experience has shewn that the cinchona grows admirably in Jamaica, some trees in the parish of Manchester having attained a height of twenty-five feet at the age of seven years, growing at an elevation of two thousand feet above the sea. The largest trees we read of are thirty-five feet high, with trunks two feet in circumference and growing in ordinary soil. A few hundred pounds of bark, stripped from these trees, were sent to England in 1878, and sold for forty-five cents per pound. The report of the Government states that the best altitude for cinchona in the island is three thousand feet. It would certainly seem as if the counterpart to the climate of a three thousand feet height in Jamaica could be easily found in the State of California, which may be said to contain within its boundaries almost every known description of climate, from the heat of the tropics to the cold of northern Europe. Besides its valuable medicinal properties cinchona may be reasonably expected to yield a handsome profit in the event of its cultivation proving successful. From the report already alluded to we learn that the bark of *Cinchona Succirubra*, grown in Jamaica, sold in London last year as high as sixty-four cents per pound. A gentleman in charge of some cinchona plantations in the island, writes to Sir Joseph Hooker, the eminent botanist, and states that he cut down one hundred trees of ten-year old *C. Succirubra.* They yielded 1,660 pounds of green bark, which dried to 415 pounds, and sold for two hundred and forty-four dollars. Three hundred trees were planted to each acre, so that cinchona culture has been proved to be very profitable. The wood also is valuable for fuel, and the trees, when cut down, sprout from the stump. Returns once in ten years of over seven hundred dollars per acre, or seventy dollars per year, is worth attention. The plantation on which these results were obtained is to be extended by one hundred acres. This experience is confirmed by Mr. Willis Weaver, of Bogota, who states that profits of $8,000 per acre had been yielded in a few authenticated cases, the bark being of the most valuable species, bringing $1·75 per pound in the English markets. In Bogota, altitude 8,650 feet, temperature 60 degrees Fahrenheit, and where there are heavy frosts, *Cinchona Cordifolia* grows, and even thrives 1,000 feet higher up the mountain side. The true cinchona region varies from 30 degrees to 60 degrees, according to the species, but *C. Succirubra* is not successful in a temperature below 60 degrees and above 70 degrees. The cinchona belt evidently covers 40 degrees extreme variation, and some single varieties have a range of over 30 degrees. On the Andes the oak and walnut grow alongside the cinchona, and the apple, peach, and wild cherry occupy the same range. All these data tend to show that, among the useful foreign plants which the authorities are endeavouring to acclimatize in Japan, the cinchona might well be included, local conditions of soil and temperature being eminently favourable to its growth and propagation."

MINERALOGY.

IT is said that mining enterprise is likely to be checked in certain parts of the Wynaad in consequence of litigation. This has been anticipated for some little time. It was known that the right of ownership of certain blocks was challenged, and that the dispute was likely to culminate in legal hostilities. It is now currently reported that the "fat is in the fire," and that actions and cross-actions are pending. Nothing could exercise a more deterrent effect upon the minds of English speculators than to hear that the legal title to the land was doubtful. For this and indeed for every reason, the best endeavours will no doubt be made to settle ground-right disputes by arbitration, and to preserve "peace with honor" among the various claimants. No question regarding the ground is ever likely to arise in the Kolar goldfield, for it was handed over to the *concessionaires* on the plainest terms possible by the Mysore Government.

MR. EDISON, who seems to discover something new every few days, has now invented methods by which he can extract a greater amount of gold from the rejected residuum of auriferous quartz, termed by miners "tailings," than is obtained by the present processes from the virgin rocks triturated by the crushing mills. The agents he employs are chemistry and electricity. He takes a quantity of "tailings," which, so far as any known process is concerned, contain not a trace of gold, and produces therefrom the precious metal in quanities truly astonishing. He says that by his method he has got gold from concentrated "tailings" at the enormous ratio in some instances of 1,400 dols. per ton, at an expense not exceeding 5 dols. per ton. This discovery was made by him while endeavouring to find a supply of platinum for his electric lamps. Keeping the secret to himself and to a few confidential agents, Mr. Edison at once made contracts for the "tailings" of the largest mines for a term of years. He has thus secured millions of tons of "tailings," and if his manipulations of the refuse really prove as valuable as stated, Mr. Edison ought to become a "veritable Crœsus."

IN our last issue we drew attention to the important fact that silver lead ore had been discovered in large quantities in the Hazareebaugh district. We may add now that ten tons of this argentiferous galena are now in course of shipment to England, and small quantities of gold and auriferous quartz have been found in the same locality. Amongst other minerals some specimens of molybdenite have been discovered and left at our office for inspection. This is a very rare metal of peculiar quality and has only been found in any quantity in Saxony. It is imbedded in fissures of limestone between two layers of hornblend. It has not yet been applied to the arts, but was known to the ancients as a valuable chemical agent. It is found in small flaky cakes of a brilliant platinum colour. When reduced to a paste with oil, bedded in charcoal and exposed to an intense heat, it becomes brittle. By heat it is converted into a white oxide which rises in brilliant needle flowers like those of antimony; nitric acid readily oxidizes and acidifies the metal: nitre detonates with it, and the remaining alkali combines with its oxide. A very small particle of the metal is to be seen in our mineralogical museum, and its ultimate use as a metal, if obtained in quantities, has yet to be discovered. This is the first *bonâ fide* discovery of its presence in India. As previously intimated, we shall have more to say shortly about the working and prospects of these mines.

LITTLE has been said lately about the sapphire mines of Siam, concerning which we heard so much a few months ago. The existence of mines of inferior value has long been known; and about five years ago the new mines were discovered. Owing to their remote situation, it was some time before the news of the discovery reached the Burman and Indian gem dealers. Some fortunate individuals, however, found their way to Calcutta and Rangoon with valuable specimens of the result of their labours. The sapphires brought by them sold

for large sums; and numbers of adventurers at once hastened to take advantage of this fresh source of wealth. Throughout the year 1879, thousands of British subjects from Burmah passed through Bangkok on their way to the mines. The unhealthy conditions of the place, however, proved fatal to numbers of the miners, and although many realised great profits, the rush is now beginning to abate. The only revenue raised from the mines is by a poll-tax of less than six shillings a head. No royalty is paid upon the gems found. The finders of valuable stones are not anxious to publish their good fortune, it is, therefore, impossible to estimate the value of the outturn of the mines. One stone was offered for sale at Chantauboon for Rs. 1,000; afterwards the owner refused Rs. 15,000 for it in Rangoon; and it was finally sold in Calcutta for Rs. 30,000. A sapphire weighing 370 carats in the rough, and 111 carats when cut, is the largest yet known to have been found. Other very valuable specimens have been seen in the possession of persons returning from the mines.

COAL IN BHAGULPORE.

WE have been credibly informed that Baboo Hera Lal's coal mines in the south of this district are now being worked, and that coal is carried to Pathurghatta on the bank of the Ganges near Colgong at something like 3¾ annas per Bhagulpore maund. The coal is at present being used for lime burning, but its use may shortly be extended to other branches of industry. Excellent roofing, and paving tiles were once made at Pathurghatta, and there is no reason why the manufacture of these works should not be revived. Lead mines: About two years ago one Mr. Jones started operations on a lead mine in the estate of Luchmiput Roy in the south of this district, but owing to some cause or other he was obliged to abandon the project. We are told a large sum of money was spent by him for putting up machinery, &c. We are now informed that lead has been found in more favorable localities near Bousee, a place only 32 miles from this station, and is accessible by a first class metalled road. Want of capital is the greatest drawback in Behar; but there is no reason why Bengal should not step in and convert some of its 4 per cent. stocks into working capital to try these mines. Many of the retired men from the Public Works Department would do well to turn their thoughts in this direction.

THE INDIAN GOLD FIELDS.

THE text of Mr. Brough Smyth's report on the Wynaad gold fields was issued last week as a Parliamentary paper. It is an interesting document, giving details of the various reefs, and many practical hints as to the best modes of gold mining. With respect to the extent and character of the Wynaad fields Mr. Smyth states that—

"Gold has been found on the south near Eddacurra, and on the north near Nellacottah, on the west near Vyteri, and on the east as far as Bolingbroke—that is to say, over an area of more than 500 square miles. The reefs are very numerous, and they are more than of the average thickness of those found in other countries; they are of great longitudinal extent, some being traceable by their outcrops for several miles; they are strong and persistent, and highly auriferous at an elevation of less than 500 feet above the sea, and they can be traced thence upwards to a height of nearly 8,000 feet: near them gold can be washed out of almost every dish of earth that is dug; the proportion of gold in some of the soils and reefs in the neighbourhood of Devala is large; and, the country presenting the greatest facilities for prosecuting mining operations at the smallest cost, it must be apparent to all who have given attention to this question that, sooner or later, gold-mining will be established as an important industry in Southern India."

It is, however, he thinks, not unlikely that the first attempts to open out the mines will fail.

"Speculative undertakings, having for their object the making of money by buying and selling shares, are commenced invariably by appointing secretaries and managers at high salaries, and the printing of a prospectus. This is followed by the erection of costly and not seldom wholly unsuitable machinery; no attempts are made to open the mine; and then, after futile endeavours to obtain gold, and a waste of capital, it is pronounced and believed that gold mining on a large scale will never prove remunerative. It is probable that this story will be repeated again and again, here as in other gold-mining countries, until some one of the mines is opened by experienced persons who desire to secure profits not by dealing in shares, but by mining."

This warning is not unneeded. The Government of India, it is announced, purpose to authorise the Madras authorities to grant gold-mining leases of Government lands in lots of from one to thirty acres for a term of ten to twenty years at a rent of five rupees an acre, provided that not less than five labourers per acre are regularly employed on *bonâ fide* mining operations in such manner as the Government approve. And in order to attract capital, they do not propose at present to levy any royalty or tax on the industry.

GOLD MINING PROJECTS.

THE *Times of India's* London Commercial Correspondent, writes by the last mail:—

The strong tendency—almost amounting to a mania—for investment and speculation in gold-mining in India is still being carefully nursed. A "private and confidential" prospectus has been circulated of "The South Indian Gold-Mining Syndicate" for the purpose of providing the requisite capital for obtaining a concession of mining rights of the gold reefs on a property situate south of the Neilgherry Hills, upon which Captain W. N. Middleton has reported very favourably. The capital of the Syndicate is only £7,500, and its primary object being the introduction to the public of a large company for the purpose of working the property described by Captain Middleton, the prospect is held out that in four months subscribers for the £1 shares will receive a dividend of nearly £3 per share, exclusive of their interest in the remainder of the property. While the professional promoters are taking the business of Indian gold-mining company making in hand, the leading advertising stock-brokers are "building" those enterprises which are already before the public. Thus we are told that "the almost unparalleled success which attended the introduction of the South Indian and Indian Glenrock Gold Companies has naturally brought to the service a multitude of Gold-mining projects from all quarters of the globe, but the bulk of them, if not all, appear to have received very little support from the public, as those who have hitherto been in the habit of investing in mines have learnt by bitter experience to become descriminating, and the properties which have been offered for subscription lack one very important feature which distinguished both the South Indian and Indian Glenrock Companies, *viz.*, the Government brand as to their merits." After a reference to "the report of the Indian Government upon the gold mines of Southern India," as proving the intrinsic merit of both undertakings, Mr. William Abbott intimates that "the mere butterfly speculators who applied for shares simply to sell at a premium have evidently been entirely cleared off the market, which is consequently in a much more healthy condition. The fully paid (£1) shares of the South Indian and Glenrock Companies can now be bought at £2, and upon such a report from Government they must advance considerably."

ANOTHER GOLD MINING COMPANY.

THE London Commercial Correspondent of the *Times of India* writing on the 16th ultimo says:—

Another Indian Gold Mining Company! The prospectus has been issued this week of the "Indian Grange Gold Mining Company, with a capital of £100,000, in £1 shares, of which 33,000 are taken by the vendors" in part payment of the purchase money. The Grange Estate, it is stated, extends over more than 300 acres, and contains four reefs of auriferous quartz. It is situated within a mile of the properties of the Indian Glenrock and the South Indian Gold Mining Companies. The estimate of profits is made on the usual principles, thus:—

100 tons of quartz crushed per day for 300 working days — 30,000 tons; this at 10 dwts. of gold per ton — 15,000 oz, which at £3-15 per oz., amounts to per annum ...		... £56,250
Deduct cost of crushing 30,000 tons at 12s. 6d. per ton...	£18,750	
Deduct other expenses, say 5s. per ton	7,500	
		£26,250
100 tons per day will yield net profit per annum of ...		... £30,000

which will be equal to 30 per cent. per annum; and, what is more, as "this estimate is based on only 10 dwts. of gold being obtained per ton of quartz, whereas Mr. Harris, late Manager of the Alpha Gold Mining Company, estimates that double that quantity will be obtained from the reefs on the Grange Estate," 60 per cent. per annum may be reasonably expected. The prospectus states that specimens of quartz from the tunnel "excavated by Mr. Harris were collected on the spot by Captain P. G. Watts and submitted to Mr. Brough Smyth, who stated that they were as rich for gold as any he had in the Wynaad District." Now a reference to Mr. Brough Smyth's report, as officially published by the India Office, fails to discover any mention of quartz from the Grange Estate; but the last paragraph but one is as follows:—"Two stamples sent from the Chumberra Estate by Mr. Lamb;

twelve collected from Cherrambadi and Vallery-Mulla ; one from the Orange Estate, sent by Captain Ponsonby Watts ; one from the Eagle Estate sent by George Salmoon ; two from Terriott and Glenmary Estate, sent by Mr. Percy Batty, two from Oheppa Toda, and three from Glenlee Estate, Manantoddy, sent by Mr. J. H. Anderson, were tested, and gold was found in minute particles in fourteen." It seems, therefore, that the statement of extraordinary strength, on which the British public are invited to risk their money, rests at present on the *ipse dixit* of the vendors who are promoters of the company, and whose consideration is 33,000 fully paid shares and £17,000 in cash, of half the entire capital of the company. The publication of the prospectus of this company has created some misapprehension, owing to the name of the Secretary to the South Indian Gold Mining Company, and the Indian Glenrock Gold Mining Company, appearing thereon, and the offices being in the same building as those lately occupied by these two companies. The Directors of the South Indian and Indian Glenrock Gold Mining Companies have issued a statement that the Indian Orange Gold Mining Company is not brought out under their auspices, nor is it in any way connected with them.

PETROLEUM.

THE pamphlet by Mr. Doyle on "Petroleum, its history, origin, and use," was written, its author tells us in consequence of certain legislation on the subject of the inspection and storage of kerosine oil, already carried out in Queensland, where Mr. Doyle now lives, and contemplated in India, to be carried out there as soon as the report of the Committee appointed some time ago shall have been adopted by the Government. The pamphlet is an interesting one, so much so as to cause us to regret that it is so small. Enough is said, however, to establish the author's chief position, which may best be stated in his own words. He asks :—

I. Are the interests of the consumers identi cal with those which public safety demand ?

II. Whether legislation is required to—

(*a*) Restrict the importation of low standard oils ? or

(*b*) Regulate their carriage and storage ?

"In reply to the first, it is only necessary to remark that general measures (of acknowledged merit) for the common weal often require much more than the community can concede; and when the limit of acquiescence is so far exceeded as to become what is usually called a "hardship," it is then only that mutual interests cease to be in unison. In other words more directly to the point at issue—these interests are only identical when any measure necessary to secure the public against the risk of fire does not greatly inconvenience the consumer of the oil.

With reference to the second, legislation hardly appears to be requisite to restrict the standard of importation, for, on the principle of self-preservation, this would be self-adjusting. The danger before and after shipment, the risk during a long voyage, enhanced freight and insurance, would soon induce shippers to consult their own interests, and select the lowest standard consistent with safety.

Leaving the disadvantages of high st andard oils aside, which have been fully set forth, and dealing with the safety they insure in the abstract, it is doubtful whether the danger could be removed in this and other hot countries except by an exceptionally high standard of refinement—practically impossible. For it may be argued, that, since a flashing point of 100° F. is requisite in a country wher e the temperature rarely attains 80°, even for a few days in the year, it must be 120° or even 150° F. to give the same security in India and Queensland, where the temparature often rises far above 100°.

Under the nearly certain probability that transport by sea and, perhaps, sand carriage, would soon find its own minimum point of the safety, the responsibility of local authorities, including those that watch over public safety, would commence immediately the oil landed arrived at its destination. There are special warehouses for the reception of petroleum at the London and Liverpool docks ; and similar precautions are adopted with reference to the same in the principle ports of the East—*isolation*, as in all other combustibles, being the *sine qua non* for safety—the only provision against accident."

The recommendation embodied in the last paragraph of the above will probably soon be carried out in India and Burmah, in accordance with the draft rule submitted to Government some time ago by the Committee which met in Calcutta, the more important of which we quoted in full in a former issue. We may here take occasion to remark that we think that the local Government might take some steps in the direction of providing safe and isolated storage for kerosine oil without waiting for the Government of India. This city being built for the most part of wood renders the need of extreme precautionary measures more urgent than in a city like Calcutta. Already rules have been issued compelling ships carrying kerosine oil to discharge it below the Hastings, one step, certainly, in the right direction. Could not a storehouse be built on the banks of the river near to where the vessels lay to discharge, so that when a ship comes in she could commence discharging at once ? Only small quantities need then be kept in town, and the risk of accident reduced to a minimum. A vacant site between Monkey Point battery and the nearest mill might be found, where a storehouse sufficiently isolated for all practical purposes could be built. The need for such isolation is abundantly clear from the extract we have given above ; and the sooner the suggestions of the Calcutta Committee are carried out in the above, or in any more practicable way the better.—*Rangoon Times.*

FORESTRY.

CASUARINA PLANTATIONS.

ABOUT eight or ten years ago casuarina planting was all the rage among small capitalists in and around Madras, and lands were taken up from the revenue authorities in large parcels for planting this fuels-producing tree. In the Chingleput district some thousands of acres of land were acquired under the tope rules, but the Board of Revenue soon put an end to the system of granting lands, as it was found that applicants got the land for no other purpose than to grow a crop of casuarina sufficient to pay the outlay incurred in laying out the plantations and then abandoned them. Restrictions were placed upon the assignment of lands, and casuarina plantations are not such attractive undertakings now as they were ten or twelve years ago, when whole villages from the municipal limits of Madras on the Ennore road, up to Coromandel, on the route of what is now known as the Buckingham canal, were filled with thickly studded casuarina plantations. The enterprise was not confined to Europeans ; a few Hindoos who were anxious to invest some of their spare cash in remunerative undertakings, formed joint-stock companies, and started casuarina plantations. Two such ventures were registered under the Indian Companies Act, the capital of each being ten thousand rupees. They did not prove successful : the directors were not able to get the capital required, the managing directors grew lax after the gloss of novelty had passed away, and in the course of three years the companies were wound up. At this time between twelve and thirteen thousand cawnies of land were planted with casuarina in the Chingleput district. Of late, however, there has been no great desire to revive the enterprise, and all that is being done in this direction is the work of the Forest Department which maintains large casuarina plantations for the purpose of supplying fuel to the public and the railway companies. That casuarina planting is remunerative and amply repays the outlay incurred in its cultivation is well-known. In the southern parts of Madras a few enterprising people have started small plantations and to these information supplied in the report of the Sydapet Farm for the year ending 31st March 1879, will be of interest. The cost of planting casuarina is very small at the Sydapet farm ; with ½lb. of seed one thousand plants were raised, the cost being Rs. 2 against five rupees a thousand plants, the usual price in the market. Sixty thousand casuarina trees were raised in the farm in the year and four coolies were engaged to prepare the ground, sow, water, and weed for four months ; were 120,000 trees raised an additional cooly only would be necessary. The trees were planted at some distance from each other ; twelve square feet being the space allotted. To protect the casuarinas from the sun, castor beans were planted between them, and it is said that if the first crop of beans turned out well, it would have paid the cost of watering the whole plantation. In planting casuarinas it has been found that, if they are put down too far from each other, the main stems instead of growing straight are liable to fork and produce many side branches. The want of a good stem considerably reduces the value of the tree. It is therefore better to plant them close to each other, giving each tree 12 square feet. 3,630 plants were put down on an acre of land, and the expense incurred was Rs. 49. The most expensive item in casuarina planting is manure and the cost of carting which is set down at Rs. 36 per acre. In some places where it is difficult to get water, the cost is increased to Rs. 100, but after the first year, the expenses are light. The sixty thousand plants put down at Sydapet in 1878-79 will, in a short time hence, give a small return.—*Madras Standard.*

GARDEN.

CULTIVATION OF FRUIT TREES.

DR. JOHN SHORTT, F.L S., writes to us from Yercaud :—

I have read with interest your correspondent *Observer's* letter in the *Mail* of the 13th ultimo, on "Fruit Trees," and I write to say that the plan of notching fruit trees is familiar to natives of this presidency, and I have seen it practised on the cocoanut, palm, jack, mango, and other trees. When these trees do not fruit, the trunk is beaten with the iron shod end of a rice-pounder, so as to leave circular indentations on the bar to arrest the too rapid flow of the sap downwards, and thus render the tree fruitful. I have seen the cocoanut trees thus operated on about Vellore. As regards jack trees, the natives prefer to weight the forked end of the branches with large stones, and it is no unusual thing to see these trees carrying half-a-dozen or more large stones tied on to them. Thus weighting the tree may possibly have the same effect of arresting the too rapid flow of the sap by the pressure exerted on the bark. Another familiar practice is to give the jack a companion, by planting a cutting of the *Euphorbia Nivulia* or *Ella Cullo* (Tamil) under it, or next the stem ; and it is believed to possess some mysterious power of rendering the jack tree

fruitful. How this is effected I could never ascertain, but the practice is general and believed in. As regards the planting of jack-stones and growing the young plants, several ways are in vogue ; one is to plant a whole fruit, and, as the several plants grow up, to tie them together so as eventually to form one single trunk by the union of the many plants that sprout up (Drury.) Another is to encourage the plant to grow lanky under shade, and, when it has attained sufficient height, to coil it into the form of a hoop, leaving the tuft of young leaves above the soil and planting the rest under ground (Firminger.) I generally prefer planting jack stone whilst fresh in nursery beds, singly one season and the following season, just before the rains, transplant them out, and if attention be given them for a while till they are established in their new locality, there is no trouble with them after, except to prevent cattle trespass. The jack wood is highly prized for furniture of all kinds, and has been imported to England. and the dye from it is largely used in Burmah. For full information on these points I would refer your readers to Balfour's Cyclopædia of India, article *Artocarpus integrifolia* in the 1st volume, where much information is embodied on these subjects. The name jack seems to be derived from the Malayalum word *jacka* for the fruit according to Balfour, but Drury says that the name jack is a corruption from the Sanscrit word "*Schackka*" which means the fruit of the tree. The plan of supporting the mango fruit artificially is also well known, and practised to some small extent. The difficulty of reaching fruits at the extreme end of large trees has always proved a difficulty to the natives, and prevents the practice from becoming general, but it is put in operation as regards the pumelow and other fruits, in which the weight of the fruit is cleverly transferred to the surrounding branches by means of straw pads and plaintain fibres. The practice may be witnessed at any time about the fruit gardens at Arcot. As regards "girdling" or rather "ringing," the more correct term, it is well known in English Horticulture by the cutting of a ring of bark from a branch or tree to render it fruitful, but this practice requires a knowledge of the composition of the tree to make it successful, for in no case should the ring cut through the alburnum or sap wood ; if this be done, the tree is destroyed. This is what the planter does in destroying the sap wood by ringing, and thus kills the tree to make room for his plants eventually ; but how often, from this fact not being known, the tree is rung and still stands flourishing in all its verdure. Examples of this may be seen on the Shevaroys occasionally. As regards fruit trees, should ringing be practised, care must be taken not to cut through the alburnum or sap wood, but only so much of the outer bark as will reach and expose the sap wood, to accomplish which, tact and cleverness are necessary to arrest its too rapid flow downwards.—*Madras Paper.*

ON THE TREATMENT OF HEPATICAS, PRIMROSES, AURICULAS, AND POLYANTHUSES.

THE interest in these early spring flowers, which is yearly on the increase, renders it very desirable that they should be multiplied in numbers as rapidly as possible. No garden in spring can be considered well provided with early flowers if a goodly supply of these be not included in the list of spring flowers cultivated in it. They are among the most showy, profuse, and lasting of the flowers of the season. Complaints are heard in various quarters that they are slow to increase ; and, like all really good things, it must be admitted that they cannot be multiplied in the ratio of their merits. But they may be increased with greater rapidity than they generally are, if right methods, and the proper season, are adopted for operating on them with this object in view. A very common error in their propagation is to divide too early or too late. The best time for this operation is immediately flowering ceases, and the plants begin to grow. If done before, and the division necessarily small, there is risk of much loss; and the same will, in all probability, happen, if it is done any time after growth ceases, except it be attended to immediately, so that the divisions may have time to establish themselves perfectly before winter sets in. We prefer attention being given to this point in their culture immediately on growth beginning and flowering ending, which are nearly simultaneous in this occurrence. When divided very small a little sandy compost should be used immediately about the roots to encourage the formation of fibres abundantly ; this is especially necessary in heavy loam or clay soil. If the weather is dry at the time of dividing, give a good watering before fully closing the soil in about the roots, and continue to water as the weather may necessitate. When they have established themselves, and are growing freely, they will be benefited by frequent supplies of liquid manure, and from the first after being divided they should be well mulched with leaf mould or manure, to encourage the formation of fibres on the surface of the soil, and retain moisture during periods of drought.—*North British Agriculturist.*

VALERIANA PHU AUREA.

THIS is one of the most effective of spring hardy plants. Its effect does not, however, arise from any showiness of flowers, but from the leaves, which are a deep golden yellow, the finest yellow coloured vegetation, whether in flowers or leaves, that we happen to know for the flower garden. The well-known Golden Feather is quite inferior in effect to it when at its best. Unfortunately, like many other fine things, it has a drawback. It is only fitted to adorn in the spring months. The leaves become quite green when the sun becomes powerful ; and when the plant begins to throw up its flower stems, which, being anything but ornamental, do not in the least compensate for the loss of colour sustained by the leaves. Nevertheless, the plant is well worth the attention of all who have to do with spring bedding, for it has no equal in its shade of colour at any season either for massing or lines. It is perfectly hardy and is easily increased by division.—*Ibid.*

TEA.

AS far as we (*Indian Tea Gazette*) have been able to ascertain, we estimate the production of Indian tea this season at 46 million pounds, should no specially adverse climatic influences supervene.

INDIAN TEA CULTIVATION.—The land under tea in Assam in 1878 was 140,146 acres ; in Bengal, 32,255 ; in the North-West Provinces, 5,380 ; and in other districts 10,980, making a total for British India of 187,961. The total quantity of tea made in all was 36,143,045lb. The average yield in pounds per acre of mature plants was in Assam 286lb., in Bengal 263lb., and in the Punjab and North-West Provinces about 200lb. There are 2,330 plantations in all, of which 850 are in Assam, 235 in Bengal, and 1,174 in the Punjab.

A CORRESPONDENT signing himself PEKOES writes to a contemporary on the present position of Indian tea in connection with the taste for tea as now existing at home, and strikes the nail on the head when he asserts that the consumer at home has not yet had an opportunity of tasting pure Indian tea. And when he has, it has been that class of rasping, pungent, malty tea, made with a view to bolster up China trash, and never intended to be drunk pure. He also speaks of the immense profits which are made by the middlemen at home, and quotes a tea which sells at, say, sevenpence per pound in Mincing-lane, as costing the consumer three shillings per pound, after sixpence duty has been added. This tea then costs 1*s.* 1*d.* per lb., and as it sells to the consumer at 3*s.*, it follows that somehow a profit of 177 per cent. has been made on it between the auctioneer and the consumer. The manufacturer gets none of this. We think it exceedingly likely that 3*s.* is rather an exaggerated figure for a 7*d.* tea ; however, there can be no doubt but that very large profits are made by these middlemen. Even if this tea sold at 2*s.*, a profit of 85 per cent. would be made on it, and this while the individual who ought to make the largest profit on it—*viz.*, the man who has risked his capital in the venture—is finding his capital disappearing gradually from his sight.

To a very large extent the planters are themselves to blame for this state of affairs. They refuse to associate. Were they only to do this, and combine for praiseworthy objects—self-protection among them—such a state of affairs would be impossible, as the Indian tea industry is now of sufficient magnitude to exert an influence and make itself respected in commercial centres. We have written on this before, but it seems of little use. The individual jealousies of each company bulk larger in the eyes of proprietors than do the general prospects of the entire industry, and until the mischief of this is seen, and united action taken, we can hope for nothing in the way of amelioration.

A CORRESPONDENT to a contemporary speaking of the proposed attempt to introduce Indian tea to the Australian consumer, mentions as one of the difficulties to be overcome, the fact that the taste for Indian tea is like that for beer or tobacco, an acquired one, and that it will have to be created slowly. We do not think this is the case to a very large extent. We think this correspondent is only right if he refers to Indian tea as now made for mixing purposes. If this be his meaning we agree with him, and with regard to the taste for this class of tea we believe, moreover, that it never will be acquired by the lover of the genuine beverage. There is tea and tea, and we look upon the production made from the rasping tea of the present day, much as a lover of delicately flavoured tea would regard his cup, if his servant had boiled it for half-an-hour, instead of simply infusing it in boiling water. We find

a steadily increasing local demand for the teas of the Kangra Valley, Dehra Doon, and Kumaon, and this supports our contention that tea if properly made will always command fair prices. These manufacturers do not make rasping tea, simply because they cannot; the *jat* of plant of the Upper Provinces is not suitable for its production; the climate is too cold, and the leaf, wanting the forcing power of the Assam climate, and the richness and strength of the Assam black soil, has not the inherent succulence to qualify it for that process; consequently the planters make a delicately flavoured tea, which is what all tea should be, and which is therefore in demand for private consumption. This tea, if sent to Calcutta, would be sacrificed at auction, where delicacy of flavour is out of fashion, and where little else is wanting but strength and excessive pungency. This fact alone goes to prove that the taste for pure Indian tea is not an acquired one, to the extent referred to in speaking of its probable introduction into the Australian colonies. That the taste for malty, pungent, rasping tea is, and ever will be, one to be acquired we do not doubt. At the same time we have no hesitation in calling this bitter decoction not tea at all, as that beverage is understood by all true lovers of it. In the process of manufacture the fermentation is checked at too early a stage, and this resumes itself as soon as infusion commences; thus we have a decoction such as is known in Scotland by the term applied to boiled tea, *viz.*, *hay bree.*

WE would invite those of our readers who are interested in the tea-trade of India to study a letter which we reproduced, in our last issue, from the *Englishman*. The writer draws attention to two salient facts—that the superiority of Indian to China tea is now almost universally admitted, and that, in spite of this, the finer is being still beaten by the inferior article, in the markets of Europe. Does the planters' supineness account for this unsatisfactory state of things? Or is the trade being throttled, so to speak, by an over-plus of middlemen? Or is its progress interfered with by trade-tricks at home? Some assure us that all these causes combine to ensure the failure of one of the most promising of Indian industries: and their explanation is certainly in keeping with the enormous difference between the Calcutta sale-prices, and the prices charged by London retailers. At the beginning of this month some of the Calcutta quotations were six annas a pound—about seven pence. Adding six pence for duty the price amounts to thirteen pence a pound; " yet such teas cannot be bought at home for less than three shillings to four-and-sixpence a pound." Surely, a retail price of two shillings might leave an ample margin for brokers' and other middlemens' profits. To heap on intermediate charges, beyond a certain point, is only to kill the goose that lays the golden egg. A reduction of such charges to the lowest possible limit would benefit the brokers and others as well as the producers and the ultimate consumers—for the obvious reason that it would stimulate demand. But the " tricks " of the trade ought also to be discouraged. To mix good Indian tea with China rubbish—as is done by the retailers at home—is not exactly a process calculated to enhance the reputation of the former. Curiously enough, some of the planters are themselves the greatest offenders in the matter of " mixtures." Again, as regards the Kangra valley, and some other localities in the Western Himalayas, the planters are certainly more deficient in *esprit de corps* than is compatible with their true interests. What have they done to establish their footing in Kurrachee,—the route by which is by far the shortest and cheapest to the markets of Europe? And what have the Indian planters, as a body, done to get themselves directly and properly represented in London itself? Almost nothing.

IT seems that the past year has not been more favorable for Indian tea cultivators than for Ceylon coffee planters. According to published returns of Assam and Cachar tea companies, their yield per acre has been far less than in previous years, and whilst the cost per lb. of the article produced has been greater, the price realised at home has been less. So large a portion of Indian teas are the produce of plantations owned by companies who publish their accounts yearly, that the position of the tea industry of India and its actual net results can be gauged with tolerable accuracy; this is not the case with coffee in Ceylon where, however, we are able to gather a tolerably accurate idea of the prosperity of the coffee enterprise from facts patent to most of us. In strong contrast with the working of Indian tea companies are the latest annual reports of Ceylon Coffee Companies, and bad as are the times in reference to coffee production, we shall be surprised if the next accounts of the Ceylon Companies do not shew very satisfactory results.

OF the 300,000,000 of population of China and it dependencies, every man who can anyhow afford it, drinks tea morning, noon, and night. The area of unoccupied land suitable for tea-planting is practically unlimited, and as, of the tea planted, much remains unpicked every year, it may be presumed that the cost of the beverage is not much hindrance to tea-drinking among almost all the entire adult population.

THE price paid to the China tea grower, for the raw leaf, is ¾*d.* a lb., and it is estimated that the cost of picking, firing, packing, inland freight and duty, export duty, and freight and charges to London or New York, is not less than 8*d.* per lb of teas.

THE TEA PLANTERS' DIFFICULTIES.—Our tea planters are constantly having impressed upon them the necessity of studying quality more than quantity in their produce; but it seems to be an uncertain matter as to what quality will suit the tastes of the London buyers. Messrs. George White & Co., in their last circular, tell us:—" The tastes of the trade have for many years been changing, but we believe that if certain gardens could guarantee a supply of good standard tea of uniform quality, and in sufficient quantity, many retail men would prefer to buy such marks regularly, rather than be continually changing their mixtures, as they do now-a-days by purchasing little lots of six or eight chests at a time, which they find it difficult afterwards to match."

THE *Indian Tea Gazette* SAYS:—We hear from two or three quarters in Assam and Cachar bitter complaints about the nefarious habit which some men indulge in, of enticing away and harbouring other men's laborers. We have before dwelt on this subject, and can only repeat that we consider intentionally and knowingly taking away a brother planter's coolies to be quite on a par with, and as bad as, stealing his purse. Why don't the right-minded planters in a district where this sort of thing prevails try the effect of a little lynch-law on any notorious offender.

IT must be satisfactory to Indian planters to see the Press of Australia interesting themselves in the question of the introduction of their teas into the local markets, even though its zeal in the cause is qualified by some misgiving. All that is necessary to ensure success in the enterprise is, we are convinced, a certain amount of mutual accommodation, combined with the removal of mutual misunderstanding, and the more the question is discussed in a spirit of fairness, the more likely this is to be attained.

After quoting our article of February 13 on the subject, the Melbourne *Daily Telegraph* goes on to say that it sees and acknowledges the force of our arguments, and on purely national grounds would like to see Englishmen in India " participating in the first hand advantages now enjoyed by the Chinese planters." " But," continues the writer, " there are two serious obstacles very difficult to overcome. The first is prejudice, and this, at present is not in favour of Indian teas. Like olive eating, the liking for tea grown on the Indian hills is an acquired taste. We are told, and we feel sure with truth, that no other teas are so pure, but while their purity is kept intact they must also be made pleasant to palates accustomed for generations to China teas. The other difficulty is the price, and this is the most insuperable. Indian teas are far more expensive, and when the simple query is put, why should we pay more for an article we do not like, while we can get what we prefer for less money? we do not find it easy to frame a cogent reply. If Indian teas can be grown to suit our taste, and put on our markets at equal to Chinese values, they will inevitably command a share of our trade, instead of being restricted, as at present, to the requirements of a few epicures."

Now one of these objections, that of cost, is based on pure misapprehension, for, though Indian tea is, no doubt, weight for weight, dearer on the average than its China rival, it yields so much stronger a liquor, and consequently can be made to go so much further, that in the end it is considerably cheaper. As to the objection that Indian tea is unpalatable to tastes not habituated to its use, though it is no doubt true as far as it goes, it is one which will disappear with time and management. Given the opportunity, the taste, in nine cases out of ten, is rapidly acquired, and when once acquired it is not easily lost. The difficulty lies in making a beginning; and this difficulty is to be overcome by that process of admixture which has succeeded so well in England.

According to all accounts the Australian market should present a specially good opening for Indian teas, for the simple reason that the China teas exported for Colonial use are exceptionally poor.

THERE is good reason, we think, for hoping that the tea syndicate lately formed, will be able to do much towards promoting that mutual accommodation between the Indian planting interest and the trade in Australia which is an indispensible condition of success in the attempt to introduce our teas into that colony. The objects of the syndicate, as we understand them, and as set forth in their programme, are to enlist the interests of those already in the trade in the promotion and extension of the consumption of Indian teas, or, to quote the words of their circular, to interest produce brokers and tea dealers in the extension of the trade, and to arrange with them for mixing and blending teas, &c., &c." It is not the wish of those interested to promote opposition, but rather to solicit the support of the colonial dealers, and it is the general opinion that the scale on which the syndicate will be in a position to conduct its operations will ensure a fair trial for Indian teas in Australia. They will then stand on their own merits, and, if appreciated, the object for which the syndicate has been formed will have been accomplished, and the trade will flow into the regular channels.

We understand that, in addition to sending down a special agent of their own, it is the intention of the syndicate to appoint an influential house in Melbourne to represent their interests, and to assist with their influence in carrying out the object in view.

The movement has been responded to most cordially by proprietors of gardens, and a large quantity of tea has been placed at the disposal of the committee, to be bulked and blended in such a manner as to render the consignments suitable to the Australian market, the proceeds of sales being divided *pro rata* according to an independent valuation of each parcel before bulking.

The expenses of the representative will be paid by the syndicate, and, with the contributions of tea received from all interested to be sent down for sale, the operations of the syndicate will be on such a scale as could not possibly be undertaken by private and individual enterprise, and it is gratifying to see the cordial unanimity with which the tea growers of India have recognised the necessity of opening up new markets for their produce.

There is no reason why a similar effort should not be made to introduce Indian tea in America.

We learn that 2,000 lb. of Ceylon tea, recently sent to Melbourne sold—two-thirds of the quantity at 2*s*. per lb., and the other third at 1*s*. 6*d*., prices which must be considered very satisfactory in a new market. We may notice that the Customs duty on tea and coffee in Victoria, New South Wales, and South Australia is 3*d*. per lb., in New Zealand and Tasmania, on the other hand, while it is 3*d*. on coffee it is 6*d*. on tea; in Queensland both tea and coffee are taxed 6*d*. per lb. In Western Australia coffee is charged 1*d*. and tea 6*d*. per lb. at the customs.

OPENING OF THE MACAO TEA SEASON.

In connection with the opening of the Macao tea season, the *China Mail* draws attention to the ever-recurring tendency to over-do this article as to the prices first paid for it. It is said that the usual excessive rates have been paid for the earlier samples; and this fact might be accepted quietly if it merely affected those immediately concerned. The policy, however, of rushing up prices of first shipments tends materially to damage the chance of obtaining tea at anything like reasonable rates; and the same system blindly followed year after year results only in profit to the native tea men, who chuckle and laugh in their capacious sleeves at the want of "nous" and entire lack of combination displayed by the foreign buyers. The latest telegrams, referring to the last shipment of Congou for the season 1879-80, do not favour the notion that the tea brokers at home are likely to follow in the wake of tea buyers on this side. Common Congous, which had been selling for 9*d*. per lb., had declined to 7¼*d*. Such a decline, when it affects any other article in the Home market, produces corresponding caution and prudence at this end of the line; but the effect is but too frequently of a different kind in regard to tea and silk. There is every reason to believe that much of the success which has attended business during last season was owing to the combination, such as it was, organised by foreign buyers before the opening of the various tea markets in China. It is sincerely to be wished that the same course will be followed this season, with a like favourable result.

NOTES ON THE COMING TEA SEASON.

(Foochow Herald.)

That the successful outturn of tea shipments from this port in 1879-80 was due in large measure to the self-restraint and pre-concerted unity of action exercised by buyers is now, we imagine, a generally recognised fact. And it must follow, that, unless corresponding action be at once taken, the opening of the new season will prove less favourable than the preceeding one, if not positively disastrous.

It is perhaps unnecessary to remind our readers of certain threatened political complications which may at any moment develope into powerful agencies of disaster. But, apart from purely political considerations, there is another element of danger in the almost absolute certainty that teamen will, in the ensuing month, bring forward a superabundant supply of leaf. These unfavourable conditions may, however, be converted from a factor of loss into one of gain by an early consensus of opinion, made formal and binding on all buyers, to the three following points:—

First.—Market not to be opened before the 1st July.

Secondly.—Not over Tls. 20 per picul to be paid for any Congou tea.

Thirdly.—Buyers to engage not to ship tea on Chinese account.

Let the foregoing points be made sufficiently binding, and stocks will assuredly accumulate. Teamen will then be at the mercy of foreign buyers and supplies on the London market will not necessarily be squeezed dry of all profit by the Chinese seller. But should foreign buyers rush madly in, and a wild competition ensue, as in former years, the course of the London market may be predicated with absolute certainty. The same old causes must produce like unsatisfactory results. Scores of millions of pounds weight will be thrown upon the London market in the first two months of the season, and telegraphic advices of the rest of the crop being already afloat, will infallibly induce the usual haste to realise, and the hindmost must then, as in former years, come off second best.

It may be urged that the hardest thing in the world is to do *nothing* in a masterly manner, and that this sore task would be the lot of the Foochow *chaahsses* during the months of May and June if our advice as to united action were followed. But those who would grow rich must keep cool, otherwise, it will be the old story of a bad season:—with the auctioneer's hammer rapping out, as the sequel, over the furniture of "the house," a fresh verification of the truth "United we stand; divided we fall."

THE TEA PLANTING INDUSTRY.

There seems but too much reason to fear that we are approaching a critical period in the fortunes of teaplanting in India. The margins of profit is rapidly and surely nearing the vanishing point; and, though planters surely may still do something to improve the quality, and diminish the cost of production, of their outturn, there is every prospect of the result of their best efforts in this direction being more than neutralized by the growth of competition among producers. It is not only that the outturn of the Indian gardens is steadily increasing, but new competitors are entering the field on all sides, and with demand lagging behind supply, the low cost of production in China is beginning to tell on prices in a way which it never did before, when there was room for all in the market. At such a juncture, it tells cruelly against the ability of the Indian planter to hold his own that he is heavily handicapped by restrictions from which his rivals are free. Indian labour is usually regarded as cheap labour, and the time is within memory when the Indian tea-planter looked to its cheapness as a guarantee against the competition of countries which have now established themselves in the field. No doubt, Indian labour, when left to the operation of natural laws, is still cheap labour; but this cannot be said of Indian labour in Assam. There, after making every allowance for the remoteness of the province from its recruiting grounds, and for the disamenities of the climate, both of which, under any circumstances, would add materially to its cost, it is extravagantly dear. We trust that it is in an opportune moment that the Indian Tea Districts Association has come forward with a strong memorial to the Viceroy on this important question. The Association point out, on the one hand, that the true remedy for that insalubrity of climate from which Europeans and natives in Assam alike suffer, lies, not in imposing vexatious restrictions upon immigration, but in the re-peopling of the country and the reclamation of its waste lands and, on the other hand, that such risk to health and life as this operation must necessarily involve, is insignificant in comparison with the direct morality and wide-spread lowering of the standard of vitality which result from over-population in other parts of India.—*Englishman.*

TEA IN JAPAN.

Some time since a correspondent asked us to obtain certain information regarding tea matters from Japan. Through the courteous assistance of the Editor of the *Japan Herald*, we are able to state as follows:—Foreigners in Japan have nothing to do with the tea until it is brought down to the Treaty ports. There is, therefore, no opening whatever for a tea-maker; and no foreigner is allowed to interfere with the manipulation. The tea plant was originally brought to Japan from China, but appears almost from its long acclimatisation, to have changed, to a certain extent, its character. The product is gradually increasing. In 1873-4 it was 17 millions. This last amount is, however, an excessive one, caused by there having been a short stock in America and there were consequently an increased demand of high prices and a corresponding tendency to ship there direct. This tea is all *green*, and the entire crop is taken in America. The area of ground occupieds by tea gardens is unknown, probably, even to the Government, a no return of their extent has ever been published. The gardens are generally farmed or let out,—the lessee taking the crop of leaves. The tea is brought down to the open ports in a half-prepared condition. It is purchased in Yokohama, in large or small lots as it arrives, by the European tea-tasters and then is re-fired, colored, and packed under foreign supervision. A considerable quantity of coloring matter is used in the preparation. The tea season commences in May, and before this nearly all the tea-tasters of Yokohama take a run over to America to ascertain the latest tendency in the public taste, in order to regulate the firing, coloring, &c., accordingly. The cup quality is thin, but delicate in favour; whilst the leaf is rough-looking, and wanting in make. The Government do not own any tea gardens, but they have given a certain amount of assistance to an attempt which has been carried on here for the last two or three years to make *black* tea for the European market. This tea was said in many respects to resemble Indian tea, and

several of the Japan tea-men being favorably impressed with it, when it first made its appearance purchased small quantities and sent them to London; but the opinion there was decidedly adverse to the new experiment, and nearly all of the shipments lost money. For the last two years the Japanese have tried the same experiment on their own account, but with equally unsatisfactory results, and the losses incurred are said to be heavy.

THE TEA CRISIS.

THERE seems but too much reason to fear that we are approaching a critical period in the fortunes of tea planting in India. The margin of profit is rapidly and surely nearing the vanishing point; and though planters may still do something to improve the quality, and diminish the cost of production of their outturn, there is every prospect of the result of their best efforts in this direction, being more than neutralised by the growth of competition among producers. It is not only that the outturn of the Indian gardens is steadily increasing, but new competitors are entering the field on all sides, and, with demand lagging behind supply the low cost of production in China, is beginning to tell on prices in a way which it never did before, when there was room for all in the market. At such a juncture, it tells cruelly against the ability of the Indian planter to hold his own, that he is heavily handicapped by restrictions from which his rivals are free. Indian labour is usually regarded as cheap labour, and the time is within memory when the Indian tea-planter looked to its cheapness as a guarantee against the competition of countries, which have now established themselves in the field. No doubt, Indian labour, when left to the operation of natural laws, is still cheap labour; but this cannot be said of Indian labour in Assam. There, after making every allowance for the remoteness of the province from its recruiting grounds, and for the disamenities of the climate, both of which, under any circumstances, would add materially to its cost, it is extravagantly dear. For this extravagant dearness the Government alone is responsible, and it has now become a grave question for the Government whether, for the sake of all concerned, of the cooly as well as of the planter of the public revenue as well as of private interests, it will by a revision of its labour regulations, give the tea enterprise a new lease of life, or whether, from a one-sided view of its duty, it will elect to hold its hand and see the industry die out.

We trust that it is in an opportune moment that the Indian Tea Districts Association has come forward with a strong memorial to the Viceroy on this important question.

The Association point out, on the one hand, that the true remedy for that insalubrity of climate, from which Europeans and natives in Assam alike suffer, lies, not in imposing vexatious restrictions upon immigration, but in the repeopling of the country and the reclamation of its waste lands, and on the other hand, that such risk to health and life as this operation must necessarily involve, is insignificant in comparison with the direct morrality and widespread lowering of the standard of vitality which result from over population in other parts of India.

Taking this reasonable view of the case, they question whether a certain amount of direct expenditure might not be beneficially applied in promoting immigration into Assam At the same time they urge the necessity of a general revision of Act VII. (B. C.) of 1873, in the direction of greater simplicity, and, pending such a revision, of dealing promptly with certain points of pressing importance. These are :—

First.—The extension of the maximum period of contracts from three to five years.

Secondly.—A simplification of the regulations and conditions attaching to recruitment in the labour districts, with instruction to the local officers to co-operate in a friendly spirit towards smoothing the difficulties which stand in the way, thus reducing the cost.

Thirdly.—That the influence of the Government be exercised to induce the rulers and sirdars of the quasi-independent territories bordering the ordinary recruiting districts, to remove the impediments which stands in the way of free emigration from such territories, under a guarantee that the emigrants shall receive the same degree of protection as those drawn from our own districts.

Fourthly.—If the scale of diet and medical comforts prescribed for the immigrants while on board the river steamers in transit, shall not have been simplified and reduced in cost, as the Association understands, was in contemplation by the Government, that such may be done.

They further add their opinion that it would tend towards greater regularity and economy if the obligation to provide diet, medical attendance, and sick comforts, were transferred from the employers to the steamer companies as forming part of their contract as carriers.

The considerations which argue in favour of the first of the above concessions are almost too obvious to stand in need of comment. Not only is the term of three years absurdly short, when compared with the initial cost of the cooly, but it is only towards its close that he becomes thoroughly acclimatised, and the planter begins to reap the full value of his services. The fourth point, we believe, has already engaged the attention of the Government. The desirability of the other reforms asked for is scarcely less obvious, though the practical difficulties in the way of their realisation, will probably prove less easily surmountable.

THE TEA SYNDICATE.

THE following circular has been issued by the Calcutta Tea Syndicate :—

It has been suggested to the Committee of the Syndicate, by Planters and Proprietors, that many Public Companies and Private Concerns are desirous of co-operating with the Merchants and Agents of Calcutta, who have subscribed to the above object, by forwarding consignments of Tea for disposal on their account at the best price obtainable in the Melbourne market.

As such consignments would materially aid the object in view, and enable the Syndicate to carry on operations on a much larger scale than could be attempted if the business were restricted to the amount of subscriptions in cash, the Committee would request the favor of your assistance in arranging with the estates under your agency for such consignments as they may deem expedient.

The representative appointed to proceed to Melbourne, Mr. D A. Sibthorp, is a professional Tea-taster, who has had long experience of both the London and Calcutta markets and in the Tea-growing districts, and is also believed to possess the business qualifications essential for the establishment of the trade.

He will enter on his duties in Calcutta in June next, and proceed to Melbourne in August, so as to arrive there in good time to make all preliminary arrangements before the opening of the exhibition in October.

During his stay in Calcutta, he will be prepared to receive through the Calcutta Agents of Gardens, consignments of Tea, and arrange for their shipment under the direction of the Committee.

It is well-known and admitted that one of the causes operating against the more rapid extension of the consumption of Indian teas in England, is the immense variety in the classification and the quality of the Teas offered for sale throughout the year, and the consequent impossibility of retail dealers obtaining the same standard continuously. It is, therefore, in the opinion of the Committee, most important that the tea shipped to Australia by the Syndicate should be of a description that can easily and at any time be repeated if orders be sent up by dealers and others.

In order to secure uniformity in quality and appearance as far as possible, and thus create a demand for that class of Tea which the Committee are informed is most in request to Australia, it is proposed to bulk the Teas from the different districts before shipment, classifying them under the descriptions of Assam Teas Darjeeling Tea, Cachar Tea, &c., samples of which will be retained here by the Syndicate for general reference. The Teas thus bulked to be shipped under the Syndicate mark.

The detailed instructions given will, to a great extent, secure a degree of uniformity in the Tea forwarded, but to guard against the possibility of the interests of any one shipper being affected by the bulking together of Teas of different quality and price, it will be the duty of Mr. Sibthorp, in concert with the Calcutta brokers to carefully inspect and value every parcel, and to set aside for bulking only those parcels which according to their judgment are considered suitable.

The proceeds of sales will be returned to the various contributors of Tea in proportion to the value fixed on each parcel before bulking.

The advantages of this course are not confined to the better opportunity thus afforded of establishing a large trade in the class of Tea most in demand in the Colonies, but it also ensures that unity of action and identity of interests so essential to success.

The Merchants and Agents of Calcutta have subscribed about Rs. 20,000, and the Government of India have been pleased to sanction a grant of Rs. 10,000 towards the expenses of the undertaking. It now remains for proprietors to give their co-operation to the common object by consignments of Tea to be dealt with as proposed above, and although sales in Australia, to begin with, may not result so favourably as sales in Calcutta or London, the difference should not fall heavily on any individual Garden when only a few chests are sent from each, and a combined effort on such a scale will probably be of great ultimate advantage to all interested, by creating a demand that may divert a considerable quantity of Indian Tea from the overstocked market of London.

Particular attention is requested to the instructions given regarding quality, packing, marking, &c., and all consignments should reach Calcutta not later than the end of June, in order that Mr. Sibthorp may have plenty of time to arrange for shipment; but should any parcels arrive after Mr. Sibthorp's departure, the firms of Brokers who are members of the Syndicate have kindly offered to classify them for shipment.

The Syndicate will also be glad to take charge of consignments with Garden marks from those who have contributed not less than 20 half-chests for bulking and to ship them for sale, charging 2½ per cent. commission proceeds exclusive of all Australian charges.

The requirements of the Australian Market, as far as can be ascertained are principally for the lower grades, and the Committee, therefore, recommend that the bulk of tea forwarded should consist of—

1. Broken Souchongs, or Broken Pekoe Souchong.—Black *leafy* with strong, dark, full-flavoured liquor.

N. B.—Dusty Broken to be particulary avoided.

2. Souchongs and Pekoe Souchongs.—Small even made leaf of good appearance, with clean, dark liquor.

The above two classes should form the bulk of the Consignment, but a small quantity of the following will probably find a ready sale, *viz* :—

3. Pekoe.—A Good medium Pekoe leaf with some tip.

Fair strength and brisk flavor Darjeeling Pekoes and Pekoe Souchongs, and also Souchongs, if not too bold, with good quality and flavor would probably sell well, but no *extra fine* Teas should be sent. Nothing worth over about 14 annas, and this should only form about a quarter of the consignment.

Packing.—The packages should be as uniform as possible in size, strongly nailed, *but not ironhooped.*

The size of the box should be 25" × 17" × 12", inside measurement, 45 lb. to be packed in each package.

The boxes should be neatly made, and Tares as even as possible.

Marking.—The only mark required is the garden mark, to distinguish the boxes on arrival in Calcutta, and "Tea Syndicate" on the opposite side.

Invoice.—To accompany each parcel.

COFFEE.

A FEW FACTS ABOUT COFFEE.

THE present depressed state of the coffee trade naturally turns the thoughts of all connected with it, to the general position of the article and leads them to ask the questions, are prices too high or too low? Is consumption larger than production or otherwise? There may be added, another, are outside influences at work determining the course of prices at the present time?

We have before us a large array of figures extending over a number of years, made up on one principle and therefore if not absolutely correct as to totals, at any rate perfectly trustworthy as representing relative quantities.

We find the landings in the six principal ports of Europe, and in an equal number of those in the United States, were in the under-noted years, as follows :—

	European Ports.	American Ports.	Total.
1879 landings	336,750 tons	190,970 tons	527,720 tons
8 ,,	298,700 ,,	141,816 ,,	440,516 ,,
7 ,,	314,700 ,,	145,568 ,,	460,268 ,,
6 ,,	282,150 ,,	110,743 ,,	392,893 ,,
5 ,,	330,050 ,,	153,131 ,,	483,181 ,,
4 ,,	263,400 ,,	118,469 ,,	381,869 ,,
3 ,,	285,450 ,,	112,157 ,,	397,607 ,,

The deliveries at the same ports for the like periods were as under :—

deliveries	tons.	tons.	tons.
1379 ,,	333,050 ,,	179,834 ,,	512,884 ,,
8 ,,	315,350 ,,	143,906 ,,	459,256 ,,
7 ,,	282,950 ,,	134,735 ,,	417,685 ,,
6 ,,	321,900 ,,	128,960 ,,	450,860 ,,
5 ,,	292,200 ,,	135,114 ,,	427,314 ,,
4 ,,	259,000 ,,	121,108 ,,	380,108 ,,
3 ,,	280,550 ,,	116,293 ,,	396,843 ,,

From the above figures it will be seen that 1875 was the year of heaviest landings, and 1876 that of the largest deliveries, until the year 1879 when both these sets of figures were exceeded.

With reference to the deliveries of 1879 it must be borne in mind, that in the latter part of the year speculative demand increased them, especially in the United States, far beyond actual requirements, and smaller deliveries in 1880 will most certainly have to be expected. But even when this is granted, the steady increase in consumption is clearly shewn by the above figures and still more so if we compare the totals of two years' deliveries, viz :—

1878-79	1876-77	1874-75	1872-73
972,140	868,545	807,422	759,459 Tons.

Arrivals during the same periods were—

1878-79	1876-77	1874-75	1872-73
968,236	853,161	865,030	734,942 Tons.

and we cannot help being struck with the even progress which production and consumption seem to make. A consideration of these different statistics brings us to the conclusion that, in any case, we should not take extreme views as to the figures coffee may reach or decline to. There is no reason for particularly high prices because production is ample and likely to continue so, as it pays, whatever may be said of the labour difficulty in Brazil, and there is no reason either to fear an exceptionally low range of prices, because consumption has proved strong enough to absorb the largest quantities ever brought forward.

There will always be times of comparative scarcity or superabundance, but small fluctuations in price will easily allow the trade to tide them over.

The heavy fluctuations, however, which we have had to witness of late, are the result of speculative elements which have been introduced to no profit for the speculators themselves but certainly to the detriment of all sound trading. The fall during last summer was too heavy, and there was nothing more natural than that prices should go up to a certain extent, and a very good and steady business might have been done at a gradual rise of 10s. or so. But no! Mincing-lane was to be turned into a stock exchange, and if we are well informed, the buyers of coffee at the very highest prices, were to be found amongst people who had no connection with the trade whatever.

Is it to be wondered at that such influences force the article entirely out of its groove, and can we wonder now at the sudden collapse of prices which means heavy losses and a great disturbance of trade? We are not informed on this particular point, but we shall be astonished if the last fall was not to a certain extent the consequence of speculators losing courage and forcing their purchases off with no more reason than that with which they were made!

The production of coffee in general as well as the trade therein, might be sound and safe, but for the disturbing influence of speculation. Many a planter would have secured a good price for his crop, and every one of them would have a fair idea of the time at which he ought to dispose of it, if those unaccountable oscillations in prices had not defied all reasoning.

Let us hope that the severe lesson taught this time will keep from the coffee trade, for some time anyhow, people who desire to make money without working for it, and who interfere with those who wish to work and are satisfied with a fair remuneration.—*Ceylon Times.*

MINERAL POISON AS A CURE FOR COFFEE GRUB.

AN experienced planter and visiting agent writes to the *Ceylon Observer*:—"I would ask you to bring before the public the advisability of using arsenic or other mineral poison for grub in coffee. A few years ago, when I was in America, the Colorado beetle had destroyed the potato crop over an enormous extent of country stretching from the base of the Rocky Mountains to the Atlantic seaboard, the damage done by the larva of a beetle almost indentical with the common cockchafer which is doing the mischief here. The beetle had two yellow stripes on one wing and three on the other if I recollect rightly, and at certain seasons they appeared in such enormous numbers that the streets in the town were covered with them in the morning, but the difference between the Colorado beetle and the Ceylon grub is very great, inasmuch as the Colorado beetle laid its eggs in the ground and when hatched they came out on the leaves and stems of the plants and literally ate up, first the potatoes and then the tomatoes over hundreds of square miles. The Ceylon beetle is different in so far that the larvæ remain and work entirely underground, and live on the roots of the tree. I may mention that I have seen hundreds and thousands of healthy young trees completely eaten underground by grub, and have dug up a tree otherwise healthy and got a grub with his mandibles in the bark of the root.

The Colorado beetle has in America been completely stamped out by the use of "Paris green," a very simple and inexpensive preparation of arsenic. It was applied to the potato plant mixed with two or three times its bulk of plaster of Paris not calcined but ground to an impalpable powder; the mixture was simply dusted over the potato leaves, and the arsenic was washed into the ground, and all insect life was destroyed. A long discussion was carried on in the Canadian and American papers and in several scientific journals both in America and England as to whether the arsenic was not taken up into the plant, rendering the produce of the plant dangerous for food, but it was clearly proved that no danger arose in that way. On the other hand, the preparation must be used with care in the application, or it will be absorbed into the system by handling the fine particles. Arsenic has been long used for rust and smut in wheat and also for the destruction of insects of various kinds, and I feel sure that a mixture of lime and Paris green forked into the soil would be of the greatest benefit to coffee estates infected with grub and insect pests, of which there are many. There is another preparation largely used: it is cheaper than Paris green and said to be equally effectual—"London purple," but I have never used it myself. I send you extracts from a Canadian paper which you may consider worth reprinting. I am fully convinced that grub in certain soils and in certain localities is doing even more injury to coffee than leaf disease, and frequently it is the combination of the two (can they be allied?) which causes the crop to drop prematurely from the trees.

SUCCESS OF LIBERIAN COFFEE IN CEYLON.

QUITE a representative party were able to accept an invitation from Mr. Forbes Laurie to visit "Liberia" plantation, 2½ miles beyond Roigahawela, on the left hand side of the railway line. The shade trees under which the coffee and cacao were originally grown, (from the belief, now proved to be erroneous that shade of some sort was necessary for the healthy growth of this species of coffee) having been now removed, the estate can be seen, by those on the watch for it, from the passing trains. Even the brief glance thus obtained reveals the essentially different character of the gigantic coffee of the west coast of Africa to that of the so-called Arabian species which really owes its origin to Abyssinia, whence it made its way to Yemen, and from Arabia Felix to Ceylon and Southern India, accompanying the Mahomedan voyagers to Serendib and India, no-

doubt. However, this may be, there can be no question as to the recent introduction *to*, any more than the marvellous success *in*, Ceylon of the gigantic coffee of West Africa. The glance of "Liberia" plantation obtained from the railway shews at once the distinctive character of foliage and habit of growth of the Liberian plant, but it requires a visit such as was paid to the place on Saturday, to reveal the wonderful wealth of magnificent blossom and of big fig-like fruits with which the bushes, or rather trees, are loaded. Mr. Laurie's main object in desiring the presence of visitors was that they should witness the phenomenon of dense clusters of blossom on the very same wood and even the identical nodes which had borne a crop of fruit in the previous year. This is a departure and a most important one from the habit of the "Arabian" bush, from which "*wood*" which has borne a crop of fruit has to be pruned away. For an appreciable period, however, after entering the fifteen-acre field of the oldest coffee (and it is only three years old, if quite that) attention to this detail became impossible from the admiration excited by the truly gorgeous display of large snow-white blossoms, contrasted with the immense dark-green jack-like leaves. All agreed that for bridal occasions a branch of Mr. Laurie's coffee in full blossom would leave the traditional wreath of orange blossom nowhere. The rain, which had fallen copiously the previous day, had added a fresh feature of beauty to the scene by loosening numbers of the big blossoms, which, retained by the double-headed pistils, looked, for all the world like prehensile lillies. From the same cause, the rain, the ground under many of the trees was thickly carpeted with the white star-like blossoms, which gave forth as handfuls of them were gathered, the most exquisite jasmine perfume. But a Liberian coffee tree in full blossom, or loaded with fruit as well as blossom, must be seen to be appreciated. It is impossible for language adequately to describe what is essentially "a thing of beauty." As the serpent entered Eden, so the leaf fungus has found its way to Libreia, but the affected trees are as yet few and far between, and grub on this property is still unknown, though we heard of its ravages on one nearer Kurunegala. "Where the carcase is, thither will the eagles be gathered together," but one of the grand advantages of the new coffee is that its large-surface foliage enables it to bear, if not to resist the fungus. The tree is not denuded of leaves as in the case of the ordinary coffee." The general feeling found expression in the words "Well! whatever the fate of the old cultivation may be, there can be no doubt of the importance to Ceylon of the new coffee. Not that any one present despaired of the old favourite. On this the first plantation of Liberian coffee opened in Ceylon there are, we learned, 110 acres planted, nine feet apart (some cacao being interspersed) of which fifteen acres have commenced the full bearing stage. The view of the whole place and especially of the older coffee (still so young) from the bungalow where Mr. Laurie hospitably entertained his guests, was very striking, as well as the view from the estate, which is more undulating and contains more elevated ground than would be supposed after merely a passing glance from the railway. The party of Saturday were fortunate in the weather, which was cloudy, Dr. Trimen, the new Director of our Royal Botanical Gardens, repeatedly expressing the extreme gratification he felt. All the way up, indeed, the well-trained botanist was delighted to see growing in tropical luxuriance numerous trees and plants, which he had previously known only through the medium of cabinet specimens. A local amateur botanist, who has evidently formed an intimate acquaintance with our flora, was indefatigable in attracting Dr. Trimen's attention to the most striking individuals in the rich and varied vegetation, from rice in every stage of emerald green leaf to the full ripe corn, up to the grand talipot palms. This gentleman states :—" The show of blossoms on the Liberian coffee plants was quite a floral sight, apart from the fact that the same parts of the branches producing them are now or lately have been loaded with fruit. In many cases the ground was white with the flowers that had just fallen, whilst the plants were at the same time covered with newly blown flowers, and a large number which had separated from the young fruits, but which were caught by the bifid style and hung in masses along the branches.''

The same authority has thus recorded his opinion of the soil of "Liberia":—

"The soil of Liberia estate is composed chiefly of the usual light-coloured cabook of the Western Province, and looks anything but a good soil for coffee, but then it has not been chenaed for 100 years at least, and during this period, or a much longer one, it has been covered by forest trees, whose roots have loosened the soil, whilst the fallen leaves have no doubt added to its fertility. In respect to the want of stones, it contrasts in a remarkable degree with the group of Liberian coffee estates opened on the bank of the Kaluganga, near Kalutara, most of which are very largely composed of gneiss rock, the coffee plants occupying the spaces containing soil amongst the rocks. Many of the plants on Liberia are rather tall and lanky, and some are a little topsided from the fact that they were left under shade for some time, but there can be no doubt that in a very short time all these will become fine well-shaped trees, now that the shade has been removed. With an ordinary fall of rain the climate is no doubt a good one for Liberian coffee, but until a large mass of the dense vegetation is cleared, it is feared the climate will be a feverish one."

All enjoyed their trip, and were pleased and deeply interested with what they saw, heartily wishing Mr. Laurie, a higher decree of success than usually falls to the lot of pioneers.—*Ceylon Observer*, February 23.

CINCHONA.

Cinchona.—The following are the latest official statistics as to the culture of cinchona in the several Government plantations in India for 1879. Total number of plants, cuttings, and seedlings, in the Sikkim plantations, 4,881,055, on 2,174 acres of land; of these, the bulk, 4,260,000, are of *C. succirubra*, 421,500 of *C. Calisaya*, and 149,498 of *C. Ignota*. On the Thandoungyee plantation, Burmah, about 147,000 plants; on the Kalhatti plantations, Mysore, 36,055 plants; and on the Neilgherry plantations 1,043,101 plants, on 847 acres. There are also about 200,000 plants on private estates. The produce of bark in the year from these is stated at 377,000 lb.

It appears to us that in addition to the undoubted success which has been arrived at by the Government in providing a very cheap and a very reliable antidote to one of the most destructive Indian diseases—malarial fever—in the shape of cinchona alkaloid, the low price of which places it within reach of even the poorest ryot in the country, there is more than a probability of the Government plantations at Rungbee being able in time to supply all the quinine required for medicinal use in this country. Mr. Gammie, the practical head of the Government Cinchona operations in this district, has recently been engaged in manufacturing sulphate of quinine from cinchona bark, gathered on the Government plantations. Judging from a sample of the result of his operations which, entirely without Mr. Gammie's knowledge, came into our hands, we have no hesitation in saying that the sample of sulphate of quinine manufactured in the Government gardens, which we had the pleasure of examining, answers all the tests as to its purity required by the British Pharmacopœia and in appearance is superior to the quinine manufactured by Pelletier, the great Belgian firm, while it is somewhat inferior to the outturn of Messrs. Howard. The quinine manufactured at Rungbee appears to be a very superior commercial article, and it will probably be found when the alkaloid can be produced in considerable quantities, that India will be entirely self-dependent as regards thoroughly reliable antiperiodic medicines, the price of which need not place them beyond the reach of even the poorest native of the country.—*Darjeeling News*.

SERICULTURE.

SERICULTURAL PROSPECTS.

In reference to the mild and almost spring-like weather which has recently prevailed in the south of France, the *Journal de l'Agriculture* points out that its continuance will render it a matter of great difficulty to prevent the premature hatching of silkworm eggs in those districts. It would be advisable, therefore, at once to store them in very cold cellars, inaccessible to the outside warmth; or in default of such storage, to send them away into the mountainous districts where the cold lasts up to March or April. If this cannot be managed, the eggs should be kept in ice-boxes, under due precautions to avoid any excess of damp. Now-a-days, continues our contemporary, everybody is aware that the eggs require air, and that consequently they must be kept in very shallow layers in well-ventilated places. This precaution is rarely omitted at the periods when their respiratory activity is most marked, that is to say, for the first few days after they are laid, and during the period of incubation, but it is often lost sight of during the winter months, or is purposely neglected for fear of weakening the eggs. It would appear from some recent experiments by M. Verson, of Padua, that even in the cold season there is an active interchange of gases between the egg and the surrounding atmospheric or gaseous medium. Thus, eggs exposed for four or five days in October to an atmosphere of carbonic acid, hydrogen, or oxygen at a temperature of 5 degrees R., and then stored in the usual manner, were found to turn out very infertile at hatching time, thus showing that they had suffered much from the treatment in question. Some of the most practised silk-worm rearers are convinced that, to obtain good results, it is absolutely necessary that the eggs in store should be turned over gently at least once a week, so that they may be thoroughly well aired on all sides. But their management differs so much in different hands, that the whole business seems to be conducted by routine rather than with any true scientific knowledge as a guide.

TOBACCO.

THE experiments made with the growing and curing of Lunka and Madura tobacco at the Saidapet Experimental Farm during 1878-79 were very favourable, as also were those with an Italian variety, but the most successful of all was the Maryland tobacco which yielded the largest return and finest leaf. Nothing, however, is said of the market value of the different kinds experimented on. In a paper, entitled "Our Food Supply," the greater portion of which was laid before the Famine Commission, Mr. Benson, M.R.A.C., Acting Superintendent of Government Farms, Madras, says that the consumption of food in that presidency is probably not much less than 1·4 lb. a head per diem, the population of the Government lands, that is of all the country excepting the zemindaries, being about twenty-four millions. The amount of seed used per acre of arable land and sown with food-grains is probably not less than 56 lb., or ·5 cwt, thus causing a demand on the Government lands of ten millions cwts. The annual exports and imports nearly balance each other, so that the total demand from the soil for the support of the population is about 130 million cwts. In the lands belonging to Government there are annually about five million acres under irrigated paddy, thirteen million acres under unirrigated cereals, and two million acres under pulses. Mr. Benson says it is a common mistake to suppose that India, or at least Southern India supports a teeming population, or a population even in numbers alone in excess of that supported in some European countries. In only one district of the Madras Presidency (Tanjore) is the population per square mile of Belgium exceeded, whilst in thirteen it does not reach that of Italy.

ADVERTISEMENTS.

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.

Calcutta, 1st Feb. 1876.

CONTENTS:

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.

CORRESPONDENCE.

CINCHONA LEAVES.

TO THE EDITOR.

SIR,—I shall feel obliged if you or any of your readers can tell me if cinchona leaves are put to any use? Would cinchona tea—made from the young shoots—be of any value as a febrifuge, and has it been tried?

I hear that the bark from the roots of the cinchona tree is of much greater value than that from the stem? Is it so, and of how much more value per lb.

DON D'EGLANTINE.

BURMAH PADDY BASKETS.

TO THE EDITOR.

SIR,—Will you be so kind as to inform me what quantity, precisely, is referred to as "a basket" of paddy in articles on rice cultivation in Burmah.

M.

NOTE.—The basket being a measure of capacity, it is impossible to give an exact weight, but from information received through one of the first mercantile houses in Calcutta, we believe a basket of rice throughout all Burmah, including British Burmah, weighs 16 tubbies. A tubby is equal to 1¾ seer; one basket will therefore contain about 28 seers, a little over half a cwt.—ED., *I. A.*

THE GROUND NUT AND AFRICAN PALM.

TO THE EDITOR.

SIR,— Can you tell me how close ground nuts should be planted and whether the seed should first be raised in a nursery or planted at stake at once. Also, I would be glad to know what would be the probable yield of oil per acre from African palms planted hundred to the acre.

AFRICA.

SINDOOLA, CEYLON,
14th May 1880.

INFORMATION WANTED.

TO THE EDITOR.

SIR,—Can you tell me, if the dye from the *Arnotta* bush is valuable, and give me any information as to the manner in which the seeds should be cured?

I shall also feel obliged by your telling me, where to procure cocoa (*Theobroma cacoa*) seed, and, where to apply for a good practical treatise on its cultivation, &c.

DON D'EGLANTINE.

THE MANGO.

TO THE EDITOR.

SIR,—In your issue of the 1st instant, there is a description of a method of improving the size of mangoes by notching the bark on two rings, I should be much obliged, if you or any of your correspondents could tell me, (*a*), whether the improvement in size is at the expense of flavour, (*b*), whether on an old tree, the same principle might be adopted on the upper branches, above the first or second fork.

STEPHEN HONLEY.

QUILON,
17th May 1880.

WOOD ASHES.

TO THE EDITOR.

SIR,—Can any of your readers tell me, whether the ashes of wood that has been burnt as engine fuel, are chemically different from the ashes of wood burnt on the open air, or on ordinary native hearths. It has been stated by a proprietor of a cocoanut plantation that the engine ashes kill the trees, but that the other ashes do not. I cannot but believe that this must be a mistake.

STEPHEN HONLEY.

QUILON, 17th May 1880.

CHARCOAL *vs.* HEATED AIR.

TO THE EDITOR.

SIR,—I am glad to see you have taken up the matter of "Charcoal *vs.* Heated Air." The manner in which it has been discussed so far, has led to no definite result. I think, both your plan and that recommended by Mr. Schrottky (with whose views in this matter I entirely concur) should receive immediate attention, as, only by some such trial can this matter be definitely solved. It is to the interest of all to look to it at once, and use their best endeavours in every way to remove the Indian tea out of its present "slough of despond."

By-the-bye, why do managers make so many different teas? Surely it much enhances manufacture charges? Why not keep to three good uniform teas?

1. Pekoe, 2 Pekoe Souchong, 3 Broken Mixed, the last, a mixture of all brokens; (large leaf to be forced through a No. 8 sieve, always taking care to see that the proportion mixed of each be the same). My own opinion is, that by following this method, much expense would be saved, the teas would find a better market, and the brokers would not complain of one "break" of tea being so much inferior or superior, than another, careful packing also tells—I would recommend half chests (40lb. for the Pekoe, and full chests for the other teas, and also that the *proper* quantity be packed into each, no more and no less.

I am much pleased to find that there is every chance of Indian tea getting into the Australian market. The Indian tea exhibits have won high praise out there. The colonists are great tea drinkers, and, no doubt, when they come to compare our Indian teas with the *trash* they have hitherto got from the China merchants, they will throw over the latter in our favour. Care must be taken not to pour too much Indian tea into the Australian market at first. They must have time to acquire the taste of the new tea, and, when once India gets that market, it is to be hoped managers will do their utmost to keep their teas up to the mark and, not by any chance send out a pound of bad tea, and always see that their teas are carefully and properly packed and classed.

DON D'EGLANTINE.

BAMBOO PAPER STOCK.

TO THE EDITOR.

SIR,—A correspondent referring to my letters inserted in your journal, informs me, alluding to the *cutting of bamboo*, that in the year 1875 he took charge of a tea plantation which he found in bad condition, among other deficiencies there being no houses for coolies, and he says, finding a tope of bamboos full grown, he cut down the *whole* of the stems within 6 inches of the ground to utilise them for building, and gave the said tope no more care or concern. In 1877, when he left the garden, the same bamboo was in the same full growth, as when he cut it down, the stems being fully thirty feet high, and in a fit condition for being again used for similar purposes. Now this is by no means an isolated fact, as I have similar information sent me from other districts both in the East and West Indies. At the same time I am disposed to think that such unsparing treatment, as cutting down the whole stem growth, would result in the deterioration of future growth; and I think that only a portion, say ⅔ of the stems, should be cut at each cropping, and those, cut some 4 feet from the ground. The stumps and stems thus left would then fully maintain the vegetative functions of the parent stool, and if, after such cropping or cutting, nourishment, especially in a dry season, could be given by irrigation, reproductive growth would be facilitated.

We, so to speak force dame nature both in animal as well as vegetable growth; and, pursuing the same system with bamboos, I fail to see why the same result should not follow. In Peru, in Spain, in Egypt—each of which countries produces a large tonnage of sugar—*water*, irrigation in fact, is invariably pursued. In other countries indeed, a productive crop is almost entirely dependent on the rainfall, and every one conversant with the growth of bamboo knows that it flourishes best in a humid climate.

Heat and water *both* seem necessary for bamboo growth. Heat in Southern India is continuous, but water only during monsoons, when bamboo pushes growth. Assure the water by irrigation, as and when required, and you will, I think, assure continuous or nearly continuous growth.

My correspondent does not mention the variety of bamboo he cut down from its height. I imagine it to have been the common *Bambura Tulda*, possibly *Bamb. Arundinacea*, from the height of stems 30ft. The locality, however, the Dehra Doon, N.-W. P., and at an elevation, of from 2,000 to 2,500 feet, is not most favourable to bamboo growth.

In Burmah, I learn, from the good authority of residents, that many hedges and topes, cut very keenly, year after year, do not suffer, but reproduce continuously; but in Burmah and Tenasserim provinces, we have naturally most favorable conditions for the growth of bamboo, and I am assured that the nearer the water, the more prolific its production.

THOS. ROUTLEDGE.

Claxheugh, Sunderland, 19th May 1880.

CATTLE BOX MANURE.

TO THE EDITOR.

SIR,—With reference to your article headed Cattle Manure Experiment, in this month's issue, I think there is a slight inaccuracy in the description of the method of feeding cattle in the box or *hamel*, as it is called in Scotland.

The cattle are housed separately or in pairs in a box, or shed, sunk in the ground some 3 or 4 feet with masonry walls underground and well roofed in, so that no rain can penetrate; but cattle are put in to fatten for the market, and are not removed from the shed until fit to kill. The effect of constant treading on the litter, a thin layer of which is carefully and evenly spread night and morning, is that the manure is consolidated and compressed, so that it does not poach, and there is little or no escape of ammonia, and when the cattle are removed and the manure taken out, its value is greatly increased from the oil cake and other food given the beasts, and it cuts out like a cheese or solid substance instead of the fire, fanged stalky stuff, we usually get on a coffee estate. I am now building a cattle shed on my estate, a description of which will perhaps be useful to some of your readers as being cheap and containing the advantages of the box system.

On the side of a hill excavate a pit varying in size according to the number of cattle to be housed. They should be confined as closely as possible, so that the litter may be thoroughly trodden. This pit will be, say 3 feet deep on the lower side, and 6 feet on the upper, and in the middle of the lower side there will be an opening, say 3 feet 6 inches wide, cut out to the level of the bottom of the pit. This will be the door or entrance to the cattle shed, and will be filled up with well rammed earth, as the manure fills up the pit. The walls of the shed to be formed of jungle-wood posts, placed close together, from 9 to 6 inches diameter, the ends of which are put in the ground to have the bark peeled off, charred some 4 feet, and to be *charred*, and tarred while hot. The roof to be thatched and the eaves to project well over, and a ditch to be cut on the upper side and two ends, to carry off the rain water. The walls to be built close inside the pit, and the cattle can be left in the shed day and night with perhaps a run out for two or three hours during the day for water, and fed and littered down night and morning. In the dry weather when grass and coolies are scarce the cattle can feed out in the day and be littered down at night only. In fact cattle in Wynaad will not thrive unless they have exercise during the day. When the shed is full, it can be left until the manure is wanted, the cattle being removed to a new shed which should be ready. Eighteen years ago I was engaged in getting out a book on farm buildings, so that I write with some confidence on this subject.

FREDERICK P. HUGHES.

Wynaad. 16th May 1880.

TRANSPLANTING TEA.

TO THE EDITOR.

SIR,—Have any of your tea-planter readers ever tried to plant long-rooted tea plants which have attained the age of three years in the nurseries, and whose roots have attained a length of some 14 or 15 inches? The mode of transplanting which I have adopted

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in regard to such large plants is this:—Cut the roots, keeping only 4 or 5 inches, and heavily plaster them with nursery earth and then plant. This is how I now fill up the vacancies in my garden. I get the work done generally by female coolies. The result of such a planting is very satisfactory. The vacancies both in high and flat ground can be filled up by this mode. The plants I have made use of belong to the class of hybrids. From 9th April to 12th May last I planted 25,225 bushes with a force of labour consisting of 102 men, 441 women, and 132 children, which cost me only Rs. 124-11, and not a single plant was lost.

Is not this a very cheap and easy way of transplanting long-rooted plants? In comparison with the cost of what I planted from November 1879 to 9th April 1880, according to the ordinary mode, this new method has cost me only 15 per cent.

S. C. D.

Sylhet, May 23rd, 1880.

NOTE.—Our correspondent is quite correct. It is evidently a labour of great cost to move old seedlings entire, the tap-roots necessitating the digging of very deep pits, both for the removal of the seedling from the nursery and also as a new home for it in the garden. We tried this with some six-year old seedlings of common China variety, and the attempt was thoroughly successful. We have never personally tried it with hybrid plants, but we presume that what succeeds in the one case would succeed in the other.—ED. *I. A.*

CINCHONA TREE MEASUREMENTS.

(To the Editor of the Ceylon Observer.)

DEAR SIR,—I notice that a correspondent has sent you measurements of cinchonas, which considerably exceed those I gave you. As, however, he took his measurements some two months after I observed mine, I thought I would measure again; and such has been the influence of the fine growing weather we have had that I found the same tree to measure 4 ft. 7in.! This was measured in presence of a friend, and if I remember, is a little short of your correspondent's tree. Yet, bearing in mind that mine was an unpricked seedling with months of drought to endure, I think we may say "quits" about a competition in which it is so hard to judge exactly.—Yours truly,

J. F. W. GORE.

Mukeloya, Deltota, May 8, 1880.

RED BARK CINCHONA.

(To the Editor of the Madras Mail.)

DEAR SIR,—As all facts connected with cinchona cultivation in Ceylon are just now very interesting to many of your readers, I think it desirable to give publicity to an analysis of *Whyddon* cinchona succirubra bark furnished to me a few days ago by Mr. C. E. H. Symons. He writes thus :—The bark "contains total alkaloids 3·870 per cent. of which crystalized sulphate of quinine 1·533 per cent, which would give a gross value in London market of 2s. 6d. sterling per lb., I may add that the proportions of cinchonidine and quinodine are very good, the percentage of cinchonine being small. I hope you will consider the result satisfactory."

The interest and value of the analysis arise from the fact that the trees from which the bark was cut (stem bark) were only 21 months old, having been planted in June 1878. They are grown in old and luxuriant coffee which I planted in 1856, and the particular field is at an elevation of nearly 4 000 feet. The trees at the time of cutting, had attained a height of between five and six feet.—I remain, dear Sir, yours faithfully,

JOHN NORTHMORE.

Colombo, 11th May 1880.

CINCHONA ANALYSIS, &c.

(To the Editor of the Ceylon Times.)

SIR,—As a good deal of inquiry is made about cinchona in all its growths and forms, it may prove of interest to your readers to have the following figures :—

800 trees 10 to 12 years old, on Choisy Estate, gave an average of 17lb. each, dry bark shipped. One tree, a sample of a dozen probably, measured 38 feet 6 inches in length ; 3 feet 6 inches in girth ; giving 135lb wet bark, and turned out 44lb when dry.

Colombo analysis gave—2,127lb. stem, and quill bark, 1,675 per cent. chrystallised sulphate of quinine, valued at 2/9 sterling gross in the London market,

1,847lb. root bark, contains 2·307 per cent. sulphate valued at 3/10

1,191lb. chips, contains 1·605 per cent. sulphate valued at 2/8.

There will be an average loss in weight over the whole parcel of 11 per cent. To get at the value f.o.b. in Colombo, deduct from gross value in London 11 per cent. drysge, London charges and allowances, Colombo charges, frieght, and exchange.

19th May 1880. E. W.

TEA AND ITS FUTURE IN CEYLON.

PRUNING, FLUSHING, AND PICKING.

(To the Editor of the Ceylon Observer.)

SIR,—This subject seems to be much disregarded in Ceylon. When we hear of the doleful cries from all sides of the coffee prospects being a toss-up for another season, it is best for us to turn and look about to our new industries and see what may be the future of the tea, which is now being greatly extended all over the Island, and will no doubt, with cinchona and cacao, be our leading enterprises. We have large acreages still unopened which will prove a source of competition to many, who have yet small capital remaining, in a few years' time ; and it is for those who have had any practical experience to come forward and give every assistance to men wishing to invest their year's savings or remainings in these new openings. What is much wanted is men who can really afford such assistance. There are planters in the island who have through their own means gained a slight knowledge of tea planting, &c., but this slight knowledge is or will prove a source of danger to them hereafter, and instead of taking advice they may try to give it and lead others astray—though unintentionally. What I wish to draw the attention of tea-growers to, is the want of attention paid to the pruning, flushing, and picking, on which depends entirely the future of tea. There are no doubt different times and various styles of pruning in different parts of the island ; but which have proved the right time and style ? Here only experience can come forward and answer the question. Pruning in June or July are very good months, or soon after the bushes shew a decided tendency to cease flushing. Taking this for granted, the next point is what style of pruning will mostly benefit the yield ? Some say a surface or flat one, others a round top cutting, and again a few advocate what is called the cup-shaped touch. I have seen all these tried, and largely too, but from my experience I would strongly push forward the last style ; here we have not only the flushes confined within a given surface, but the heat of the surrounding out branches increases the growth and strengthens the flushes. I have noticed that in tea gardens in Ceylon, some have pruned their trees below to give the plants the appearance of a single stem or umbrella look. This is indeed a great fallacy and mistake. A very few gardens in Assam shew any acreage of this kind. Where Col. Money speaks of it is in the pure indigenous plant, little of which is really grown in India. The more a tea plant bushes from the ground, the larger will be the top surface, and consequently stronger of flushes. In parts of the Himalayas, such as Kumaon, Nynee Tal, Almora, &c., planters, to make a bush, put in three and four plants in each hole, and in no instance a single plant, and planters strongly advise you against it. What is meant by cup-shaped is cutting out the centre or heart of the bush to as far as you consider proper, but not in any way touching the outside or spreading laterals—when the flushes after pruning have attained a growth of 4 to 6 inches, the latter preferable, the first three leaves, and no more should be picked, giving and outturn in bulk of Pekoe Souchong, or if the estate is young, of Pekoe—the great fault with the picking here at this stage is, giving too much as a *nerrick* or quantity for a day's work ; where they, the pickers, over-pick these young tender shoots they destroy all the future crop and throw back the next flush. Three, and in no consideration more, leaves should at any time be picked. This will not only give you a full outturn of 400 to 400lb. of tea, but such teas as will find a ready market at home. I have been over several large estates in the Island, and I was very much surprised at the coarse leaf and the large quantity each person brought in.

C. A. R.

(Late of Assam.)

Dolosbage, 1st May 1880.

AGRICULTURE IN INDIA.

(To the Editor of Allen's Indian Mail.)

SIR,—Mr. Robertson, in the interesting paper on agriculture in Southern India, which he read in the Society of Arts room on Friday, raised several questions, the importance of which can scarcely be overstated. India is

essentially an agricultural country; the bulk of her population subsists by tillage, and her revenue is derived chiefly from land. Everything, therefore that hinders the development of agriculture vitally affects the interests of the Government, as well as those of the people; and among the causes indicated by Mr. Robertson as operating in the direction the assessment of the land revenue is, perhaps, the most powerful.

Over the greater portion of the Madras Presidency the assessment of the land tax is, under the existing system, annually liable to enhancement at the option of the Government, and is actually enhanced wherever the productiveness of the land is found to have increased. The working of such a system necessitates the utmost caution lest the officers empowerd periodically to re-adjust the land tax should so increase it as to leave too small a margin for the support of the cultivators, or to absorb the profits due to the expenditure of capital, and thereby discourage the application of capital to agriculture. During the last thirty years several causes have been at work, which afforded the greatest encouragement to agriculture in India. The construction of Indian railways with English capital not only opened new marts for Indian cultivators, but, by raising the price of labour and ameliorating the condition of the labouring classes, led to a larger consumption of agricultural produce. The Crimean War, moreover, by closing Russian ports, created an additional demand for Indian seeds and corn, and the Civil War in America gave an extraordinary impetus to the cultivation of Indian corn, jute, and other articles of Indian produce. These circumstances resulted in a rapid extension of cultivation throughout India, and the Chairman of the meeting at the Society's-room demonstrated, by statistical figures obtained at the India Office, the great increase in the area under tillage which occurred in the Madras Presidency during the period above mentioned. The authorities in India failed, however, to take into account the temporary nature of several of the causes which had led to this prosperity, and their belief that the cultivators in their improved condition, could bear much heavier burdens than previously, induced them to effect excessive enhancements in the demand upon land, amounting in some instances in the Bombay Presidency, where the revisions had not taken place for many years, to 100 per cent. of the existing tax, and, in some cases, to a greater proportion still. The restoration of peace in Europe and America, meanwhile, had brought down the price of Indian agricultural produce nearer to its former level, and the proceeds of the crops in India no longer enable the cultivator to satisfy the enhanced demand of the Government. In his altered circumstances the ryot, in order to protect his field from attachment for arrears of revenue, had recourse first to the savings laid by in the years of prosperity, and, when these were exhausted, to the assistance of the money-lender, by means of a mortgage of his farm. With a continuation, however, of moderate prices, and with interest accruing on his debts, the ryot was ultimately, in numerous instances, unable to meet his increased liabilities, and his farm was put up for sale by the revenue authorities, subject to the enhanced rate of land tax, but free from the claim of the mortgagee, who thus lost the money he had advanced. Notwithstanding the last-named condition, which was favourable to buyers, many of the farms met with no purchasers at all, and thousands of acres of arable land especially in the Bombay Presidency, were thus annually thrown out of cultivation between the years 1869 and 1876. The drought in the latter year found therefore the agricultural population in Madras and Bombay in greatly reduced circumstances; and when the crops in the following year likewise suffered from want of rain, many millions of human beings died of starvation or disease caused by insufficient food, and many millions sterling were lost to the State through deficient land revenue and famine relief expenditure. The immediate cause of all this misery to the people and of this heavy loss to the State was the impoverished and almost destitute condition in which the drought of 1876 found the peasantry and the landholders in general. Such destitution, however, would obviously not have occurred, looking at the remarkable prosperity which the same classes enjoyed at the close of the American war, had they been allowed to retain the savings effected under the prosperous circumstances of preceding years, and to continue applying them, as many had already done, to the sinking of irrigation wells and to other improvements in their farms. The primary cause of the evil must consequently be looked for in the excessive enhancement of the land tax in Bombay, between 1869 and 1874, and in the maintenance of unduly oppressive rates in Madras, where the land tax is intentionally fixed at so high a figure that it is recoverable only after full crops and leaves outstanding balances in other years, thus keeping the bulk of the cultivators in a permanent state of poverty and indebtedness. I am glad to observe in th report of the meeting a confirmation of the views expressed above, in th following sentence of Sir William Robinson's speech on the occasion;—"The land tax in India is a very heavy fiscal demand amounting to one-half the rate produce of the land, a proportion which in England wou d go a long way to arrest improvement." Mr. Robertson thought that remedy would be found in the permanent limitation of the Government's demand on land, as it would induce the application of capital to agriculture; and Sir Charles Trevelyan probably entertained the same thought when he said, on the same occasion, that "the burdens of taxation could be lightened by greater certainty."—I am, Sir, your obedient servant,

J. DACOSTA.

Devonshire Club, May 10.

The Indian Agriculturist.

CALCUTTA, JULY 1st, 1880.

CANAL IRRIGATION.

ONE of the most noteworthy articles in the first monthly issue of the London *Statesman* is entitled "Irrigation in Upper India," and if we must accept its conclusions the prospect which it sets before us is appalling. The views expressed are not novel. Similar views were long ago stated in the *Agriculturist*. They have forced themselves on many observers of the effects of irrigation in Northern India, and have been set forth at length by Lieutenant-Colonel Corbett in his "Climate and Resources of Upper India," the book which supplies the basis of the article to which we refer. The subject is one on which we do not wish to dogmatise. But it calls urgently for discussion and inquiry. If Colonel Corbett's views are accurate, then we must open our eyes to the alarming fact that we are steadily and hopelessly ruining those vast tracts of Upper India which we have believed ourselves to be enriching by our systems of irrigation. The only question is, how long it will be before Upper India becomes a lifeless desert of salt. We are all familiar with the fact that in former times there were fine canals in the country which we found fallen into disuse and ruin, when we became masters of India, and we take great credit to ourselves for digging them again, and pouring afresh the waters of irrigation over plains that without them would often be parched and barren. It is now suggested that perhaps the rulers who allowed these great works to fall into neglect and decay, were not careless of the country's good, but had learned, as we are learning now, that the canals were the mightiest of defertilizing agents; and that the people ceased to use the water simply to save the land from utter barrenness. Whether or not this was so, the facts now alleged as to the production of *reh* by the continuous use of canal water are grave enough to startle the most ardent believer in irrigation, and to make him examine the foundations of his faith.

Apart from and prior to the production of *reh*, the mere hardening, baking effect that follows copious irrigation is doubtless an evil. The "surface soil is brought into the position of sun-dried bricks; the more water that has been applied to the land, the harder the soil becomes; and while its powers of absorption and radiation are reduced, those of reflection and retention of heat are increased; and we also find that the powqr of capillary attraction possessed by the land is increased, and that the soil so compacted will sooner become dried up than soil left loose and open." Canal irrigation—if the above may be accepted as a faithful description of its effects—can, clearly, be entirely beneficial only when it s accompanied by a style of agriculture very different from what obtains in India and from the best that we can hope to introduce. Deep ploughing ought to go hand in hand with canal works. Deep ploughing and sub-soil drainage would, we believe, effectually remedy the baking of the soil and also prevent the efflorescence of *reh*. But we have only to observe the ryot and his bullock to admit that before we can look for the introduction of deep ploughing, the *reh* will have done its work, and it will then be a question of reclaiming a parched and saline desert. So far back as 1850, the growth of *reh* was thus described by the Superintendent of the Western Jumna Canal:—

"A white efflorescence has made and is making its appearance in various places, destroying all vegetation with which it comes in contact. The barren space gradually increases in area, and speedily the ground thus affected is deserted by the cultivators, who forthwith assail the civil officers with petitions for remission of revenue."

The ruin has, it is said, been steadily progressing since 1850, and in 1874 a canal officer writes :—

"Canal water creates *reh*, especially when it runs above the surface of the ground-level. It is with canal water that the disease is propagated. The canal, in its passage through *oosar* lands, drains off the saline matter in the *oosar*, and deposits it elsewhere. Three to seven years is the time required to poison the land, and the *reh* to show itself. . . . No physical law governs the character of the land in which the *reh* appears. It is only necessary to irrigate good land with poisoned water for four or five years to propagate *reh*.

The writer in the London *Statesman* gives a brief history of the growth of *reh* in the tract watered by the Jumna canal. After the system had been re-opened by the British authorities, there was a rapid extension of cultivation, and new crops, such as wheat, cotton, and sugar-cane, began to be grown. But in 1850 the Collector of Paniput reported that the lands of thirteen villages in his district had been seriously injured by the saline efflorescence which then began to be regarded as a calamity of a very threatening nature. Of the lands of one village, which were particularly examined, it was found that 21 per cent. had been made sterile. In 1856 it was found that one-tenth of all the villages in the Delhi territory had suffered in this way. After this, Mr. Sherer, a civil officer, was deputed to investigate the matter, and he reported that lands which formerly had been singularly rich, were now "barren and depopulated, and either covered with *reh* or hopelessly water-logged." "The spectacle," wrote Mr. Sherer, "of sick women and diseased children crouching among the ruins of their houses, of haggard cultivators wading in the swamps or watching their sickly crops, or attempting to pasture their bony cattle on the unwholesome grass, is present to my mind constantly." The prime cause of this misery he believed to be the "plague of water" and the consequent sickness, aided by the unrelenting system of taxation which regarded not the condition of the tax-payer. The Government were alarmed and began to cast about for a remedy. Colonel Baird Smith proposed to close the canal, which was supposed to be defective in construction, and to excavate a new one upon improved principles. But then came the mutiny, and the project dropped. The mutiny was followed by the famine of 1861, the beginning of a ghastly procession of these calamities. Every one saw the need of doing something, and it seemed to most men that the only remedy for drought must be irrigation. Irrigation might, indeed, have its own disadvantages, but these, it was thought could not be comparable to the terrible evils of extensive and frequent drought. In Lord Mayo's time it was proposed to borrow ninety millions sterling in order to cover India with a net-work of canals, and 7 per cent. on the cost of construction was to be the rate charged on the ryot whether he chose to use the water or not. "Had this scheme been carried out"—we quote the monthly *Statesman*—"the British Empire in India must have collapsed. The liveliest imagination cannot even dimly realise the extravagant achievements of the Indian Public Works Department, when in possession of a guarantee to the amount of seven per cent. on all they expended. The people would have perished of fever by thousands. Upper India would have been smitten with barrenness from one end to the other ; and the Government reduced to bankruptcy." In the meantime *reh* was steadily spreading itself over the land. In 1868 the surface of the country for miles on the left bank of the Jumna canal was "as white as snow," and where this was the case "not even grass" would grow. The climate had worsened, bad fevers prevailed, and in many villages "population was either at a standstill or was retrograding." Since then, it is said the curse has been "marching rapidly over the country." In 1878 Government appointed a committee to visit the worst *reh* districts, of which committee Mr. Medlicott was a member. This committee has reported, but its report has not been published, and the results of its investigation are not, therefore, available. Mr. Medlicott's opinions on the production of *reh* are, however, known, and—though it is somewhat long—we shall borrow the following extract :—

From motives of beneficence and of economy, the object of the department is to make the given supply of water in any canal cover as large a surface as possible. The cultivator (if the quantity supplied affects his water-rent) would have even more active motives to make his share go as far as possible, regulating his draught to just that amount which would keep the soil, to a small depth, in the state of moisture required for vegetation. Little, if any, thorough soaking, with underground escape, or even surface washings, occur on canal lands. The arrangements are made to retain the irrigation water in each field till drunk by it, and this acts for the rains also. A more ingenious system for the production of *reh* could scarcely be devised. It is true that the primary elements of *reh* are scanty, and very slowly set free on alluvial soil ; but then the canal water would daily bring its dose of ready-made *reh*. This goes on over a country where the rainfall ranges from less than 10 to less than 30 inches, where the mean humidity is under 60 per cent. of saturation, and the mean temperature 75°, with summer monthly (day and night) means over 90°. It may safely be said that over a large portion of this land not a drop of the fertilising water so distributed escapes. . . . . The area irrigated per cubic foot of discharge is about 200 acres ; and if this were being watered all day and all night all the year round, it would only get 3·6 feet of water. The irrigating season is about half the year, and not much work is done at night, except in the very high demand season, so that two feet may be taken as the very outside any irrigated field ever gets in the year.

It has, besides, to be noted that while in Upper India sweet water is found at a depth of from 60 to 100 feet, there is interposed between this and the surface an upper water-bed of a strongly saline character. The effect of canal irrigation is said to be to raise the level of the impure water-bed, to bring it within the reach of active evaporation, and thus to cause a profuse efflorescence of *reh* on the surface.

We have given but a very imperfect abstract of the article in our London contemporary, which we commend to the attention of our readers. And we do not wish to commit ourselves to any decided opinion on the important subject of which it treats. But it is a subject which calls loudly for discussion, and we shall welcome contributions to our knowledge of it from those who have had means of observation in the canal watered tracts of Northern India. The writer of the article evidently believes that these canals are slowly but surely converting the country into a desert, and he has no remedy to suggest. If we go on pouring canal water over the country, we shall, in process of time, bring on universal sterility ; if we close the canals, we must face the certain prospect of frequent famines from drought. The drought again, is in large measure the consequence of the process of forest denudation which, from different causes, has been going on more or less steadily for centuries, and with increasing celerity in these days of multiplying railways which devour the timber wherever they place their iron foot. Thus it would appear that the mightiest blessings which we introduce at enormous cost into India, have a fatal tendency to develop into desolating curses. We hope it may be found that the picture has been overdrawn—that the evil is less enormous and less invincible than it seems. But though we deprecate panic, we see ground for serious alarm, for the most painstaking investigation, and for cautious dealing with the facts that can be gathered from the experience of thirty years.

MINERAL OILS IN INDIA.

A VERY full and interesting report on mineral oils has recently been prepared under the orders of the Government of Bengal and submitted to the Municipal Commissioners of Calcutta. A special committee was appointed for the purpose, nearly twelve months ago, by the local Government, and much useful information has been collected by it on the subject. A brief review of some of the leading features of the report may not be out of place, as the matter is one which affects the public safety

and convenience in no small degree, not only in this city but throughout India. Under special enactment, Act III. (B.C.) of 1865, the importation, or rather storage, in Bengal, of inflammable oils, the flashing point of which is below 100° F., is to a certain extent placed under restrictions, but the law not being sufficiently stringent, it is practically inoperative and calls for early revision. In order to ascertain to what extent the requirements of the existing law are actually observed or evaded in this city, Mr. Pedler, on behalf of the petroleum committee, personally made some experiments. He procured as many as eleven samples of kerosine oil from various European and native firms in Calcutta, of which no less than nine samples, on being submitted to careful tests, were found to flash at between 85° and 90° F. On this point the Committee very appositely remark that "with oil of so low a class freely procurable, it is perhaps remarkable that so few accidents have been reported." To us it appears to be no less remarkable than it is matter for congratulation that such has been the case hitherto. But it is probable that accidents of this nature are not publicly reported, generally, and in fact would never be heard of except when they led to very serious consequences. We should not care to witness conflagrations in this country on the same scale as in other parts of the world, in Chicago for instance. Fortunately, however, in the burning climate of India, houses in the larger towns and cities, excepting of course, native huts and *bustees*, are not generally constructed of combustible materials. But with a rapidly growing trade in this commodity, and with possibly much cheaper prices in the future, inflammable oils will be far more largely consumed and will necessarily find their way in the course of time, into every native village or hut throughout the length and breadth of this country. The necessity, then, for timely and precautionary legislation is a matter of great urgency, and on this point the committee have laid considerable stress. They say that "there cannot be the smallest doubt that oil of the kind commonly sold in Calcutta, is of a most dangerous description, and that it is essential in the interests of the public safety that such restrictions should be placed on its importation and storage as will practically debar it from finding its way into the market at all." Both in England and America very stringent restrictions are imposed on the importation and sale of low class petroleum. Why should it not be so in this country also, the need of which for protection by special legislation is far greater, considering its less favourable climatic conditions, when compared with England and America? The committee, we are glad to learn, have recommended that the Government of India should legislate, and that an Imperial act should be passed which will affect and protect, equally, every part of the Indian peninsula. Local legislation, in a matter like the present, is unsuitable, as it would be almost impossible for half-a-dozen legislative bodies, acting independently of one another, to arrive at the same results. On all the more important points there is a possible basis of common agreement, and, therefore, it is the Supreme Legislative Council which should assume the delicate duty of assimilating the law and legislating for all conflicting interests. As regards the varying circumstances of different provinces, discretionary powers may be vested in subordinate legislatures to adapt the minor requirements of the law to the actual necessities of their respective administrations. This can be readily done without disturbing the primary and essential requirements of the law. On one point, however, there should be no variation. A common standard should be adopted as the flashing point and it should be constant for all India. The committee have raised the question whether flashing point of 100° F. is not too low, and they have suggested, in the event of fresh legislation, that it should be raised; but, not to strangle the trade, they have recommended this course to be adopted, on the assumption that the comparative quality of inflammable oils will be distinguished by separate classification. And they have also recommended that some distinctive mark should be affixed to each class of oil, on the cases which contain them, so that the public may know exactly the character of the oil they may be purchasing. Various other valuable suggestions and recommendations have been made as regards the places and conditions of landing, the localities for storage, and the quantities to be stored, &c., but we cannot at present go into this part of the subject more fully. But we would impress on the Government the desirability of fostering a growing and useful trade without imposing hampering restrictions, while at the same time we feel bound to remind it that the public safety and convenience are of paramount consideration, and should not be lost sight of or ignored, when dealing with this question. Should the Government of India intend to deal with the matter in some practical way, which we trust they will, before long, we venture to hope that not only will the labours of the late petroleum committee be generally utilized, but that the gentlemen, who composed it will be unreservedly consulted before any legislative action is finally taken. And we further trust that the Chambers of Commerce of Calcutta, Bombay, and Madras, as well as the Municipal Corporation of the leading cities in India will also be invited to offer such suggestions for the satisfactory settlement of all the issues in the very important question of the petroleum trade of India.

EDITORIAL NOTES.

THE exports of wheat from Calcutta to Great Britain in May amounted to 11,989 tons, making the total exports for the first five months of this year 33,110 tons, as compared with 1,603 tons exported in the same period last year, 9,011 tons in 1878, and 88,783 tons in the first five months of 1877.

THERE was a great increase in the export trade from India to Northern Afghanistan last year, but this was due to exceptional causes; and there has been a great falling off not only in the import trade from Cabul, but in the total trade in the normal articles of commerce. The famine in Cashmere accounts for the smallness of the normal traffic to and from that principality; though, curiously enough, the returns of imports to India from Cashmere are flourishing. The statements regarding the exports of Indian and other teas across the frontier would possess more interest if their trustworthiness—a point on which Sir Robert Egerton confesses to some uncertainty—were beyond doubt. But unfortunately it does not seem that due pains have been taken to classify the teas. On the supposition, however, that the returns are accurate, there has been a decrease in the foreign and an increase in the Indian, tea exports to Northern Afghanistan. The Central Asiatics, including even the Afghans, are great tea-drinkers, and the prices they pay for the luxury are extravagant. Under more peaceful relations between India and the trans-frontier countries, the cheaper and better Indian article might supersede, or at least rival, the dearer and worse, from China.

THE Deputy Commissioner of Nowgong, in his immigration report for last year, notes that there has been a remarkable diminution in the coolies imported from the North-Western Provinces and Behar. The fact is in one way satisfactory, as these coolies have lately suffered more than any others on first arrival. It would be interesting to know whether the diminution is owing to improved circumstances in the recruiting districts (which seems probable, as the distress of 1877-78 led to an unusually large number of importations), or whether employers have shown an unwillingness to take a class of coolies so difficult to maintain at a fair standard of health. The matter is of real importance, for the tea-gardens cannot long go on drawing on the thinly-peopled regions of Sonthalia and Chota Nagpore; and, if the tea interest continues to develope at its present rate, a time will come when the vastly over-populated tract of the Behar and Benares divisions will surely form the main recruiting-grounds for Assam. Sir Stewart Bayley thinks, and with reason, that by careful attention to diet in the first year or two of their contract, this class of coolies, who are certainly not less intelligent than the "junglies" of Sonthalia and Chota Nagpore, might equally retain their health; and if a sound system of recruiting could be established in those districts, the results would be beneficial to both parties.

FROM various hints thrown out in administration reports we are glad to note that the subject of improving our crops by means of better seed has lately engrossed a good deal of attention. Doubtless the notice of Government was more immediately drawn to this by the exhaustive report on wheat cultivation in India, compiled by Dr. Forbes Watson, in which he shows that while some of the finest wheat in the world is

produced here, we also grow a large quantity of inferior sorts. He points out that the value of the various samples forwarded to him varied from 48 to 26 shillings per quarter; some were even lower than this latter, but the reduction was caused more by the admixture of other grains than by any inherent inferiority of the original sample. Now 48 is about 85 per cent. above 26 shillings, and while we cannot hope to improve all our grain to this extent, we think we are justified in expressing a hope that a general advance in value to the extent of 20 per cent. is not beyond our reach. Dr. Watson found the average value of all the samples to be 39*s.* 8*d.* per quarter, an increase of 20 per cent. on which would amount to close on Rs. 8. If the farmer only got two-thirds of this increase, which he ought to get for his improved article, it would mean an increase of over Rs. 8 per acre to his earnings, the calculation being based on an outturn of 13 bushels per acre. This, then, shows the importance of the movement. When the officials who are agitating the subject propose to utilize the bunnia as the medium of improving the seed, we join issue at once. The bunnia is the worst possible instrument that could be employed in the work, and hence we trust some other agency will be used. The bunnia cannot be depended on to sacrifice the chance of cheating the ryot *now* to the prospect of ultimate gains, and besides he has no interest in helping the ryot to become rich; his interest all lies the other way, and he fattens on the cultivator's poverty. No: let us have nothing to do with the bunnia in this connection. He is a necessary evil, only to be countenanced as a last resource, and surely the Government will be able to find suitable instruments for this work in the members of the subordinate revenue staff.

THE steamer *Pemba* arrived in Calcutta the other day with six saloon passengers, and 760 on deck. She came from the Straits and Burmah, and it is most probable that the bulk of these deck passengers were from Burmah, most likely from Rangoon. It seems to us that 760 is a very large number to carry in such a steamer, where all must pass their time for, say four days on the deck of the vessel. This, however, is a matter for the port authorities, and in all probability the *Pemba* is licensed to carry even a larger number than this. Our object in noticing the fact is not to find fault with the arrangements of the B.I.S.N. Co., whose agents are a guarantee that everything will be done according to regulation; we wish rather to point out the difference that exists in the regulations regarding the carriage of native passengers generally. Had the *Pemba* been bound for Assam with coolies, under Act VII of 1873 (B.C.), we venture to think that she would not have been allowed to carry such a number on her deck alone. The tea cooly is a pet of the Bengal Government, and as such he is particularly well taken care of, while the emigrant who does not travel under the protecting ægis of that enactment, is naturally supposed to be perfectly able to take care of himself, and rightly so. If, however, the paying emigrant can protect himself, why cannot the labour transport cooly do the same? We quite admit he is a shade lower in the scale, but any one who has had dealings with him directly, from the time the recruiter takes charge of him till he gets his contract cancelled at the end of his three years' engagement, will have no difficulty in certifying that he is able to take care of himself. Why, then, will the Bengal Government continue to coddle him to the point of strangling the great tea industry of India, which certainly has enough to contend against without having to pay over 50 per cent. more for labour than there is any necessity for?

WHILE deprecating the length of *nukshas* generally, we are tempted to make an exception in favor of those from Madras. They are usually compiled with the greatest care, and contain much that is interesting, the contents not being made up of dry statistical tables which frequently go to prove nothing, and can usually be made to prove anything. In the Madras reports no small amount of skill is frequently spent in drawing inferences from certain occurrences, and in endeavouring to reconcile apparently incompatible conditions, and this is not done by amateurs, the work having the impress of an expert's hand on it. The area under cultivation in that province last year fell off fully two million acres, owing partly to the unfavorable character of the north-east monsoon, but more particularly to the poverty of the people who naturally have not quite recovered from the two years of famine. The outturn is estimated at a 10-anna average, which is rather low as compared with a full crop, but not so bad relatively to an *average* crop, as it is five-sixths of this latter. While the mass of the people must have benefited by the cheaper prices which prevailed generally, it must have pressed hard upon the cultivators, who had to sell their crop at those low rates, coupled with the fact that the crop was itself deficient. The price of ragi was 11·2 seers per rupee, against 11·1 during the preceding year, and rice 9·1 against 8·1. The Presidency of Madras seems to have been the sport of fortune lately in agricultural affairs, and it is to be hoped that it will, under the new *régime*, have a large increase in irrigation both by canals and wells, and a brighter day dawn on the cultivator.

THE Agricultural Department has recently issued a "memorandum on materials in India suitable for the manufacture of paper," from the pen of Mr. L. Liotard, which consists of an exhaustive summary of articles for paper-making obtainable here. Great care has been taken to give botanical names, and, where obtainable, local native names as well. One is astonished at the variety of suitable materials for this purpose obtainable in India; trees, plants, straw, and even the most common and noxious weeds are shown to possess a value in this way. It is perhaps not necessary, or with the state of mechanical knowledge presently possessed by the natives of this country, advisable, that we should recommend them to try paper-making with new products. Such attempts being more or less of the nature of experiments, might perhaps best be left to such experts as are only to be found in Europe. At the same time there does not seem to exist any reason why the natives should not import the necessary machinery to separate the fibre from the woody particles of plants, so that it might be conveniently screwed into bales, and shipped home for paper-making purposes. Among the more common plants which can thus be utilized, we find the *bhendi*—the lady's finger of our dinner-table—the stalk of which plant is peculiarly tenacious; the sunn grass, the yercum, and among nettles, the rhea grass and the common *bhang* plant. Nor is the stem of the plantain without its value in this way. The most promising article, however, seems to be the bamboo, which has already passed the experimental stage, and only waits capital and enterprise to enable it to take a prominent place among the many industries of India. Mr. Thos. Routledge, of Sunderland, England, has experimented on this fibre for some years, and we have now lying before us a sheet of paper (a sample of what can be done) made entirely of bamboo fibre, which will bear comparison with any other of a similar class in the market. From the many experiments made by Mr. Routledge he was enabled to draw the following conclusions, which are not guesses but calculations from what he has actually succeeded in doing. One acre of closely growing bamboo land will yield 40 tons of young shoots—such only being suitable; these will, when crushed, yield ten tons of dried produce, three-fourths being removed in the form of moisture. This dried produce yields 60 per cent. of fibrous paper stock; consequently one acre will produce six tons of paper-stock, and as this acre may be cropped every second year—in favorable circumstances every year—we have no difficulty in seeing that this ought to be a profitable industry. Of course a large quantity of expensive machinery is necessary to produce the finished fibre, which Mr. Routledge estimates as worth about £24 per ton. This is of course an estimate, none being in the market. He also estimates the entire cost of preparing this stock at Rs. 150 per ton. We shall be glad to show anyone this fibre in its principal stages, as well as the finished paper, both plain and printed.

MR. WEDDERBURN has proposed a scheme of agricultural reform for the Deccan, which the *Bombay Review* thus summarizes:—

There are three problems, in the opinion of the author, connected with agriculture in this presidency, awaiting solution. These are:—1*st*, how to reduce the present responsibility of the rayat—which he has shown himself quite unable to meet—by "adapting the assessment of the land revenue to the variations of the

seasons." 2ndly, how to keep the money-lender in his proper relation to the rayat ; and 3rdly, how to secure for the state, a safe and increasing revenue. All these questions are sought to be answered in the scheme which Mr. Wedderburn purposes. In the place of the present fixed assessment, in coin, Mr. Wedderburn thinks their ought to be one in kind, a fixed proportion, say one sixteenth of the gross produce. Moreover, as a premium on improvements there should be an alternative quit-rent in kind, say three-sixteenths of an average dry crop which an enterprising cultivator who may like to irrigate and well manure his land in order to raise a garden crop may find it to his advantage to substitute in place of fixed proportion of his gross produce. The collection of this assessment should be entrusted to "zemindars," a class whom Mr. Wedderburn would create out of capitalists of intelligence and position, who might engage to pay a lump sum into the Government Treasury and realise their dues from the rayat. To increase the usefulness of this class there ought to be "kauls" (grants or concessions) executed in favour of them for fixed periods, so conditioned as to interest them in the development of the land and the happiness of its cultivator. Capital, partnership, joint-stock or otherwise will then easily flow in the direction of agriculture. But if there should be a difficulty in finding good, permanent middlemen, the Government share of the produce might be annually put up to auction as soon as the outturn for the year could be fairly gauged. But the improvement of land and the raising of garden crops requires an amount of capital, and who would advance it to the rayat hopelessly sunk in debt and utterly without credit ? To meet this difficulty, there ought to be produced a mutual good understanding between the zemindar and the rayat. One of the ways of doing this would be to give a lien to the zemindar on the years' crop for the advances which he makes ; this lien to be enforced by summary process before the mamlatdar. Still Mr. Wedderburn admits the rayat's way is not all clear before him. There would still be a hitch. That is the existing claims of the sowkar against the rayat, the exact extent of which, no man can tell. To move this difficulty out of the way, Mr. Wedderburn proposes that the zemindars should be allowed to buy up these debts for half their value, with money advanced by Government for the purpose. This sum could be recovered gradually from the peasant in times of good harvests and repaid to Government in small instalments, and without interest.

There is much in the above scheme which commands approval.

A CHICAGO agricultural journal gives an account of the largest plough ever known to be made, which has been recently turned out by an Illinois firm of agricultural machinery makers for use on the St. Louis Iron Mountain, and Southern Railway. It is attached to a platform car of a construction train in such a way as to cut its ditch a sufficient distance from the railway line. It will make one mile of ditch, 2 feet deep and 3 feet wide every four hours, thus doing the work of about 1,000 men. The beam is made of swamp oak, and is 8 inches by 14 inches, the land side being made of bar iron 8 inches wide and 1½ inch thick, which had to be forged expressly for the purpose. Its total weight is 1,700 lb.

OFFICIAL PAPERS.

RUBBER MANUFACTURE.

Dated London, February 1880.

From MATTHEW GRAY, Esq., General Manufacturer, India-rubber, Gutta-percha, and Telegraph Works Company, to J. R. Royle, Esq., Statistics and Commerce Department, India Office.

WE have received your letter of the 31st ultimo, and have examined the three samples of dried *Ficu* milk which you sent to us. We have no doubt they are all of some commercial value, if properly collected and carefully dried. The samples were too small for us to form any correct opinion of their value, and, we would feel much obliged to you if you could get sent to us about 100lb. of each of the three sorts, that will enable us to test in some practical manner their value.

It is of the greatest importance in collecting the milk and drying it that it be done with care and in a proper manner, so that it be kept clean, and no decomposition takes place in the drying. To do this, it is necessary that the drying be done under a roof supported by poles, to screen the milk from the direct rays of the sun. Trays for drying the milk should be made of common deal timber, say three feet long and eighteen inches wide, with side and ends about three inches high ; these trays are put upon supports below the roof, and into them is poured the milk about one-eighth of an inch deep ; this is allowed to remain until it is dry, or nearly dry when another layer of milk is put on top about one eighth of an inch in depth, which is allowed to d ry. The process is repeated until a cake of two or three inches in thickness is made up, when it can be turned out of the tray in a dry cake of firm dry gum three feet long eighteen inches broad and two or three thick. This care in the drying of the gum may appear unnecessary to those who collect it, but years of experience has proved to us the necessity of doing it as we describe ; we have found that if it is dried with the direct rays of the sun bearing upon it, decomposition takes place, or if dried in too thick a mass the outside of the mass gets dry and firm, while the centre contains moisture and induces decomposition, thereby injuring the quality of the gum very much.

PROPOSALS FOR DESTRUCTION OF THE TEA BUG IN ASSAM.

Dated Calcutta, the 9th April 1880.

From J. WOOD-MASON Esq., Officiating Superintendent, Indian Museum, to the Honorary Secretary to the Trustees, Indian Museum.

I HAVE the honour to submit a copy of an article by Professor Ray Lankester, F.R.S., which has recently appeared in the columns of *Nature*. From this article, entitled "The Destruction of Insect Pests, an unforeseen application of the Results of Biological Investigation," it will be seen that a definite line of inquiry, having for its object the destruction of insect pests, has at last been pointed out, and in the hands of Professor Elias Metschnikoff, the celebrated morphologist of the arthropora (including insects), has already yielded results exceedingly promising of ultimate success. At the meeting of the French Academy of Science, held on the 8th of the current month, M. Pasteur spoke in favour of seeking a parasite wherewith to destroy the phylloxera, as it would be easy to destroy the silkworm race by means of the corpuscular parasite of pebrine ; and, in answer to an objector, showed "the possibilities of experimental multiplication of parasites," already accomplished by Metschnikoff (see Lankesters' article).

The qualifications which the man should possess who undertakes this inquiry are an extensive acquaintance with the structure, development, and physiology of arthropods, and at least an elementary, but sound knowledge, acquired by a course of practical work in the laboratory, of the structure and development of the lower fungi. In fact, he should have had a practical training in biology, and have afterwards acquired a special knowledge of insect morphology and physiology. I possess these qualifications ; and I shall be willing to undertake the required investigations if the Trustees will spare me, and the Government will send me to Europe, in order that I may make myself acquainted with this remarkable application of the results of biological inquiry,—its facts but more especially its methods ; and if the latter will make permanent the temporary assistance they have recently given me in the Entomological Department, shortly after my return I should be ready to go in to the field to operate against these pests. I should not be able to leave India until Dr. Anderson's return, or at any rate till about a month before that date : but in the meantime I could push on the arrangement of the entomological collections, get up the literature of the subject, and commence my microscopic work (in the course of which it is possible, though improbable, that I might discover something that would render the proposed visit to Europe unnecessary), and thus prepare myself for taking the fullest advantage of all I might learn in Europe. I am of opinion that a clear period of at least six months would be required for experimental investigation in Europe, a year at the very most.

The Destruction of Insect Pests; an unforeseen application of the Results of Biological Investigation.

"What is the good of a knowledge of microscopic creatures? What is the good of prying into the anatomy of insects? It is all very well as an amusement, but serious persons cannot be expected to assent to the devotion of endowments or State funds to such trivial purposes. Chemistry geology, electricity, if you please, have their solid commercial value ; but biology is an amusement for children and old gentlemen." Such is the opinion of many a "practical man," ignorant and short-sighted as the genus invariably proves itself.

Already the practical man may be told in reply that surgery is entirely reformed by our knowledge of the minuter fungi ; that by avoiding the access of bacteria to wounds, we avoid a large destruction of human life ; already we see our way to avoiding some deadly diseases caused by these same bacteria, now that we know them to be the active cause of such disease. Already, silk is cheaper in consequence of our knowledge of the bacteria of the silkworm disease ; already better beer is brewed, and better

yeast supplied to the baker, in consequence of Pasteur's discovery of the bacterian diseases of the yeast-plant; already vine gar-making, cheese-making, butter-making, wine-making, and other such manufacturing trades are on the way to benefit by like knowledge. Potato-disease and coffee-disease have been traced to their causes, and means suggested by biologists for dealing with the parasitic plants causing those diseases, whereby not thousands but millions of pounds sterling a year may be saved to the community.

Insect pests which have depopulated whole provinces,—such pests as the phylloxera and the Colorado beetle,—are about to receive a check at the hands of the same class of scientific students. The application of knowledge of natural facts is in this case a very remarkable one; for it is actually proposed to make use of our recently-acquired knowledge of diseases due to bacteria—not that we may arrest such diseases, but that we may promote them. Insect pests are to be destroyed by poisoning them, not with acrid mineral poisons, which damage plants as well as the insects, but by encouraging the spread of the disease-producing bacteria, which are known to be fatal to such insects. Professor Hagen, of Cambridge, Mass., has called attention to the old practice of destroying greenhouse pests by the application of yeast. He conceives that this method may be applied to other insect pests, such as phylloxera, Colorado beetle, cotton worm, &c. He imagines that the yeast-fungus enters the body of the insect on which it is sprinkled, and there produces a growth which is fatal to the insect's life. It is a well-known fact that insects are very subject to fungoid diseases; and it is also ascertained that the application of yeast to the plants frequented by such insects favours their acquisition of such disease. Professor Elias Metschnikoff, the celebrated embryologist, has, however, made some investigations on this subject, and given an explanation of the possible value of yeast application (*Zool Anzeiger*, No. 47), different and more satisfactory than that which Professor Hagen appears to adopt.

The general result of the most accurate investigations of the beer-yeast fungus (*Saccharomyces cerevisiæ*) is entirely opposed to the notion that it can enter an insect's body and produce a disease. Beer-yeast is beer-yeast, and appears always (or within experimental limits) to remain so. On the other hand, De Bary has made known the life history of some simple fungi which destroy insects; and from Pasteur, Cohn, and others, we know of diseases due to those simplest of fungi, the bacteria, which produce the most deadly ravages amongst insects. Professor Metschnikoff has examined some of these minute parasitic fungi and cultivated them by passing them from one insect to another and has experimentally proved their very deadly character to the insects exposed to infection. The "green Muscardine" (*Isaria destructor*) is the name given by Metschnikoff to one of the minute fungi, the effects of which he most successfully traced. Now it is perfectly evident that if green Muscardine spores could be produced in large quantity, or spores of similar disease-producing fungi, and applied to the ground and shrubs infested by insect pests liable to harbour those fungi, we should have the best of all means for effecting the destruction of the insects, *viz.*, a poison which, once set at work, would spontaneously multiply and spread its destroying agents around.

Accordingly, Professor Metschnikoff endeavoured to cultivate the "green Muscardine" apart from insects, so as to obtain its spores, if possible, in great quantity, in a liquid which might be applied to places attacked by injurious insects. He at last succeeded in effecting this cultivation by the use of beer mash: in this decoction the green Muscardine produced a rich mycelium, and finally spores.

It is exceedingly probable that we have here the true explanation of the value of the application of yeast to plants, &c., affected by insect pests. If there are a few spores only of such parasites as the "green Muscardine" about, the fluid of the yeast will serve them for nourishment, and so cause the Muscardine to spread until it comes into contact with the insects. There is no reason to suppose that the beer-yeast plant itself is capable of generating a disease in any insects; at the same time we must remember that yeast, as ordinarily used by the brewer, is by no means pure. It contains in small quantities other minute fungi, besides the Saccharomyces cerevisiæ; and it is quite possible that a given quantity of it, say a pint, may, if the brewery from which it came were not conducted on the most perfect system such as that lately introduced by Pasteur, contain a few spores of such a disease-producing parasite as Muscardine. A diseased insect once in a way falling into the mash-tub would sufficiently keep up the supply, and thus it is possible that yeast may carry infection to insect pests and destroy them.

At the same time, Professor Metschnikoff's suggestion of a deliberate cultivation of an insect's disease-producing fungus, and the application of the cultivated fungus in quantity to places infested by these insects, is in the highest degree ingenious, and likely to give results the value of which will be estimated in thousands of pounds, and so do something to persuade "practical" men that all science is deserving of their respect and encouragement.

E. RAY LANKESTER.

ARTESIAN WELLS.

FROM W. King, Esq, Deputy Superintendent (Madras), Geological Survey of India, to C. G. Master, Esq, Secretary to Government, Revenue Department, Madras, dated Bastar Territory, 31st March 1880.

Sir,—I have the honor to send you, for the information of the Government, the following notes on the Artesian Wells of Pondicherry, with considerations as to their bearing on the development of such sources of water-supply in Madras.

2. I have thought it better to burden this letter with as few as possible of the details I have collected on these wells, such being given in the technical paper which will be published in the records of the Geological Survey of India and which will be available, I trust, for reference, in May next.

3. There are three wells at Pondicherry now in thorough working order, *viz.*, and in the order of their completion:—two at the Savana and Oopallem Filatures (the work of private individuals), and the third in the Jardin d' Acclimatation, which was carried out by the French Government, under the administration of Mr. Carriol, the Chief Engineer. Besides these there is a further Government boring in operation in the Ville Noire, and I hear that another well has been opened up in the compound of Mr. Cornet, one of the proprietors of the cotton mills above mentioned.

4. The Savana well is almost 173 feet deep; its water rises to a level of nearly one foot above the surface of the ground, the discharge being at the rate of forty-four gallons a minute, and it has been flowing, with the exception of a gradual increase in the discharge for a few days, for more than two years and-a-half.

5. The Oopallem well is about 119 feet deep, with a hydrostatic level of 3·28 feet, and a discharge of 99½ gallons a minute. It has been in constant flow since the 10th of October 1878.

6. The Garden well is about 261 feet deep; it has a hydrostatic level of 4·95 feet with a discharge of 146·6 gallons a minute, and it has been flowing at a constant rate for more than a year.

7. The Ville Noire boring has been run down about 550 feet from which depth I understand that there is now a rise of water to within 2·95 feet of the surface, and a discharge of 13¼ gallons a minute.

8. The well in Mr. Cornet's compound gives a gushing sheet of water at 200 feet. The water is not yet very abundant and it is only of middling quality. There is a suspicion that the oscillations of this column of water are in accord with the tidal motion of the sea. It is proposed to carry this boring deeper.

9. The three first wells discharge altogether in the year about 740,000 cubic yards of water. The water of all is fairly good, has rather a sulphurous odour and a slightly metallic tart. It is good for washing, boiling vegetables, is drunk freely by the natives, and has an average temperature of 93° Fahr.

10. On the evidence of continuous discharge and constant hydrostatic level, I am obliged to discard my speculations that the rise of the water might be due to pressure of the superincumbent strata. The wells must be as was all along contended for by Mr. Poulain, the original projector for Pondicherry, properly artesian in their action.

11. From the sections displayed by the borings, there seems no doubt but that they are entirely in the alluvial deposits, though it would appear that the deeper one, in the Ville Noire, is very nearly the next oldest rocks (for Pondicherry), *viz.*, the "Cuddalore sandstones" of tertiary age.

12. Each boring has passed through, first, a good thickness or series of permeable beds (sands, &c); next through an impermeable band of clayey beds below which comes a second thick band of sands. Beneath this again is a second band of clayey beds, below which is a third very thick and irregularly-constituted series of sands, gravels, &c., which, except in the Ville Noire, has not been pierced through by the borer.

13. The Savana Garden and Oopallem wells are in an angular line nearly at right angles to the coast, or in what may be considered as the line of dip of such alluvial strata, and though the distance between the wells are large as compared with their depth, I really think that the borings have all gone through the same zones or bands of permeable and impermeable beds. I also think that the same beds have been pierced in the Ville Noire boring.

14. Of the two bands of clayey or impermeable strata, the upper one has a dip of 2° 3° to the eastward, but the lower band is rather flatter.

15. If the upper clay seam preserves its dip or lie and is of any good lateral extent, it ought to hade up or come to the surface about two miles west of Pondicherry; and again the lower seam would, under similar conditions, crop up at about four miles further west. This is merely conjectural; there is just the possibility that those seams might behave in this way. It is not likely, however, that they would appear at the surface of the ground, there being nearly always a covering of surface soil; but they might crop up in the Ariancup river not far west of Pondicherry

16. The water of the Oopallem well appears to rise from the permeable beds between the two thick series of clays. That of the Savana and Garden wells comes from the thick sandy and gravelly series below the second band of clays.

17. In the boring operations there were several rises, falls, and gushes of water, especially below the second seam of clays, which looks as though there were a corresponding number of water. I am doubtful as to there being so many separate sheets; and I rather take to the view that the sheets below the second band are connected with each other, the rising and falling of the water being possibly in great part due to temporary clogging of the lower extremity of the bore tube, or to the sudden opening up of new channels of communications in the permeable system.

18. The Savana waters, at the western extremity of the angular line above mentioned, have only a hydrostatic level of nearly a foot over the surface; this surface being here at 9 feet above mean sea level. At 470 yards (or thereabouts) east of this, the Garden well which draws its water from the same permeable band has a hydrostatic level of 4·95 feet, the

surface level being here 11·80 feet over mean sea level. Again, at 770 yards (or thereabouts) further east the Oopallem well has a hydrostatic level of 8·28 feet, surface being 6 feet over mean sea level.

19. All the wells, except that of the Ville Noire, are at comparatively insignificant depths as compared with the lateral extent of the alluvial beds and their supposable thickness. The quantity of water discharged by them in the year is also insignificant when compared with that absorbed in the alluvial area.

20. The borings being entirely in alluvial deposits, there is no necessity, in the present stage of artesian well-boring, to inquire as to the relations of the Cuddalore sandstones the cretaceous rocks, or the bottom gneiss n the neighbourhood of the French settlement, however much they may be adapted by their lie for holding water with a head. Indeed the depth at which the cretaceous rocks may be supposed to lie and the difficulty of boring through the hard grits and conglomerates of the Cuddalore beds above them are such as to make boring inadvisable except under very special demand for a water-supply of this kind.

21. Pondicherry is situated right up in the northern seaward corner or horn of what may be called the Cuddalore-Pondicherry alluvial plain or bay or basin. The head of the basin may be taken near the village of Allabadi, some 27 miles due west of the coast, at the point where the Pennar river enters on its proper alluvial course, though besides this water-supply there is also the Gingee river which flows across the northern part of the plain and falls into the sea as the Ariancup, close to Pondicherry.

22. The greatest breadth of the plain is about 21 miles, and then it closes in, towards the sea-coast, to a breadth of some 12 miles, between the low plateau headlands of the Red Hills of Pondicherry on the north and Capper Hill near Cuddalore to the south, after which it again widens out to the sea-beach in the horns on which the two towns stand.

23. The area may be roughly reckoned at 500 square miles, and the boundary or edge receptive of water from the adjacent rising grounds may be taken as 160 miles long. The drainage so obtained would, however, be small as compared with the amount of water brought in by the two rivers.

24. The fall or inclination of the surface from Allabadi may be 6½ feet in the mile, though a safer rate is at 4½ feet.

25. It has been generally assumed by Mr. Poulain and others, that the head required for the hydrostatic level must be at a good distance westward of Pondicherry, even as far back as the debouchements of the Pennar and Gingee rivers on the plain, the low rise obtained being attributed to the frictions in the passages.

26. Such are the physical conditions of the Cuddalore-Pondicherry alluvial basin, and if we are to take all these as necessary in the search for other sites for artesian wells, then the inquiry becomes limited to a great extent. Cuddalore is manifestly, on these broad and general features, the best place for a trial. There are better sites, I should think, even than this one at many spots on the seaward edges of the deltas of the Cauvery, Penner, Kistna, and Godavari rivers; and it is not improbable that Madras may, in one view of its situation, be a favourable locality.

27. Madras is only comparable with Pondicherry, in this connection, in very few points; and, if we are to be guided entirely by the conditions of the latter place, it may be said at once that it is after all not so favourably situated for large artesian wells because, though on the seaward edge of a remarkably long belt of coastal alluvium, it is in front of only a much smaller and poorly-fed basin. The alluvial deposits are, however, not confined to this bay, but are connected to the northwest with the great plain of the Kortalayar and Narayanavaram rivers, the permeable beds of which may trend down towards and under the city. Madras is also so situated that part of the town may lie over water-bearing deposits of the Poonamallee plain, while its northern end may be over the tailing-out of the Kortalayar beds, and as proposals have already been made for sinking wells in particular parts of the suburbs, it will be as well to examine the conditions of the smaller alluvial flat.

28. The Poonamallee plain extends to the westward by a long arm, at the end of which it is again connected with the Kortalayar alluvium by a narrow neck across the Red Hills plateau towards Tiruvallur; and it sends another long arm to the south-west part, the Pallavaram Hills. Its extreme length, to the western neck, is about twenty miles, the breadth at the mouth (between the Red Hills and the Mount) being about 7½ miles. The area including the seaward extension is about 175 square miles, and the receptive edge is not more than eighty miles in length.

29. Only two small rivers flow through it, *viz.*, those which enter the sea as the Cooum and Adyar; but it is possible that they may gather sufficient water at any rate for a small number of wells like that of Pondicherry. It is besides just possible that a fair supply of water may be taken in by the beds at the western neck from the Kortalayar water-bearing strata.

30. Indeed, unless there be an in-flow of water at this neck, I do not see how a head and service, according to the Pondicherry type, can be gained in this basin. Without it, the absolute drainage can only be relied on, and the form of the bay is such that no good length of receptive edge can be looked for much after a distance of eight miles from Madras; the further westward we look for a head beyond that distance, the smaller becomes the drainage area, in such a narrow armed bay, and the prospect of a sufficiently constant supply of water.

31. I do not, however, think that it is quite clear that such a great distance is required for the head of water at Pondicherry. It is a question with me, for instance, whether the same hydrostatic level could not be attained with a lower head at a shorter distance; there being no doubt that far more than the quantity of water discharged is obtainable in the bed of Ariancup if there be only an absorbent outcrop. The irregular oscillation of the water in the boring of the first three wells and the non-rise above ordinary well level, down to 500 feet, in the Ville Noire seem to point to a head not far distant. I find it hard, too, to believe in the impervious strata extending for any great distance westward, the few outcrops of alluvial deposits which I have noticed in the banks of some rivers having generally given indications of ultimate thinning out, in moderate distances, up, and indeed very often down, the rivers. It is again difficult for me to conceive that the borings have run down, anywhere near strata holding water absorbed in the higher reaches of the rivers within the edge of the basin.

32. I have already drawn attention to the bare possibility there is that the two zones of clayey strata disclosed by the borings at Pondicherry may hade up to the surface at beyond two and six miles from the town. The difference between the heights of the jets of the three wells is also noteworthy, as this may, to a certain extent, be due to a near head; the rises in 1,246 yards between Savana and Oopallem being, it seems to me, hardly in such proportion as might be expected with a head fifteen or twenty miles away, working in such flat deposits as these are.

33. With these doubts in my mind, I am then rather inclined to favor the view that a sufficient head and service may even exist at eight miles from Madras in the Poonamallee basin.

34. For the inclination of the surface of this plain I have only one approximate level at hand, which is nevertheless sufficient to give an idea of the height of head to be expected. The basin runs out by the narrow western neck to the Tiruvallur railway station, which is 156 feet over mean sea level; and, taking Madras at 13 feet, there must then be a fall of about 5 feet in the mile. This would give a head of about 40 feet, at the distance I suppose a sufficiently long receptive edge might be reckoned on.

35. A very serious question, however, is, as to the thickness of the alluvial deposits at Madras, and the form of the plan on which they are laid down; for the rising grounds and the rocks along its edge seem to indicate in part, a shallow and irregular bottom. There is also a record extant in the writings of the late Captain Newbold, see Journal, Royal Asiatic Society, Vol. VIII., page 2,480 of a boring or well which was made many years ago at the inland custom house, some three-quarters of a mile from the seashore, which is reputed to have struck the crystalline rocks or gneiss at only fifty-five feet below the surface.

36. The northern and western edges of the Poonamallee plain are of the "Cuddalore sandstones" of the Red Hills, which are lying at a very low angle eastwards or nearly flat, though it is probable these are denuded very evenly, and that they shelve rapidly under the plain. On the other hand, the greater part of the south side of the plain and its south-west arm are all of gneiss which goes to form the Pallavaram and Mount ridges which are in fact only part of a long promontory running north-eastward under the alluvium, perhaps still with rather a ridgy and rugged contour. It was possibly a summit of this sub-alluvial promontory, rather than a boulder of gneiss which was struck in the well noted above.

37. In any case the gneiss shelves slowly under the Adyar alluvium cropping up in the Adyar itself; hence it would hardly be advisable to run down borings along a north-east line from the Mount ridges. It is possible, of course that borings might here be run down in places to a sufficient depth, for there is no certainty about the contour of the sub-alluvial ridge, but the chances are against this. The Madras Government Farm and the Horticultural Society's Gardens are unfortunately on this line.

38. For this basin the most likely sites for wells would be in the area ranging northwest from the left bank of the Cooum between Government House and the Commander-in-Chief's Bridge towards Perambur. The alluvial deposits ought to be deep here, and the axis of any basonal lie they may have would trend in this direction. I can hardly take it on me to be more definite than this in pointing out the ground, but if I might suggest a locality for Government work, a boring in the neighbourhood of the General Hospital, the People's Park, and the Penitentiary, might strike fairly good and abundant water. For such an exeperiment the labor available in the Penitentiary might, perhaps, be very advantageously and economically utilized.

39. The northern part of the town is again situated on the southern seaward horn of the Kortalayar-Narayanavaram alluvial plain; and if its water-bearing strata only trend down here, then there seems every prospect of an inexhaustible supply of water which under the Pondicherry type conditions, should have a high hydrostatic level. The plain is of very great extent with wide arms up its main river and the affluents. The Nagari river has a level of about 800 feet at its entrance on the plain, and a good head must exist at the passage of the Narayanavaram river through the Nagalapuram hills. The Kortalayar alluvium proper is most remarkable in its extent, considering the present size of the river, while it actually extends right back to or is joined with the alluvial deposits of the Palar river at a point where the continuity of these is broken by a rise of gneiss through which the larger river continues on its course to the sea. It seems probable, on this, that much of the waters brought down by the Palar may have a take-off into the Kortalayar beds at this point.

40. The doubt in my mind is as to where the Kortalayar beds do trend so far south; and again, if they do this, the far-reaching head which shall catch the head gainable in this area will not, I feel sure, be struck except by deep borings. Shallow borings such as those at Pondicherry will only strike the water-bearing strata of the Poonamallee bay, or such strata as

may crop up to the surface at a short distance in the Kortalayar arm. Mr. deCloseta, C.E., of Madras, has, I think, stated in a letter to Government that he struck a sheet of rising water in the Napier Iron Works at 90 feet. This had not a gush over surface level, but it was a promising sign as all the Pondicherry wells have shown these preliminary rises. However, to gain a hydrostatic level of any height in Madras it would seem, in any case, that the boring must be run down for at least 300 feet, for the best height, attained at Pondicherry is only sixteen feet over mean sea level at a depth of 261 feet.

41. It would be better that any borings likely to be carried out in the northern part of Madras should be to the west of the canal and north of Rayapuram railway station, though it would be almost worth risking the chance of missing any sub-alluvial ridge of gneiss if a well were tried for in the western half of Black Town.

GOLD IN THE WYNAAD.

From R. Brough Smyth, Esq., Mining Engineer, to J. H. Garstin, Esq., C.S.I., Acting Secretary to Government, Revenue Department, dated Mangalore, 2nd March 1880.

I have the honor to submit the following report for the consideration of his Grace the Governor in Council.

2. I left Mangalore at 6 P.M. on the 8th February and arrived at Karkal on the 9th at 4° 30 A.M.

3. On the 10th, I was engaged in examining the country and in making inquiries respecting the occurrence of gold in this area; and the Sub-Magistrate, and all others who were questioned, stated that they knew of no gold workings, and that they never heard of gold having been found near Karkal. White stone (quartz) was, however, I was told, to be seen at Tallar and Miar.

4. *Tallar.*—This spot is about two miles north-eastward of the bazaar. The bed-rock is gneiss and granitoid gneiss; the foliation obscure, but where observable about N. 60° W.—S. 60° E. The soils are poor and of variable thickness, the colors being pale chocolate and light yellowish and reddish brown. Numerous fragments of country-rock, and small angular pieces of quartz are scattered on the surface, and found also rather abundantly in the soil wherever it is dug up. In the valleys the soils and the bed-rock (the latter to some depth more or less decomposed) are nearly of the same color. At one spot on a low ridge there are larger fragments of quartz, and they cover a considerable space, all derived from what may be a vein, the situation of which is indicated by outcropping blocks. It was not possible to ascertain the direction of the vein or band without making an excavation; and as no gold was found in the soil, after repeated trials, I did not think it desirable to undertake any works in this locality. Northward of this ridge, on the edge of the valley, where a deep ditch has been cut, the bed-rock is well exposed. Throughout a thickness of fifteen feet it is intersected by veins of quartz from one to twelve inches in width; and wherever a cutting is made similar veins, usually less numerous, are found. One small vein or "leader" was seen to strike N. and S. and to dip W. at a very low angle. The soils near those veins were washed and not a particle of gold was seen. All that remained after washing was a small quantity of yellow sand with minute specks of sesqui-oxyd of iron. Specimens of the quartz were collected for subsequent treatment by amalgamation. The quartz is everywhere of the same character; it is milk-white with translucent patches, and in places crystalline; it is not mineralised; no pyrites were seen in any place, and it bears no resemblance to the auriferous quartz usually found in Southern India. Some of the quartz was broken on the spot and in none was gold visible under the lens.

5. *Miar.*—About one mile eastward of Karkal there is an out crop of quartz extending for a length of one hundred and fifty yards. The direction of the vein is N. 30° W.—S. 30° E. The thickness probably does not exceed five feet in any part. Several dishes of earth were washed here and not a trace of gold was discovered, nor was any gold seen in the quartz. Pyrites and other minerals generally found with gold were absent.

6. *Mooroor.*—Near Kookund oor, about 2½ miles from Karkal, is a hill named Mooroor. The hill is a bare blackened dome-shaped mass of gneiss with a thin covering of the so-called laterite (detrital) at its base. Intersecting this rock are (rarely) thin veins of crystalline quartz and one, from half an inch to four inches in thickness, running in a straight line, has a direction N. 72° W.—S. 72° E. There are rather large crystals of felspar impacted in the rock, giving it in places a porphyritic character, but it is strictly a granitoid gneiss, many hand specimens being exactly similar to an ordinary ternary granite. And the thin veins of quartz are like those usually seen in granite. About two hundred yards south of the base of the hill is a rather large exposure of micacised crystalline quartz; its direction being, as nearly as could be ascertained N. 7° E.—S W. The thickness and dip could not be measured. It is seen only where a cutting has been made, but the low rise near it is strewn with fragments of quartz.

7. These areas have none of the characteristics of auriferous tracts, and no native workings were seen in any place.

8. On the 15th February I left Karkal on my way to Mijar, and I was compelled to remain at Mudbidiri until the 17th, as a shelter of sticks, boughs, and leaves had to be erected at the old "diggings" near Mijar for the accommodation of myself and Mr. Thomas Laing, and to afford protection also to the stores, tools, instruments, and furniture which I had to carry with me. The native officer at Mudbidiri, I am sure, did his utmost to get the place prepared as soon as possible; and from its appearance it was probably the work of a few hours. It afforded some slight protection from the sun during certain hours of the day.

9. I arrived at the diggings on the 17th at 3° 45 P.M., and at once commenced an examination of them. The hill—Munda-bettu—is distant about two miles from the village of Mijar, and its summit is only sixty feet above the valley or "flat" on its south-western side. The bed-rock, before it was disturbed, was covered with soil and gravel to a depth of a few inches on the summit, gradually thickening towards the base; at the foot of the hill in the valley the thickness of the soil, gravel, clay, &c., is twelve feet.

10. Subsequently during my stay at the old diggings the hill and the neighbouring ranges were diligently prospected.

11. The form and position of Munda-bettu will be best understood from a sketch-plan and section:—*

12. The auriferous soil and detritus on Munda-bettu are composed of loam and clay with small water-worn pieces of country-rock, fragments of laterite mostly in the form of hematite and limonite and small angular pieces of white and ferruginous quartz. Those have been derived partly from the disintegration of the bed-rock and partly from the laterite.

13. The area actually worked by the natives is not more than one acre and-a-half, and much of it seems to have been turned over several times. At one spot the bed-rock is laid bare over a space of several square yards, and it was here, it is said, that gold was got in considerable quantities. The surface of the bed-rock is irregular—grooved, so to speak, downward from the summit—and there are consequently variations in the depth of the soil. Water was conserved in shallow excavations, and used either for sluicing or for washing the earth in the wooden dish. There are heaps of "tailings" lying on the surface.

14. The natives at Mijar say that no profitable work has been done during the past two or three years; that few of them ever mind on the hill; and that nearly all the work was done by men who came down from the ghats. Near what is supposed to have been the richest "patch" some earth was taken by Mr. Thomas Laing and washed, and one rather coarse speck of gold was found together with some finer particles.

15. The hill was prospected by cutting sections across it at different levels, and by making excavations on and near its summit and by sinking pits down to the bed-rock on and near the "flat."

16. Earth was taken from all these places and washed. Nineteen dishes of soil from various parts of the hill showed a few minute particles of gold; of five dishes from the summit one only gave a speck; and one dish from a new cutting near the summit showed no gold.

17. A pit was sunk on the "flat" where I was certain I should find undisturbed ground and thus get a correct section, and it showed the following layers from the surface downwards:—

		Ft.	In.
1.	Loamy soil	0	6
2.	Sandy clay and gravel and a few small pieces of carbonised wood	7	6
3.	Harsh, dry, mealy loam fine gravel (greyish-brown) (auriferous)	1	3
4.	Clay, with pretty large water-worn pebbles of quartz, country-rock, laterite and hornblende rock	2	3
5.	Yellow and mottled clay resting on bed-rock (decomposed)	0	6
		12	0

As soon as the bed rock was reached water came in, but only in small quantity. The auriferous stratum (No. 3) was not rich. Fourteen dishes were washed and thirteen showed gold. The clay (No. 4) contained a few particles of gold; of three dishes washed two gave a few specks, and one none. The decomposed bed-rock (in the condition of wet clay) yielded no gold.

18. Earth taken from a shallow hole sunk near the head of the "flat" and "bottomed" at a depth of four feet was almost non-auriferous four non-auriferous: four dishes were washed and one only showed a speck of gold.

19. The slopes of the ranges near Munda-bettu and the edges of the paddy flats for a considerable distance on both sides were carefully prospected. Holes were sunk and excavations made at various points. Forty-one dishes of earth were washed and only twelve gave, in each case, minute specks of gold. Indeed it was barely possible, very often, to see the gold with the naked eye.

20. There is a band of talcose schist running through the hill, but near the hill the rock is the ordinary hard gneiss of the country, and though it contains quartz, it is not intersected by reefs or veins. The direction of the foliation observed was N. 75°—80° W.—S. 75°—80° E.

21. On the hill there is an irregular band of quartz of no great extent, and running out altogether not many yards from the spot where it is from eighteen inches to two feet in thickness. It is probably not a vein, but

* We are sorry, we cannot reproduce the sketch.—Ed., I. A.

merely an example on a larger scale, of the thin intercalated bands of quartz which coincide with the direction of the foliation.

22. A great deal of the quartz and ferruginous conglomerate was broken and carefully examined for gold, but none was seen, nor was any found after it was pounded and washed.

23. A few pieces of pale rose-coloured and amethystine quartz were found probably indicating the presence of manganese, iron, and titanic acid. Black oxyd of manganese in minute quantities and small scales of chlorite, talc-chlorite and very small patches of iron pyrites are associated with the quartz, but not commonly; and grains of titanic iron and magnetic iron remained in one or two dishes after "washing off."

24. The natives appear to have entirely neglected the quartz and to have sought for gold only in the detritus lying on the slope of the hill. They say that the gold was found in the "ironstone."

25. The hills immediately above Munda-bettu are covered with a deposit of the so-called laterite. The features presented, more particularly when viewed from a distance, are exactly similar to those seen in volcanic tracts; the laterite where not affected by denudation forming high level plains, and where affected by denudation leaving in many places flat-topped hills, whose character, when the nature of the formation is known, cannot be mistaken. I carefully examined the laterite in the neighbourhood of Mijar and I found it to vary in character. In one place it is almost a conglomerate with much nodular hematite and limonite. The latter minerals are also mammillary and concretionary, showing that chemical changes have taken place since the rock was deposited. It is elsewhere quartzose, and again appears as the ordinary ferruginous clayey rock which is cut and used for building purposes. Not far distant from where the rock is conglomeratic the natives were cutting slabs.

26. The edges of these high plains present a peculiar feature. The rains have carried away the earth and partly undermined the laterite on the edges of the plains, and it has fallen away in blocks and rolled down the hills, and where but slightly moved it appears as bands eight or ten feet in width, separated from the mass forming the plains by deep narrow spaces, and not unlike what would present itself if channels had been cut by man.

27. As far as I could observe, the thickness of the deposit does not in any part exceed twenty feet, and it rests on hard dense undecomposed gneissoid rock.

28. The formation appears to have a slope towards the sea. Lithologically some hand specimens do not differ from the recent fossiliferous marine tertiaries of the southern part of Australia—thin deposits which were formed in shallow water.

29. The laterite plains were once continuous over many miles of country as evidenced now by the flat-topped hills widely separated from one another.

30. I examined this formation also at Gunnymutta, where the same features are seen. Near Gunnymutta and below the level of the laterite and separated from the adjacent hills by a narrow valley is a dome-shaped mass of granitoid gneiss; much of it not distinguishable from granite when broken in small pieces, but its true character is easily seen *in situ*. The direction of the foliation is N. 50° W. It weathers in large flakes, from two to several inches in thickness, conformable to the line of curve of the dome, and is thus easily quarried.

31. The earth lying immediately beneath the laterite and the laterite pounded (from different localities) were washed, but no gold was found in them.

32. Great difficulties presented themselves in attempting to prospect at Mijar. Water could be got only from wells, and I found it impossible to procure sufficient labor. Sometimes I had two coolies, sometimes four, and occasionally six. The men were old and feeble, and apparently unaccustomed to work with the mamoty and pick-axe.

33. On the 1st May 1868, the Acting Collector of South Canara reported that different applicants had offered as much as Rs. 200, 600, and 600 for the privilege of working the hill known as Munda-bettu, and that one native had offered to pay a higher rent than all the other applicants.

The offer of Rs. 600 was for the exclusive right to work the whole of the hill for the period of one year and-a-half. These offers were made probably either for the purpose of sub-letting or under the belief that the whole hill would prove as rich as the patch first found. The natives are superstitious, and they no doubt firmly believe in the legend* connected with the discovery of gold on the hill, and it is therefore not surprising that they made such offers as those described. Moreover there may be small patches of rich earth as yet untouched on Munda-bettu and on the neighbouring hills, but it would be only possible to discover these, if they exist, during the monsoons.

34. The result of my examination of this area of country is that it is not likely to yield gold in such quantities as to induce Europeans to undertake mining enterprises, it is not intersected anywhere by quartz reefs in the places seen by me, and I cannot learn that quartz reefs have been found by any one.

The alluviums during the monsoons will no doubt be worked by natives who are not able to obtain employment at ordinary wages; and they may, perhaps, occasionally find more than sufficient gold for their support, but few will abandon their ordinary occupations to follow gold-mining at Mijar.

* The following account of the cause of the occurrence of gold on Munda-bettu is given by the Jains:—"Many years ago treasure was hidden by the Jains on the Western slope of Munda-bettu. It lay there a long time. About twenty-two years ago a dreadful thunderstorm occurred and the hill was 'struck by the thunder;' the treasure was melted and spread over all the hill. Then men came and saw it in the morning, and one found a piece of melted gold. After that men dug for gold.

35. I have received every possible assistance from the officers of the Government in this district. Mr. W. H. Comyn, the Collector, instructed his subordinates at Karkal and Mudbidiri to give me such aid as I required, and I am greatly indebted also for the prompt and friendly help rendered by Mr. B. C. Leggatt, the Treasurer, and Mr. Herbert Bradley, the Assitant Collector.

36. During the period of my stay at Karkal and Mijar, Mr. Thomas Laing washed altogether one hundred and seven dishes of earth and pounded rock.

37. I left Mijar on the 29th February, and arrived at Mangalore on the same day at 4 P.M.

SELECTIONS.

DEATH OF ROBERT FORTUNE.

WE have to announce, with deep regret, the death on the 13th April of the distinguished Eastern traveller and plant collector, Robert Fortune. He was born on the 16th September, 1812, in the parish of Edrom, Berwickshire. After receiving a good education at the school in his native parish, he served an apprenticeship in the gardens at Kelloe House, in the same neighbourhood. He then proceeded to Moredum, near Edinburgh, as a journeyman gardener, and from thence he entered the Botanic Gardens of Edinburgh, then under the charge of the elder McNab. From here he went to London in 1842, where he received the appointment of Superintendent of the hothouse department in the gardens of the Royal Horticultural Society at Chiswick, then in the heyday of their greatest eminence. In 1843 the Society determined to send a plant collector to China, and selected, Robert Fortune for the important post. How well he fulfilled his mission is well-known to every admirer of plants, by the great number of highly ornamental as well as useful species which he has been the means of introducing to this country during that and successive journeys to the East. In 1848 he returned to China, being commissioned by the East India Company to introduce the tea plant from China to India, which he successfully accomplished in 1851. He again visited China in 1852, and in 1858 he travelled through Northern China and Japan. In the course of these journeys, extending to from two to four years, he discovered many new plants, which he sent home generally with the greatest success, considering the long distance and the numerous accidents to which such delicate subjects are liable in the course of a long sea voyage.

Many of those introductions are now to be seen in prominent positions in every collection of plants in the country, and will long be looked on as living memorials of the steady perseverance and indefatigable energy of Robert Fortune. From stately tree to lowly herb they all attest the distinguished ability, good taste, and industry of the famous Collector.—*Journal of Forestry.*

INDIGO IN THE NORTH-WEST.

WE are glad to hear that the Agra Canal has begun to tell favourably on the production of indigo in this part of the country. So readily have the villagers along its banks taken to growing the plant, that *gâd* (the dye in its uncooked state) is a regular article of commerce with the Hattras mahajuns, who come down to Agra to make advances for it. One of these gentlemen gives us some interesting information of the profits to be derived from this business. A maund of *gâd* costs from Rs. 14 to Rs. 15. It takes from 8 to 9 maunds of *gâd* to make a maund of manufactured indigo, such as is sold in the Calcutta market. The cost of the latter by this process is therefore about Rs. 125 a maund. Last season our informant manufactured 72 maunds at the above rate, and sold them at Rs. 207-8 in Calcutta, netting a nice little profit of Rs. 6,000 on an outlay of Rs. 9,000 only.

The advantages of this system are that the manufacturer is free from the risk attending the growth of indigo on his own account. As long as the cultivators to whom he advances money for the production of *gâd*, are solvent, he is safe. Judgment no doubt is required in making such advances, but we believe that a class of middlemen (*arutheas*) can always be found who will guarantee the re-payment of such advances for a small commission. The only other requisite is a factory containing a boiler, presses, &c., adapted for converting *gâd* into manufactured indigo, but these can be found in any numbers in the Upper Doab districts. For instance, the once famous concern of Chotwa near Hattras is in the market and affords every facility for such work. It contains, we believe, nine factories, and is the property of the present proprietor of the *Englishman* newspaper. Near half-a-century ago, Chotwa and the Saunders were a landmark in the N.-W.P., and it seems a pity that in these days of railways and canals, the enterprise of indigo-planting should have fallen into discredit with the European community of these provinces, while it is being prosecuted vigorously by the native.—*Delhi Gazette.*

JUTE PAPER MILLS.

A PROPOSAL has been made to the Secretary of State for India, by Messrs. McCorquodale & Co., to erect a mill in India for the manufacture of paper made from jute, and to contract for the supply and printing of the same in such forms, &c., as may be required, provided a sufficient inducement be offered to them to undertake its manufacture in India. This paper Messrs. McCorquodale & Co. state to have been used for many years in connection with some of the principal railways, and it was, some three years ago, through the influence of Mr. Rowland Winn, M.P., adopted by her Majesty's Stationery Office, thus effecting a considerable annual saving by the change. They add that the mill which they would erect could also produce other descriptions of paper now purchased in England for use in India. After due inquiry of experts and officials, the Secretary of State informed Messrs. McCorquodale & Co. that the attention of the Government of India has recently been directed to the importance of obtaining, if possible, in India, paper of local manufacture for official use. In the event, therefore, of additional paper mills being established in India by competent manufacturers, he said that the Government of India would no doubt be prepared to extend their local purchases of such paper provided that, in quality and price, it did not compare unfavourably with imported supplies. The Secretary of State added that if Messrs. McCorquodale & Co. were desirous of prosecuting this matter further, it would be more convenient that they should address the Government of India direct, by whom all contracts for local supply are arranged, and it would assist in the consideration of their proposal, if they were able to state, at least approximately, the weight, quality, and probable price of the paper which they would propose to supply.

MALWA OPIUM.

THE Agent to the Governor-General, in Central India makes some remarks about the trade in Malwa opium, the revenue from which forms so important a factor in Imperial receipts:—

For the ten years ending 31st March 1869, the total number of chests passing the scales was 341,412, the duty realized being Rs. 20,11,04,500. For the ten years ending 31st March 1879, the books show a total export from Malwa of 405,091 chests, representing in duty paid to Government Rs. 24,57,82,725. The improvement, therefore, over the previous decade is 63,682 chests, and a revenue of Rs. 4,46,78,225—in other words, the increase in export is more, on an average, than 500 chests a month, and the yearly revenue to Government has improved by upwards of forty-four lakhs of rupees.

Among the causes of improvement in this important trade I would mention the security of the country and a decrease in highway robbery and violence; inducements held out by Chiefs, to whom land under opium is the chief sources of income, improvements in communication, and particularly the facilities which the railway from Indore and Ujjain, affords. The establishment of scales at Ujjain, Jaora, and Udipur has been the means of drawing the produce of each district to pay export duty to the Government of India without being harassed by the levy of dues by each State through which the opium passed, as was the case when Indore was the only place in Malwa where Government duty could be paid.

The importance of opium cultivation to the Chiefs of Malwa can hardly be over estimated—it gives a value to land which no other crop can afford. Wheat and other cereals in the best soil pay from As. 12 to Rs. 3 per beegah; opium yields Rs. 10, Rs. 20, and Rs 40 for the same measure of land, and in some districts where the advantage of soil and water are great and the opuim crop heavy, as much as Rs. 60 per beegah is paid for land under the poppy.

The principal gainers by the growth of opium are the Maharajah's Sindia and Holkar. In Indore Territory especially, advantage has been taken of the profits which the trade in opium holds out to increase the assessment on irrigated lands, and Holkar's revenue has, chiefly by this means, steadily increased. Enhanced collections may fairly be estimated at 40 per cent. over those of 1868.

A NEW CEREAL.

BRITISH farmers will receive with mingled feelings the intelligence that a new cereal has been discovered in Kansas, and that this fresh addition to the weapons with which the agriculturists on the other side of the water attack our market is a peculiarly nutritious and hardy production. In appearance it is something like a grain of wheat, each kernel being enclosed in a separate case, and as food—as a flesh-forming substance—it fully ranks with wheat. There, however, unhappily for all corn that has hitherto been recognised by the farmer, comparison ends. It is as tenacious of life as the proverbial cat, and therein lies its value. Planted in ground upon which rain had not fallen for eight months, it sprang up at once and yielded, in face of five weeks' additional drought, a crop of sixty bushels to the acre. When tested as a means of support for cattle, its stalk was found to be not only nutritious but so attractive to the animals that they seized upon it with an avidity that surprised all spectators while, when thrashed out, its yield was so great that in the opinion of the State Board of Agriculture it bids fair to supplant maize rice corn, pampas corn, and Egyptian wheat. An enthusiastic American agriculturist now contemplates its importation into England with great glee, and thinks that its appearance will give the 'death-blow to British prejudice.' If, in exchange for what this gentleman terms 'British prejudice,' we receive a grain that will grow without the adventitious aid of rain, we shall scarcely lose by the bargain.—*Daily Telegraph.*

CARDAMOMS.

AS we feel sure that Cardamoms will soon become one of our recognised staples, we will offer a few remarks on the subject. The Malabar variety of Cardamom is sometimes found in our jungles, but is not indigenous to Ceylon. The seeds have possibly been dropped by sawyers or others at work in the jungle, and the plant would naturally thrive in humid and shady hollows. It is very like the Ceylon Cardamom in leaf, though shorter and softer on the under side, and is nearly allied to the ubiquitous wild ginger. Let those who buy from the natives (they are worth about Rs. 30 per thousand,) test them by the raceme rather than the root and leaf; in case this is not to be had, we may say that the root is white, and that in all but the true variety there is a distinct red line at the springing of the leaf-stalk from the stem, which is not seen in the Malabar kind. The elevation best suited is from 3,000 to 3,500 above the sea; the rainfall should be not less than 120 inches in the year, and the soil should be light and free. Care must be taken that the stools be not separated before they are delivered, as this is an operation that requires care and supervision; the best plan to do this is to place the stool on the hand and allow it to *fall* naturally to pieces so that the roots for the *planting out* (having if possible two or more stems or at least eyes on each) can be carefully and gently separated; do not cut the stems, but rather plant them out untouched. It is not advisable to burn the undergrowth after clearing, the best plan being to heap it. In felling, the shade to be aimed at should be chequered or acacia-like, such as that of the Ingasaman and Flamboyant. In good soils we suppose seven feet apart, to be the most suitable distance to plant: this would give, in round figures, 900 stools to the acre. It is a mistake not to hole, although deep holing may be unnecessary, great care must be used in planting, deep planting is suicidal; the day chosen should be a dull, dry one, and as little stamping-down as possible should be allowed; with all care, however, the first attempts may be disappointing; we know of a case where, even after all apparent care, seventy-five per cent. of the bulbs failed. It is most advisable to put out 'virgin' bulbs, as they save a year in bearing, and we should strongly advise bulbs in preference to seedlings, as the latter would lose two years, a very important consideration in this special product, as we shall point out. The clearing must be carefully weeded and supplied and at the end of the third year, provided the bulbs were young and vigorous, will be the first picking. The fruit grows along the ground in long racemes, each raceme having about ten branches; sometimes, but very rarely, the plant throws out fruit at the top, when this happens the rhyzone should be carefully kept and propagated; immediately surrounding the plant, and under the racemes, the ground should be swept, all stones, dead stems, and other rubbish being removed: this will, in a degree, keep the fruit from the attacks of insects, &c.—almost every creature bi-pedal or otherwise, seems to be its natural enemy,—and will enable the picker the more easily to get at the raceme. The most successful plan we believe, is to take off the fruit when not quite ripe, by cutting the stems as near the raceme as practicable, with scissors; if the fruit is picked too ripe it is an impossibility to cure without the capsule splitting: the best pickers are women and children, and each child, when the clearing is in full bearing should bring in 6 to 8 lbs. a day of green fruit. Up to this point the cultivation though harassing, has been shown to be simple and straightforward, the next process—curing—is by no means so, however. The method most successfully adopted in Ceylon is to keep the capsules till they are partially dried under light shade such as that of coir-matting and gradually removing it; they should never be exposed to very hot sun and at the same time carefully guarded against mouldiness. The colour that is most appreciated in the London market is yellow or 'golden,' and not white as some people suppose; the pods should be heavy, short, and round, all split ones being carefully picked out. After thorough drying, the "heads and tails" are cut off by children who will finish about 3lbs. each daily. There is little doubt that until the home market is supplied, and at present it certainly is not, the London prices will remain very high: well cured, heavy clipped cardamoms have fetched 8*s.* 7*d.* quite recently, it is therefore evident that these fortunate ones first in the market have much cause for self congratulation. The market of the future is India, specially in the North, where there is a large and increasing demand for the Malabar kind. Owing to this fictitious state of the market statistics are unreliable; we have known, at least one magnificent and giant rhyzome give as much as 20lbs. green fruit, and we must leave it to our readers to calculate for themselves the enormous yield and consequent profit per acre of this product, only adding that the green capsules dry down to one quarter of the original bulk, and that the present price in Colombo for well cured high grown Cardamoms is Rs. 2·40 to Rs. 3 per lb.—*Ceylon Times.*

COCKCHAFER GRUBS.

THE idea of poisoning Cockchafer grubs by preparations of arsenic is worthy of attention and practical experiment. It is quite conceivable that a quantity of mineral poison so small as to have no deleterious effect on vegetation, even the tender feeding rootlets, may yet be quite sufficient to act fatally on such insects as grubs. Any effect on the fruit of the trees, from sulphate of lime with so slight an admixture of arsenic, is, of course, out of the question. The difficulty would be to get the coolies to apply the remedy without doing themselves harm. But initiatory experiments will, of course, be carried on by superintendents, or under their immediate inspection.

In an American work, "Curious History of Insects," by Frank Conway (J. B. Lippincote & Co., Philadelphia), we find a notice of the cockchafer and its grubs, confirmatory of the opinions formed of their destructiveness in the case of perfectly healthy vegetation. The winged insects, it seems, are called not only *cockchafers* but *hedgechafers*, *May-bugs* (*bug* is, in the United States, the generic term for insects) and *dorrs*. The latter name is traced to the "Irish" *dord*, humming, or buzzing; or it may be derived from the Anglo-Saxon *dora*, a locust or drone. Fabricius included the chafers in the genus *Melolontha*, a word which retains an odd notion of the Greeks that the insects were produced from or with the flowers of apple trees. The Swedish peasants call the grub *Bemärkelsemask*, prognostic-worm, from their belief that the varying colour of the creatures (they are bluish when well stuffed with food) indicates a mild or a severe winter. A more absurd notion is prevalent in England (of course confined to the ignorant) that these beetles are changed into briers. In 1575, the river Severn carried down enormous numbers of these creatures, the explanation given being that "the water overflowing the low ground brought the beetles for air to the surface, whence they were swept by the current." In 1688, cockchafers appeared in such numbers in Ireland that the air was darkened by their flight, and the noise of their humming resembled the beating of drums at a distance :—

"*The grinding of leaves in the mouths of this vast multitude altogether made a sound very much resembling the sawing of timber.* In a very short time after the appearance of these beetles in such immense numbers, they had so entirely eaten up and destroyed the leaves of the trees, that the whole country, for miles around, though in the middle of summer, was left as bare as in the depth of winter. During the unfavourable seasons of the weather, which followed this plague, the swine and poultry would watch under the trees for the falling of the beetles, to feed and fatten upon them; and even the poorer sort of the country people, the country then labouring under a scarcity of provision, had a way of dressing them, and *lived upon them as food*. In Normandy, according to Mouffet, the cockchafers make their appearance every third year. In 1875, many provinces of France were so ravaged by them, that a premium was offered by the Government for the best mode of destroying them. During this year, a farmer, near Blois, employed a number of children and the poorer people to destroy the cockchafers at the rate of two liards a hundred, and in a few days they collected fourteen thousand. The County of Norfolk in England seems occasionally to have suffered much from the ravages of these insects, and Bingley tells us that about sixty years ago, a farm near Norwich was so infested with them, that the farmer and his servants affirmed they had gathered fifty bushels of them; and the grubs had done so much injury, that the court of the city, in compassion to the poor fellow's misfortune, allowed him £25."

How many times would £25 compensate the "poor fellows" of Ceylon planters for the damage done to their interests by these "blind beetles?"

THE HISTORY OF THE MEXICAN FIBRE.

THE brief notice given in your last number of the growth and production of Sisal hemp leads me to believe that some account of another Agave product of commerce may prove interesting, and, as I have had much to do with its extensive introduction and use, and a few years ago made a tour of inspection over the wild unexplored parts of Mexico where it is grown, I have much pleasure in placing before the readers of your widely circulated and useful journal the following particulars, which chiefly relate to what is generally known in commerce as Mexican fibre:—

There is still very much doubt as to which is the particular species of Agave which yields this so-called Mexican fibre, and whether it is not obtained from several varieties or species of the genus. I am not sufficient botanist to determine this question. My knowledge being chiefly restricted to the commercial quality and character of the product.

The leaves of *Agave Americana*, Lin., and some other species, such as *A. Mexicana*, furnish a strong fibre adapted for ropes, and even for beautiful textile fabrics. The pithy stalk can be utilised for some of the purposes for which cork is usually employed, for instance, to form the bottoms of insect cases, &c. Where space and circumstances admit of it, impenetrable hedges may be raised in the course of some years from Agaves.

It is under the tropics proper, throughout Mexico, Central America, the Nothern States of South America, and in the West Indies that the Agaves are most abundant, and may be multiplied to any extent necessary to meet the demand of the world for the kind of fibre which they produce.

The fibres extracted from the Agaves differ widely in fineness and consequently value, although all are available for cloth, cordage, and paper. The quality of the fibre, it is said, also varies considerably with the age of the plant, being most pliable and easily worked if taken when the plant is young. Superficial writers and travellers have caused great confusion and uncertainty in respect of the Agaves by confounding the different species, and their contradictions have much embarrassed practical men in their calculations and efforts for utilising them.

According to some writers the plant that furnishes the Sisal hemp, the Chelem, Henequen, and Sacci of the Mexicans is *Agave rigida*, Miller, *A. Ixtle*, Kauvinsky. Drs. Perrine, Scott, and Engelmann indicate several varieties of this stately plant, the fibre being therefore variable both in quantity and quality. The yield of fibre begins at four or five years, and lasts for half a century or more, the plant being prevented from flowering by cutting away its flower-stalk when very young. The leaves are from two to six feet long and two to six inches wide; the flower stems attain a height of twenty-five feet if suffered to grow, the panicles of flowers about eight feet long, bearing in abundance bulb-like buds.

Other large species of Agave, all fibre-yielding, are *A. antillarum*, Descourtel, from Hayti; *A. Parryi*, Engelmann, from New Mexico; *A. Palmeri*, Engelmann, from South Arizona, up to an elevation of 6,000 feet.

About thirty years ago a small sailing vessel arrived in Liverpool from a Central American port. One of the crew had brought with him a bag which he used as a pillow, containing a small quantity of what is known as Mexican fibre. On landing he sold it for a trifle to a working brushmaker in Whitechapel, who made it up into scrubbing brushes. A few years after, small shipments of this fibre commenced to arrive at Liverpool and New York from Tampico. Attention was prominently directed to it in this country during the time of the war with Russia, when, bristles becoming scarce, the brushmakers were at their wits' end, and all strong descriptions of vegetable fibre, such as this Agave fibre, piassava or bass, kittool, cocoa-nut coir and other substances were used, and have since held an important place as brush-making fibres.

I was in Manchester at that time, and a firm on which I had called to do business in other fibres, drew my attention to a sample of this Mexican fibre, which had been sent to them as probably suited for a substitute to hemp and jute. They said, however, it was useless for their trade, the fibre being too stout and strong. I immediately went to Liverpool to consult the house I represented, and pointing out how admirably this fibre was fitted for brushmaking, we not only bought up all on hand but sent to New York to secure what was on sale there. Samples were then sent to all the brushmakers, in the kingdom for trial, and finding it was a good substitute for bristles, large orders were obtained, and the price of the fibre rose from £28-10 to £70 per ton. I took over samples to show brushmakers of Belgium, Holland, and Germany, but not one would look at the fibre, even when shown the excellent brushes made with it.

I even offered to present them with a hundredweight of the fibre that they might test it; one firm alone consented to accept it, but I had not gone far when they sent for me and refused to do even this, unless I paid the freight also. This I declined. At present this firm employs a very large number of hands in making brushes with this fibre. Hearing at Bremen that a lot of this fibre was lying unsold at Hamburg, I went there and secured it. The trade gradually began to appreciate the fibre and large quantities were used. It was also employed mixed with pig-hair for stuffing chairs, mattresses, etc. Great fluctuations have taken place in the price of the fibre, it has been sold as high as £100 the ton, and as low as £28, and it sells now at about £40 per ton.

The use of this fibre in brush-making now gives employment to thousands of people not only in the United Kingdom and on the Continent, but in Australia and America. In the form of scrubbing brushes it is to be seen in almost every grocer's, chandler's, and retail ironmonger's shop, and cheap nail brushes are also made of it and retailed at 3*d.* or 4*d.*

In 1874, in a commercial tour to the West Indies and Mexico, I made it my especial object to penetrate far into the interior of Mexico in order to ascertain for myself its mode of growth and preparation.

When I arrived in the interior over the mountains, I found large bunches of the plants growing wild from three to five feet apart. The plant is called Lechuguille by the natives here. The mode of obtaining the fibre is simple, and the rude implements required very primitive. They consist of a stick about four feet long, to the end of which a leather thong is attached, something like a huntsman's whip. This is slipped over the top of the leaf and serves to detach it. The leaves have serrated edges or spines down each side. When detached, they are passed to a man sitting on the ground with a strip of board before him about two feet long. This man scrapes the end of the leaves and removes the pulpy part, and he then begins to scrape the other part with a heavy iron knife, placing, when possible, one end of the knife under the root of a tree or shrub to get a leverage, by which means the pulpy matter is removed, and he has a small handful of beautiful white fibre, which speedily dries in the sun after it has been scraped. It is then known as Itzle, probably the old Aztec name. After the two men have collected about 40lbs., which they can do easily in a day, the fibre is carried to their huts, and in a few days taken to the factories to be made up into ballots and sent on mules' backs (two ballots weighing about 8 cwt.) to Tampico, a toilsome journey across the mountains of over 400 miles.

The best and longest fibre is obtained from young or virgin plants. Although the plant is not killed by the removal of the leaves, yet, after the first crop is taken away, the subsequent fibre is short and of bad colour.

Just before flowering the natives cut down the stem or flower stalk, peel it and eat it raw like sugar cane, or else roast it before eating. The plant produces a very pretty yellow flower. The flower-stem, before the fruit is ripe, is also cut in slices and fried in fat; when it makes a nice vegetable, and large quantities are thus eaten.

The plant is raised from seed, but grows also from shoots of the old plant. There are about 20 square miles of land here which formerly belonged to the Jesuits, but having been confiscated, now belongs to private owners, and this is covered with virgin plants. In other localities, the young plants being exhausted, only short and poor fibre is obtained. Some of the fibre is brought from Zacaticus and Tula.—*Arthur Robottom.*

[Reference may be made to an article on "The Products of the Agave," Vol. V., p. 149 of this Journal.—*Editor, Journal of Applied Science.*

THE FOOD OF PLANTS.

VEGETABLE extract, mucilage, and carbon, with water as a vehicle, constitute the principal food of plants presented to the roots under varying circumstances of soil and temperature which favour their assimilation, while atmospheric air, when of a suitable temperature and circulating freely amongst the trees, acts upon them through the leaves and the bark. The effects of stagnant air may be seen in cases where from want of a proper circulation and the exclusion of light the side branches die and drop off, leaving only a few green ones at the top, the tree increasing principally in length as these push up in quest of food.

Some writers have assigned to plants the power of selecting their food from the solids in the soil without the aid of water, while the opinions that water alone and even air alone are sufficient to secure plant growth have also been advanced. Pure water can only be obtained by distillation, as it does not exist in Nature unmixed with gaseous, saline, or earthy matters. These matters are carried into the leaves and the bark along with the water which is thence evaporated, leaving the substance behind. Whatever enters the plant, whether in the form of carbonic acid or as water and atmospheric air, becomes decomposed, after which some of its elements pass off, while others recombine in different proportions, forming gum, sugar, fecula, and azotic products.

A plant whose roots are placed in pure water will not flourish until carbonic acid is admitted. Carbon, of which the substance of plants so largely consists, can only enter the plant as carbonic acid gas, as may be proved by placing the roots in pounded carbon, and watering with distilled water, when no growth will take place. Nitrogen, or azote, contributes largely to the nutrition of plants, and its presence in the gluten and the vegetable albumen, as well as in the alkalies, shows that it is essential.

Silex is taken up by some plants in large quantities, and more especially by the grasses and the bamboo. It is stated that the skin, or covering, of the rattan palm contains so much of it that sparks are produced by striking this tree with a piece of steel. It is well known that silex is present in considerable quantities in the teak-tree, and also in the equiseta, or horse-tails.

Lime and the salts of lime—the sulphate and phosphate,—magnesia, sulphur, soda, potash, phosphorus, and metallic substances, are found in plants, soda being generally the most abundant. Even copper is found in the coffee-berry. The quantity of water passing through any plant which presents to the sun and the atmosphere a large evaporating surface, may be inferred from the experiments of Hales, who ascertained that a sunflower only three feet high lost twenty ounces of water daily.

The way in which the points of the roots push forward in to fresh soil as the old becomes exhausted of its nourishment, or turn aside and spread out in other directions when they meet with any impediment to their onward progress, even passing through small crevices and bursting asunder the stones by their powers of expansion, furnishes us with an instance of the wonderful provision made by Nature for the supply of the wants of the vegetable creation.

A perfect knowledge of the composition of plant-food would enable us to fertilise any soil which did not contain ingredients positively poisonous to plants. Root structures show that whatever enters them must be in a very minute state of sub-division; and chemistry proves that this comprises sulphates of lime and potash, vegetable extract, muriates of lime and soda, or common salt, and that, unless oxygen be present, both in the soil and the air by which they are surrounded, plants cannot vegetate.

In the February number of the *Journal of Forestry* is a short review of a valuable little pamphlet lately published at the request of the Scottish Horticultural Association, and written by Mr. W. Ivison Macadam, of Edinburgh. But, as is usual in such publications, the illustrations of the composition of plants are confined to farm crops. The sooner the services of such an analyst can be enlisted in the cause of arboriculture, the better for students of the science. As Mr. Macadam gives important information upon various points which have already been treated of, more discursively, in these papers, a summary of his tables of plant-food will supply me with an appropriate recapitulation.

The principal mineral ingredients in plants are nine in number.—potash, soda, lime, magnesia, iron, phosphoric, sulphuric and silicic acids, and chlorine.

Potash, containing the metal potassium (K), also present in nitre or saltpetre (KNO_3), in muriate of potassium, or chloride of potassium (KCl), and in kainit as sulphate along with the chloride of magnesium.

Soda, containing the metal sodium (Na), which also forms a part of common salt or chloride of sodium (NaCl), Glauber's salts or sulphate of soda ($Na_2 SO_4$), and nitrate of soda or cubical nitre ($Na NO_3$).

Lime, a compound of calcium (Ca), also existing in chalk or carbonate of lime ($CaCO_3$), and stucco, gypsum, or sulphate of lime (Ca SO), and in bone in combination with phosphoric acid as insoluble or bone phosphate ($Ca_3 2PO_2$).

Magnesia, containing magnesium (Mg), also found in Epsom salts, or sulphate of magnesium ($MgSO_4$), and as chloride of magnesium ($MgCl_2$) in kainit.

Oxide of iron, consisting of iron and oxygen.

Phosphoric Acid (PO_5). Its principal state of combination is with lime as bone phosphate ($Ca_3 2PO_4$), and as soluble phosphate ($Ca_2 PO_4$).

Sulphuric Acid (SO_3), found in combination with lime as stucco ($CaSO_4$), and forming the acid portion of Glauber's salts (Na_2SO_4).

Silica is made up of silicon and oxygen. It forms sands, and in combination with metals silicates.

Chlorine is a yellow-green gas, and is found as a part of common salt (Na Cl), muriate of potash (KCl), and chloride of magnesium ($MgCl_2$).

The organic constituents of plants are starch, sugar, dextrose, oil, gluten, legumin, cellulin, and lignin.

Starch ($C_6 H_{10} O_5$) softens in cold water and gives a semi-solution in hot.

Sugar ($C_{12}H_{22}O_{11}$) is found principally in the stems of plants, chiefly grasses, as the sugar-cane; and a few trees as the maple and date palm; and also in the tubers of beet and carrots.

Dextrose, or grape sugar ($C_6H_{12}O_6$), is another variety of sugar principally obtained from fruits. *Oil* is obtained from rape seed, the castor plant, and the cocoa-nut. *Gluten* is a white sticky substance obtained by washing flour in a cloth with water. It is abundant in cereals. *Legumin* is obtained from peas, beans, tares, &c. *Cellulin* composes the walls of the cells in plants. *Lignin* is a hard matter of woody fibre deposited in the cells.—*Journal of Forestry.*

MANURES—A SUBSTITUTE FOR PERUVIAN GUANO WANTED.

I SHALL now refer to what is acknowledged to be the backbone and sinew of the growth of every crop—that is manure. Twenty-seven years ago, during the heat of the Crimean War, when grain was at famine prices, the great cry was artificial manure—anything to raise up larger crops. Pervian guano was by that time well known and extensively used, but the great run on it raised the price so much, that in answer to the popular cry for some other and cheaper stimulant for the soil, manufactured chemical manures came to the front, the more readily that the guano deposits were seen to be wearing down, and the quality getting worse. Crushed bones and bone-meal had been in use, along with guano, many years previous to this, but dissolved bones, superphosphate, sulphate of ammonia, nitre of soda, and various other forms of nitrogenous and phosphatic compounds were added to the list of manures. In the infancy of such a gigantic trade, as might be expected, the dishonest and swindling element was not without its representation. No sooner had the trade gained a footing, than our markets were flooded with commission agents, each pretending to sell the best and cheapest mixture, warranted to force crops on any soil. At this time very few, I might almost add no farmer, thought of analyzing the manures he bought. It was a new trade to them; as a rule they knew nothing of the component parts of the various manures, or of their proper and economical application to the various soils and crops. A great many of them held their farms on pretty easy terms, having taken them during the period of agricultural depression immediately preceding the prosperous years of which I am speaking. They bought and applied their manures by rule of thumb. It did not seem to trouble them, so long as the results left a balance on the right side of the ledger. It was only after the lapse of several years, when that plague of the farmer—the manure commission agents—increased to such an extent, that at most of our markets they outnumbered even the farmers themselves. Then it began to dawn on their minds that there must be something radically wrong in a trade that could support such an army of sellers. It is now an ascertained fact that many special mixtures, which contained little or no manurial ingredient whatever, were sold at a clear profit to the vendor, of £6 or £7 a ton.—*Mr. Thomas Lawson in N. B. Agriculturist.*

NOTES ON SOME TREES YIELDING INDIA-RUBBER.

INDIA-RUBBER or Caoutchouc is afforded by a considerable number of trees and shrubs, chiefly, if not entirely, members of the families *Euphorbiaceæ*, *Artocarpaceæ*, and *Apocyneæ*. It is to be distinguished from gutta-percha, which is a product of trees belonging to the family *Sapotaceæ*.

In its natural condition in the plant caoutchouc is a milk-like fluid, and the channels in which it occurs occupy a definite position in the structures composing the stem. It is of the highest practical importance to bear in mind that the "milk-vessels" occur wholly in the bark, externally to the cambium-layer or vitally active part, of the stem where growth goes on. There are none in the wood, nor in the outer corky, papery, or green layers but only in the inner part of the bark, and either adjacent to or in its bast or liber-tissue.

The kinds of rubber-trees at present exciting interest in Ceylon are:—

1. *Ceará Rubber-tree.*—Manihot Glaziovii, *Müll. Arg.*
2. *Para Rubber-tree.*—Hevea Brasiliensis, *Müll. Arg.*
3. *Central American Rubber-tree.*—Castilloa Elastica, *Cerv.*

These three are all natives of tropical America, and are in cultivation at both Peradeniya and Henaratgoda gardens. The two former are North Brazilian Euphorbiaceous trees; the last is Artocarpaceous and extends over a wide area—from Mexico as far south as Guayaquil on the west coast of South America.

None of these species has been yet subjected to systematic cultivation out of a botanic garden, but the efforts of the Indian and Home Governments, extended over many years, have at length brought us to the eve of that long-desired result. It will therefore be well to make public what is known of the nature of these plants, of their surroundings in their native localities, and of the methods by which the product is obtained and prepared. Our information is unfortunately but scanty, being mainly derived from the somewhat meagre accounts of the few travellers who have had the opportunity of seeing the trees wild, and especially of the veteran Collector, Mr. R. Cross, employed by the Indian Government, by whose energy and perseverance they were brought to England.

From these extracts, and from the results of the cultivation of the trees at Peradeniya and Henaratgoda gardens, it is hoped that some answer to the numerous questions recently addressed to me by planters and others, may be given, and some guidance afforded towards a successful cultivation in Ceylon.

I.—Ceara Rubber.—*Manihot Glaziovii.*

1. *Locality, Soil, and Climate.*—Ceara is a coast town of Brazil in lat. 4° S., and the flat country which runs back to the hills is described by Mr. Cross as manifestly possessing "a very dry arid climate for a considerable part of the year. This is evident from the fact that mandiocca and other crops require to be irrigated. The rainy season is said to begin in November and end in May or June; torrents of rain are then reported to fall for several days in succession, after which the weather moderates for a brief space. According to some statements there are occasional years in which hardly any rain falls. The assertion concurs with the aspect presented by the country in general. The daily temperature on board the ship ranged from 82° to 85° F., but inland it is often, probably, 90°. The localities traversed by me nowhere seemed to be elevated more than 100 feet above the sea." At Pacatuba, about forty miles from Ceara, the actual place where the specimens were obtained, "the general forest was tolerably high, but the sparse small foliage did not afford much shade from the fierce rays of the sun. The soil was in places a sort of soft sandstone or gravel which was bound up in the most extraordinary manner. Neither grass nor weeds grew among this underwood, and there was an entire absence of ferns, mosses, and other plants." In another place, somewhat further from the coast, the traveller shortly after entering the bush-like forest "came on a large tract of land covered by immense masses of grey granite, some of which might be fifty tons or more in weight. These had been broken where they lay, and were the result of a volcanic explosion. Rounded masses of the same rock also cropped out in many places..................Many good-sized rubber-trees were growing in the spaces between these granite masses..................The situation was very dry, but no doubt some seedlings had sprung up, which, owing to numerous thickets of shrubs, were not perceived."

2. *Propagation and Planting.*—Mr. Cross's directions are as follows:—"Seeds are early produced, if the tree is not shaded. They should be buried in brown sand, kept pretty moist until there are indications of growth, when they may be planted out permanently. In some situations where the ground is rough and strong they might be sown broadcast. Meantime I would suggest the formation of plantations by cuttings, which will take root as easily as a willow. These should be taken from the points of strong shoots and may be one foot in length. In planting, each cutting may be put down in the soil to a depth of six inches. If scarce, the entire shoot may be cut into pieces, each possessing a bud, all of which will grow, if covered with half-an-inch or so of soil. On loose sandy soils, or exhausted coffee land, plantations may be formed at little expense. Hard, dry gravelly wastes, if found to support any kind of bush, are also suitable sites. Holes might be made in strong land with an iron, jumper and a stout cutting put into each and filled with pebbles. On bare, or thinly covered portions of rock the cuttings might be laid down flat, and a little heap of stones or any kind of *débris*, about the size of a molehill, piled over each, care being taken that the extreme point of each cutting with a bud is left uncovered. I do not advocate planting in an entirely barren desert, but wherever there is any sort of stunted tree or scrub vegetation, with an occasional sprinkling from a monsoon shower, the tree is likely to prosper."

Experience of the plant in the botanic garden here has proved the general accuracy of the above remarks. There can be no doubt of the hardiness of the species, its readiness of culture, and adaptability to circumstances. It grows equally readily from seed or from cuttings, and though a native of a tropical sea-level, thrives well here in Ceylon up to at least a level of 3,000 feet, and on the most barren soils. It has succeeded equally in Calcutta and Madras, but the wet season appears to have killed it at Singapore. It would seem especially adapted for the dry and barren districts of our Eastern and Northern Provinces, or in the higher districts, but it would not be wise to risk it in localities where the temperature is liable to fall below 60° F.

Germination of Seed.—The seed coat is of remarkable thickness and very hard, and the natural process of germination occupies a long period—it is said more than a year. All that is necessary to hasten this, if desired, is to assist the seed coat in splitting. This is best effected by holding the seed firmly, and rasping off with a file both edges at the radicular end.* It is best not to file off the actual end, as it may thus easily happen that the radicle of the embryo may be injured. After this treatment, properly performed, the young plant appears above ground in two or three weeks. The seedlings require no particular attention. They grow rapidly and may be finally planted out at distances of twenty feet. A peculiarity which they share with their close relative the mandioc is the possession of large tubers on the spreading roots. The trees at Peradeniya, from which seed has been distributed to Burmah, India, Jamaica, &c., flowered at the age of eighteen months, and at the present time (at 2½ years) the larger ones form branching trees about 25 feet or 30 feet high, with a stem 1 foot 9 inches in circumference at a yard from the base, and a smooth, silvery birch-like bark readily peeling off; being about half the size of those which Mr. Cross describes, and which may be assumed to have been fully grown.

3.—*System of collecting the Rubber.*—I quote again from Mr. Cross's report:—"This is an operation of a very simple description. On commencing to work, the collector takes with him a stout knife and a handful of twigs to serve as a broom. Arriving at a tree, any loose stones or dust are swept from the ground around the base, and some large leaves are laid down to receive the droppings of milk which trickle down. Some do not go to the trouble of sweeping the ground or laying down leaves, for which reason the milk adheres to sand, dust, decayed leaves, and other impurities. The outer surface of the bark of the trunk is pared or sliced off to a height of four or five feet. The milk then exudes and runs down in many tortuous courses, some of it ultimately falling on the ground. After several days the juice becomes dry and solid, and is then pulled off in strings and rolled up in balls or put into bags in loose masses. Only a thin paring should be taken off, just deep enough to reach the milk vessels, but this is not always attended to. Nearly every tree has been cut through the bark, and a slice taken off the wood. Decay then proceeds rapidly, and many of the trunks are hollow. In this condition the trees must yield far less milk, and many no doubt are broken over by the wind, or wither away. Collecting is carried on during the dry season only, when rain seldom falls."

Mr. Cross says nothing as to the age of the trees so operated upon; probably the collectors treat all indiscriminately. In the sequel of his report, however, he incidentally remarks that Ceara rubber may be tapped on attaining "a diameter of four to five inches," which is the case here in Ceylon after about two years' growth. But unless there were a very large number of trees in an extensive plantation, this would certainly be labour thrown away. The tree, however, comes so early to maturity, as shewn by the production of seed, that it is improbable that it attains any very great size. The process above described must be, if thoroughly done, almost exhaustive of the milk, but in the case of a small stem it would be a work of some care and time to so conduct it as to avoid cutting into the wood, and probably some of the methods afterwards described will be preferred. But these are practical difficulties which it may be safely assumed the ingenuity of our planters will quickly master.

II.—Para Rubber.—*Hevea brasiliensis.*

1. *Locality, Soil, and Climate.*—The town of Para occupies a position near the mouth of one of the vast embouchures of the Amazons in about south latitude 1°, but the district of the same name extends over a vast forest region to the south and west, throughout which and the enormous forests of Central and Northern Brazil this and allied species are abundantly found. The climate has been often described and is remarkable for its uniformity of temperature, usually not exceeding 87° F. at midday or below 74° at night. The greatest heat recorded is 95°, and the mean for the year is 81°.

The rainfall occurs principally during the months from January to June, the maximum being in April when it reaches 15 inches. For the remaining six months of the year very little falls, but there are fine days in the wet season and occasional showers in the dry. The whole country is

* This end is to be recognised externally by possessing at its side a flat two-lobed appendage technically known as the car uncle.

covered with dense moist forests, and the soil near the numerous and gigantic rivers is deep, heavy, and very fertile. During the wet season much of the low-lying country near the Amazon's mouth is flooded. In the *Gapos* near Para, visited by Mr. Cross, he found a flat district only three or four feet above the highest tides and completely intersected with water-courses at low tide, filled with a soft rich mud. The forest here, in which caoutchouc collecting was vigorously carried on, was 80 or 100 feet high, and very damp and unhealthy, the soil full of moisture and very rich and fertile. The young plants, however, were not often observed to grow actually within the reach of the tides, but it is evident that they must frequently be subject to be partially covered with water.

2. *Propagation and Planting.*—This valuable species as yet has been propagated from cuttings only. No fresh seeds were brought to this country, but to judge from dry ones in the herbarium of the British Museum, London, they are considerably larger than those of the Ceara rubber. Our largest trees at Henaratgoda, three years old, are thirty feet in height with a slender stem scarcely branched, and about twelve inches in circumference near the base; but neither there nor in Peradeniya have they shown any symptoms of flowering.

Cuttings may be taken from the green lateral twigs as soon as they begin to harden; they strike readily in rich firm land. Mr. Cross observes that "for planting on inundated lands the period of high flood should be preferred. Cuttings of greater length would be required in this case, the lower ends of which should be sliced off in the form of a wedge. The workman could take a bundle of these, and wading into the water would plant at proper distances, but perfectly upright, taking care to push each cutting down deep enough in the soft muddy bottom, so that not more than three or four inches is above the surface of the water. The same rule would be applicable when planting in sludge or soft marsh land. The crowns of the cuttings must not, if possible, be put under water, as the young growths springing therefrom might rot. Seeds will not be found very applicable for planting in watery places or deep mud deposits Some would come up, but a good many would mould and decay. In the varied course of circumstances and conditions, slight changes and modifications in the methods of working will no doubt suggest themselves ....It should be planted in places where nothing else could be profitably cultivated, such as frequently inundated river margins, marsh land, and mud deposits." It would not be desirable to form a plantation in any locality where the temperature at any time falls to 60° F.

The tree when fully grown does not exceed a height of about sixty feet, and the largest trunk measured by Mr. Cross was six feet ten inches in circumference at a yard from the ground. From the upright habit of the tree it will not be necessary to plant at any great distance apart.

Over 500 plants have been sent from Ceylon to Burmah and some to the Madras Presidency. An attempt to grow the tree in Assam failed.

3. *Collection of the Rubber.*—Several accounts have been given of this, the fullest and most recent being that of Mr. Cross, who saw in practice the methods employed in the neighbourhood of Para. His description is as follows:—

"The collectors begin to work immediately at daybreak, or as soon as they can see to move about among the trees. They say the milk flows more freely and in greater quantity at early morn. I do not attach much importance to this statement, but I have recorded it. Another and more probable reason is, that as rain often falls about two or three o'clock in the afternoon, the tapping must be done early, as in the event of a shower the milk would be spattered about and lost. The collector, first of all, at the beginning of the dry season, goes round and lays down at the base of each tree a certain number of small cups of burnt clay. At the lesser trees only three or four are put, but at the larger ones from eight to twelve are deposited. The footpaths leading from tree to tree are likewise cleared of sapling growths, and the bridges over the *gapos* [natural ditches] formed at each place by the trunk of a tree are, where necessary, replaced On proceeding to his work the collector takes with him a small axe for tapping, and a wicker basket containing a good-sized ball of well-wrought clay. He usually has likewise a bag for the waste droppings of rubber, and for what may adhere to the bottoms of the cups. These promiscuous gatherings are termed *sernamby*, and form the "Negro head" of the English market. The cups, as already stated, are of burnt clay, and are sometime round, but more frequently flat or slightly concave on one side, so as to stick easily when with a small portion of clay they are pressed against the trunk of the tree. The contents of fifteen cups make one English imperial pint. Arriving at a tree, the collector takes the axe in his right hand, and, striking in an upward direction as high as he can reach, makes a deep upward sloping cut across the trunk, which always goes through the bark and penetrates an inch or more into the wood. The cut is an inch in breadth. Frequently a small portion of bark breaks off from the upper side, and occasionally a thin splinter of wood is also raised. Quickly stooping down he takes a cup, and pasting on a small quantity of clay on the flat side, presses it to the trunk close beneath the cut. By this time the milk, which is of dazzling whiteness, is beginning to exude, so that if requisite he so smooths the clay that it may trickle direct into the cup. At a distance of four or five inches, but at the same height, another cup is luted on, and so the process is continued until a row of cups encircle the tree at a height of about six feet from the ground. Tree after tree is treated in like manner, until the tapping required for the day is finished. This work should be concluded by nine or ten o'clock in the morning, because the milk continues to exude slowly from the cuts for three hours or perhaps longer. I may state that there is a great difference among collectors in the performance of these duties. Some take care to get good clay previously, and incorporate it well, so that a very small portion is needed to lute the cups to the trunks; they also work with neatness and intelligence, and invariably collect a good quantity of milk. Others, again, do not take the trouble to prepare clay beforehand, but merely scrape up a handful when they require it at the side of a *gapo*, which is often of little consistence, so that a large quantity is required to fasten the cups. This class of collectors have often many fragments of clay or other impurities in their milk, the result of not following a proper method of working. The quantity of milk that flows from each cut varies, but if the tree is large and has not been much tapped, the majority of the cups will be more than half full, and occasionally a few may be filled to the brim. But if the tree is much gnarled from tapping, whether it grows in the rich sludge of the *gapo* or dry land, many of the cups will be found to contain only about a tablespoonful of milk, and sometimes hardly that. On the following morning the operation is performed in the same way, only that the cuts or gashes, beneath which the cups are placed, are made from six to eight inches lower down the trunks than those of the previous day. Thus, each day brings the cups gradually lower until the ground is reached. The collector then begins as high as he can reach, and descends as before, taking care, however, to make his cuts in separate places from those previously made. If the yield of milk from a tree is great, two rows of cups are put on at once, the one as high as can be reached, and the other at the surface of the ground, and in the course of working, the upper row descending daily six or eight inches, while the lower one ascends the same distance, both rows in a few days come together. When the produce of milk diminishes in long wrought trees, two or three cups are put on various parts of the trunk, where the bark is thickest. Although many of the trees of this class are large, the quantity of milk obtained is surprisingly little. This state of things is not the result of over-tapping, as some have stated. Indeed, I do not believe it is possible to overtap a tree if in the operation the wood is not left bare or injured. But at every stroke the collector's axe enters the wood and the energies of the tree are required in forming new layers to cover those numerous wounds. The best milk-yielding tree I examined had the marks of twelve rows of cups which had already been put on this season. The rows were only six inches apart, and in each row there were six cups, so that the total number of wood cuts within the space of three months amounted to seventy-two. It grew close to a *gapo* only eight inches above high-tide mark, and being a vigorous tree the cups were usually well filled, but with two years or so of such treatment the tree would probably be permanently injured. It has been supposed that the quality of the milk is better in the dry season than during the rains. Such is the case with some vegetable products, but as regards India-rubber there ought not, I think, to be any appreciable difference. In the rainy season the milk probably contains a greater proportion of water, but, on the other hand, I am of opinion that then a larger quantity of milk flows from the tree. No doubt the dry season is the most suitable for caoutchouc collecting, although, wherever a plantation is formed with preparing house, convenient tapping may certainly be always carried on when the weather is fine. . . . There are two other methods adopted in tapping, which are chiefly confined to the upper Amazon and tributaries. Both are exactly on the same principle, the materials used being only a little different. The loose outside bark of the tree is cleaned off to a height of about three feet. Beneath, a gutter or raised border of clay is pasted or luted to the trunk, enclosing one-half of the entire circumference. Cuts are thickly made in the bark above this, from which the milk flows down to the gutter, whence it is conveyed to fall into a calabash conveniently placed. The other mode is by winding round the trunk the stout flexible stem of a climber, and claying it round securely so that no milk may escape between the trunk and the climber. These plans are not extensively adopted, and can only be successfully put in practice where the trees have not been previously tapped. There is always a great deal of "negrohead," the result of the distance the milk has to run, and to the large quantity of clay employed in the process.

4. *Collection of the Milk.*—"Going from tree to tree at a sort of running pace the collector empties the contents of the cups into a large calabash, which he carries in his hand. As he pours the milk out of each cup he draws his thumb or forefinger over the bottom to clean out some which otherwise would adhere. Indeed, a small quantity does remain, which is afterwards pulled off and classed as *sernamby*. The cups on being emptied are laid in a little heap at the base of each tree, to be ready for the following morning. The trees occur at various distances from 10 to 100 yards apart, and as I travelled over the intricate network of muddy footpaths, I continually felt perplexed and surprised that the natives have not yet seen the advantages that would be derived by forming plantations, whereby more than twice the quantity of caoutchouc might be collected in one-fourth the time, and at far less cost and labour."

The trees are tapped if they have a circumference of eighteen or twenty-four inches, and the rough process above described is carried on for many years, until the constant and extensive injury to the young wood causes their death, for some years previous to which event they almost cease to yield milk and are practically abandoned.

I will be advisable, in order to avoid this injury, to employ an instrument for cutting so shaped and guarded that it shall not be able to penetrate

beneath the inner bark. With this precaution it will probably be found unnecessary to rest the trees as has been recommended by some; but actual experience alone can decide on the method of tapping which will secure the greatest yield with the least damage to the trees' general vitality.

III.—Central American Rubber-Tree.—*Castilloa elastica.*

1. *Locality, Soil, and Climate.*—The very extensive geographical range of this tree shews it capable of existing under considerable varied climatic conditions. The forests in which it grows are usually at or near sea-level, but it has been observed at an elevation of 1,500 feet on the Pacific coast. The soil varies, but the plant avoids marshy or boggy land, appearing to prefer warm deep loam or sandy clay, and especially affecting the margins of small running streams where it grows in little groups. A dry or a rainy climate seems equally suitable, but a high and equable temperature, which does not sink below 60° F. at any time, is essential.

2. *Propagation and Growth.*—This is a very much larger tree than those above described, being, when fully grown, of the imposing height of 160 to 180 feet, with a stem of 12 to 15 feet in circumference. It grows very rapidly. At Henaratgoda at two years of age it was 23 feet in height. The bark is thick, and the wood soft and readily decaying. We received but a few plants of this species in Ceylon, and have had little experience in its management. No flowers have been yet produced, and Dr. Thwaites did not find cuttings of the ordinary kind to succeed well. We are now, however, endeavouring to propagate at Peradeniya by various other methods.

Mr. Cross has the following remarks:—"Trees in good situations will produce seeds early, but these will require to be planted without delay, as drying destroys their vitality." The tree is stated to flower in January, and the fruit to be ripe in April. "Stout branches, cut into pieces, each possessing a bud and covered lightly with soil, will generally be found to grow. Strong cuttings a foot in length and furnished with buds, when planted in the usual way, will become strong plants sooner. However, the propagation of this tree will not be found so easy as the Ceara rubber. In the planting out of young plants, the petiole or leaf-stalk of the lowest or oldest leaf should be buried in the soil. By following this simple rule the plant commences to grow at once, its growth is vigorous, and the trunk symmetrical. But if at the period of planting there is much bare stem above ground, then growth is usually slow, the plant remains 'leggy' for some time afterwards and never makes a good tree." The plant has a curious habit of dropping its young branches, which disarticulate by a regular joint, like deciduous leaves, and leave a clean scar on the surface of the stem. From what has been said above as to its native sites, it would seem that our south-western coast would present many favourable localities for this valuable tree.

3. *Collection of the Rubber.*—Milk is abundant and flows readily, but it is of a somewhat more watery consistence than that of the Para rubber. In consequence of the large size of the trees it is the practice of the collectors in Panama and other parts to cut them down. A groove or ring is first cut round the base of the trunk and the milk received into large leaves. "The tree is then felled, and rings or channels are cut out around the prostate trunk at about twelve or fourteen inches apart," and the rubber allowed to run into leaves or vessels. In Nicaragua the trees are tapped with sharp axes in various ways, and the trees so much injured that the process is performed at intervals of three years. The milk is received into iron pails. It does not appear that this species is tapped until it has a diameter of sixteen or eighteen inches, which Mr. Cross thinks might be attained in six years.

In conclusion, a few words may be said about the preparation required to fit caoutchouc for the market. It is clear that mere exposure to the air is sufficient in some cases to effect the coagulation of the milk into a solid mass. This is all the preparation apparently that the Ceara rubber receives, which comes into the market in bales consisting of the rolled up strings pulled off the tree. But it seems that a decomposition is liable to occur in the milk if exposed in any quantity, and it is usually desirable to reduce it to a solid mass as quickly as possible. For this purpose the cautious application of dry heat is the best; the best Para rubber is prepared by being poured over a flat paddle-shaped mould, which is held in the thick hot smoke from burning wood and palm-nuts till it solidifies, then slit down one side, the mould taken out and the "biscuit" hung up to dry. In several parts of Central America coalescence is effected by the addition to the milk of the juice of certain plants (especially of *Calonyction speciosum*, which is a common convolvulus here in Ceylon.) This causes the separation of the caoutchouc, which floats in the liquid like a mass of soft cheese, and has to be pressed and rolled to get rid of the fluid still remaining in its substance.

Probably carefully conducted evaporation in shallow pans by artificially regulated heat would be found an effective method.

The purity of the prepared rubber being a matter of first importance, all pieces of bark and earth should be removed by passing the milk through sieves. Small pieces or thin sheets of caoutchouc are preferred to large masses in the market from the facility of estimating the purity of the article.

Absolute dryness of the rubber is also a point requiring the greatest attention, and may require hydraulic pressure for its thorough attainment.

As much as 129,168 cwts of caoutchouc were imported into England in 1874, of which 70,856 cwts was American and obtained from the plants here under consideration. The value of this latter was £1,007,416. The demand for the best sorts is constantly increasing. On the relative market values of the various kinds of India-rubber, reference may be made to the excellent "Report on the Caoutchouc of Commerce" by Mr. Collins, and printed for the Indian Government in 1872, to which I am indebted for some of the above information, and to a paper by Mr. C. R. Markham in the *Journal of the Society of Arts* for April 7th, 1876.

I may be permitted to add that it is gratifying to reflect on the prominent share which the Royal Botanic Garden at Peradeniya, under the care of my distinguished predecessor, Dr. Thwaites (as detailed in his Reports from 1875-1878), has taken in the acclimatization of these valuable trees of the western hemisphere in Burmah and India; where, as well as in Ceylon, it may be confidently expected that they will become a valuable source of revenue.—*Ceylon Observer.*

HENRY TRIMEN, Director.

Royal Botanic Gardens, Peradeniya.
29th March 1880.

THE DRAWBACKS TO INDIAN AGRICULTURE.

MR. ROBERTSON'S paper on Agriculture in the Madras Presidency, to which we called attention the other day, contains so much of value, and records so many important facts, that we need make no apology for dealing more at length with the matters which are therein dealt with. Mr. Robertson's previous report on Coimbatore was published as a parliamentary paper at the instance of Sir George Balfour. This account was no sooner issued than attempts were made to challenge the correctness of its conclusions. They were but too sadly verified later, and now the writer extends his survey over the whole presidency. Madras is the poorest of the Indian presidencies, and has always in some sort been looked down upon by the other two. Circumstances have of late directed more attention to the state of affairs there, and the great famine and the Rumpa rebellion would together suffice to fix our minds on the need for reform. The first point to which Mr. Robertson draws attention is the admitted fact of denudation coupled with the extension of the agricultural area. The result of this sweeping away of the jungle and what remains of forest is most injurious; and Mr. Robertson is in favour of what Mr. Robert Elliot and others have so long championed —an increased plantation of trees on hill and plain alike. As it is, the rivers are much more subject to floods than they were, and the rain-water, not being retained, rushes away. Still more important, however, than this, which can only be gradually remedied, is our present method of raising rent. Not only does it cost 22 per cent. to get in the land revenue of Madras, whereas in England for all agency-charges 5 per cent. is considered sufficient, but our present system tends to encourage bad farming and to discourage good. This has frequently been urged by outsiders, and the public still awaits with interest and anxiety Mr. Caird's report on this question. But here we have the statement as plainly as can be. "Under the rent settlement now in force a premium is offered for bad farming." That surely is a very grave observation to come from an official of experience. Yet though it is of the very highest importance to the State that the land should be well farmed, no steps are taken towards improvement. Moreover, the officials whose percentage on collection is this large proportion of nearly one-fourth, are unversed in agriculture, and are consequently unable to make suggestions of any value to the ryot. It is only fair to say here that some authorities hold that the best thing is to let the ryot alone when he has the means of getting water or can be instructed how to obtain manure. There is every reason however why Mr. Robertson's suggestion that one portion of a civilian's necessary knowledge should be agriculture ought to be adopted. It is, indeed, absurd that acquaintance with Greek plays and French literature should rank above an acquaintance with agriculture when we consider what duties the collectors and their subordinates have to perform. The poverty of the unirrigated land now being farmed in Madras is extreme. Much of it does not yield more than six or seven bushels of inferior grain an acre. Especially the land lately brought under cultivation is of a miserable character, and the restricted area now available—owing, as is stated, to the pressure of propulation on the means of subsistence—not only renders fallowing impossible, but deprives the people of the manure which they used to obtain from their cattle depastured in the waste. Thus, according to Mr. Robertson, we have a process of desiccation going on consequent on the removal of timber and jungle; we have a gradual resort to less and less fertile soils, with less and less manure applied to them; while, above all, there is a system of exacting land tax which, besides being costly, directly tends to discourage improvement.

But there is another point which is as important as any of these Crops are divided into exhaustive crops, restorative crops, and fallow. Now in Great Britain the proportions of these are respectively—exhaustive crops, 55 per cent. restorative crops, 42 per cent.; and fallow, 3 per cent.; and this country possesses large tracts of permanent pasture which do not exist in India. Moreover, in England manures are used to a large extent. Now look at the proportions in Madras; exhaustive crops, 75 per cent; restorative crops 4 per cent; waste 21 per cent. "At present not 5 per cent. of the arable land is adequately manured." Yet, as we see, the croping is very exhausting; the crops are, of course, in such circumstances very precarious, and even the refuse matter does not find its way back to the soil. Can we wonder that, this being so, the ryots state that unirrigated soils are much less productive than they were? Experienced men, says Mr. Robertson, positively assert that the deterioration during the last thirty years has been not less than 30 per cent. At this rate what may we not look for as the result of this continual exhaustion? Is it not clear that each successive year, with an increasing population and deteriorating soil, the prospect of famine becomes more and more serious? Mr. Robertson makes a few suggestions, in themselves worthy

of more space than we can afford to give to them, for remedying this state of things. Of the tree-planting we have spoken. This will scarcely be brought about unless the Government exercises some pressure or offers some bonus. In his experiments with ploughs, Mr. Robertson found that in every respect the native plough is inefficient. Its draught is far heavier than the modern plough, it does not do the work nearly so well, and has to go over the same ground a number of times to produce a given result. The statistics of this point are curious and interesting, and it would certainly appear that the English plough in a more or less modified shape ought to be introduced. A society that would sell ploughs on, say the three or five years' system to these poor cultivators could scarcely fail to do good service. Of wells so much cannot be said. Raising water from a well when it is sunk is an expensive business in itself, and though this expense consists in the labour of the ryot and his bullocks, the result to him is really the same. Besides, the sinking of a well is a costly as well as a speculative business, and must be left to the judgment of the proprietor. Advances made for this purpose are not advisable as a rule. In the way of increased use of manure more might be done; for though there is not much manure—not perhaps more than sufficient to deal with 20 per cent. of the arable land—it would be easy to apply a large quantity beneficially. This is a matter which might very well be considered, inasmuch as organic measures not only increase the fertility of the soil, but retain moisture, thus neutralizing the effect of draught. But the first and main thing is to change the method of collecting the revenue, and to do away with a system which actually empowers the State to imprison a man for debt, and yet—the poor fellow's family being reduced to destitution for want of his labour—does not permit this punishment to wipe out his liability. Evidently the whole revenue arrangements in Madras need a thorough overhaul, as there is but too much ground for the belief that apart from the method of collection, and the harshness with which arrears are pressed for, the assessments in many districts are calculated on a wrong basis. The new Ministry will have serious work to do in India.—*Pall Mall Gazette.*

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday, the 20th May 1880.

THE HON'BLE LOUIS S. JACKSON, C.I.E.,

President, in the Chair.

THE proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members :—

Major J. Listen, Lieut. A. Connell, Messrs. J. J. Cumming, Philips White, W.A. Court Beadon, Andrew Ker, and Manager of the Rampore Tea Garden, Cachar.

The names of the following gentlemen were submitted for Membership :—

Baboo Jodrolaul Mullick,—proposed by Rajah Suttyanund Ghosal Bahadoor, seconded by Baboo Peary Chand Mittra.

Baboo Bejoy Kissen Mookerjee,—proposed by Baboo P. C. Mittra,—seconded by Rajah S. A. Ghosal.

Henry M. Lennox, Esq., Hyab, Nowgong, Assam,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

Baboo Kisserelal Gossain, Serampore,—proposed by Rajah S. A. Ghosal, seconded by Baboo P. C. Mittra.

William Oldham, Esq., C.S., Dumka,—proposed by Mr. H. M. Kisch, C.S., seconded by the Secretary.

Baboo Mohis Chunder Chowdry, Pleader, High Court,—proposed by Baboo P. C. Mittra, seconded by Rajah S. A. Ghosal.

Baboo Bholanath Dhur, Merchant, Calcutta,—proposed by Baboo P. C. Mittra, seconded by Rajah S. A. Ghosal.

Rejoined—J. Deveria, Esq., Calcutta, and G. E. Porter, Esq., C.S., Gya.

CONTRIBUTIONS.

A collection of seeds and plants, including *Araucaria Cookii* and Crotons of sorts; also seeds of *Gmelina Leichlardtii* and *Tristania conferta*, both good timber trees. From L. A. Bernays, Esq., V.P., Queensland Acclimatisation Society.

Seeds of several kinds of Eucalyptus. From Mr. C. F. Creswell of Melbourne.

Seeds of *Amherstia nobilis*, teak and "Padouk" (*Pterocarpus dalbergioides*). From C. Ady, Esq.

A few seedlings of *Amherstia nobilis*. From R. Rowett, Esq.

Tubers of Begonias, Achimines and Gesneras. From Dr. T. Beaumont.

Plants of *Cyrtodeira fulgida*. From Dr. G. King.

Seed of the blood-red Orange of Malta. From Col. W. M. Lees.

Seed and plants from the Nicobars, From E. H. Man, Esq.

A quantity of American Tobacco seeds of three kinds—White Stem, Orinoco, and Connecticut. From the Department of Agriculture, N.-W. Provinces.

RESIGNATION OF THE PRESIDENT.

Read a letter from the Hon'ble Mr. Justice Jackson, C.I.E., to the Council, intimating his resignation of the office of President of the Society, consequent on his approaching departure from India.

Submitted the following Resolution of the Council :—

"The Council cannot accept the resignation by the Hon'ble Mr. Justice Jackson, C.I.E., of the office of President, without placing on record their warm appreciation of the interest he has taken, and the valuable services he has rendered to the Society in dealing with the various subjects that have been under consideration since he was unanimously elected in January 1876. The Council regret exceedingly that ill health obliges Mr. Jackson to vacate office, and beg to propose in recognition of those services his nomination as an Honorary Member of the Society."

Baboo Peary Chand Mittra, V.P., in proposing the cordial confirmation of the above Resolution spoke to the following effect :—You are well aware, Gentlemen, that we are deeply indebted to Mr. Justice Jackson, our President, for the warm interest he has taken in the affairs of our Society, for the sound judgment he has brought to bear on the important questions which have come before the Council and the Society for consideration, and for his powerful advocacy and influential aid in improving the financial position of the Society. For these valuable services, Mr. Jackson is certainly entitled to our gratitude, and it is with much regret we now part. In bidding him farewell, let us hope that in returning to his native land Mr. Jackson may, by the blessing of God, be restored to the enjoyment of health and strength.

Mr. W. H. Cogswell, V.P., said, he had pleasure in supporting the Proposer's views, which were so ably expressed, and which so well coincided with his own opinions and feelings, and he was sure, those of the Council at large The resignation of the President. Mr. Justice Jackson, would be a great loss to the Secretary, and a matter of very considerable regret to all, particularly under the circumstances that failing health necessitated such a step ; and he could only hope that Mr. Jackson would be speedily restored to health by the change he was now contemplating.

The Resolution was then put and carried unanimously.

Mr. Jackson replied as follows :—

GENTLEMEN,—I am touched by the kindly terms used in speaking of me by the Proposer and Seconder of this Resolution ; the more so, because I have always regarded myself as a mere stop-gap in holding office as your President, being well aware of the serious difficulties under which I labour. I can, at all events, claim the merit of having brought good-will to the aid of any qualities I may possess, and I can most truly say that, while the success of a President's administration must depend largely in the aid afforded by his colleagues in Council, I have had that assistance in the fullest degree, and it is to that assistance that I ascribe any advantage which the Society may have derived from my connection with it.

Gentlemen, the interruption of my official connection with the Society breaks one of the linked associations which have so largely entered into my later life in India. I am glad to feel that among the many friends whom I leave behind, I may count the Members of this Council, and it is particularly pleasing that in consequence of your flattering Resolution, the connection between us will not be altogether broken.

GARDEN.

The Head Gardener's Monthly Report was read, of which the following are extracts :—

"The weather during the past two months has been favourable for the Garden generally, alternating showers and sunshine. The work, has been as usual in regard to cleaning up the Garden. Preparations are being made for grafting work. Rose layering has been already put in hand ; beds are being made around the centre lawn for the reception of roses received from Allahabad, Agra, and Lahore. We have, in the first instance, measured out one acre of land for experimental work in compliance with the Resolution of the Government of India (Agricultural Department) under date 27th February, 1880, but we shall not be able to carry it out this year in full integrity, the proposal having been made so late. The land (1 acre) having been marked out, it remains to decide what manures can be used, also the most appropriate crops to illustrate the action of the manures. Of the following, plants, we have a large stock in hand for distribution in the ensuing rains—*Livistona mauritiana, Caryota sobolifera, Vanilla aromatica, Licuala peltata, Casuarina muricata, Antigonon leptopus, Quisqualis Indica, Pandanus Mellori, Pothos, Caladium,*" *&c. &c.*

Mr. Gleeson next refers to several presentations (already alluded to under the head of contributions), including a gift from Mr. C. Brown of some 200 Orchids, and a few Ferns collected at Port Blair ; also some Palm seeds from the Royal Botanic Garden, Mauritius, which are valuable, as the seeds invariably germinate, and 50 seeds of *Amherstia nobilis* from Mr. C. Ady, of Moulmein. These have all unfortunately, failed ; the cotyledons seemed to have separated from each other, exposing the delicate embryo at the base, this may account for their non-germination ; seeds when sent should, if possible, be packed in some light material, such as a small plantain stalk folded double, a small quantity of brown paper would exclude the direct influence of the dry air. *Cianthus Damperii* (of which some seeds have been recently received) has been tried several times in the Garden but have failed to germinate their success, depending apparently more on the soil than the climate. A nice collection of Gesneras, Archimenes, and Begonias have been received from Dr. T. Beaumont of Indore.

EXPERIMENTS WITH MANURES.

A preliminary report was read from the Sub-Committee appointed at last Meeting. The Committee submit a sketch-plan, suggesting certain kinds of manures and certain kinds of crops, to be carried out as far as practicable, but preference to be given to natural (farm yard) manures. That one acre of land be set apart for the purpose in the Society's garden that the manures employed be dried cow-dung, ashes of cow-dung, and cattle-box dung, and that a quarter of an acre be given to each, and one quarter be left unmanured. The test crops to be maize, sunn-hemp, jute, and bajra. Agreed to.

MODELS OF VEGETABLES PREPARED BY MESSRS. SUTTON OF READING.

The Secretary next drew the attention of the Meeting to the interesting large case of models of Vegetables presented to the Society, by Messrs. Sutton of Reading, and read the following extract of a letter from that Firm in reference thereto :—

"Mr. Jennings, when he was here, was very interested in our modelling-room, and in answer to our inquiry, whether he thought a present of a set of English vegetables would be acceptable to your Society, said, he was quite sure such a gift would be much appreciated.

"All these models are made by our own people on our establishment, from specimens grown in our trial grounds and elsewhere.

"We have only sent a few varieties, which are capable of cultivation in India. We hope by careful attention to the instructions enclosed in the box, it will not be found difficult to place them in the case on arrival."

The case in question (with a glass cover), measuring 7 feet by 3 feet, contains some 40 kinds of vegetables, exceedingly well modelled. All reached in excellent condition, without the least breakage, having been so carefully packed. The contents were much admired, and the cordial thanks of the Society were voted to Messrs. Sutton for this handsome and acceptable contribution to the Museum.

MODEL OF A SUGAR-CANE MILL.

The Secretary also drew attention to a contribution to the Museum from Messrs. Thomson and Myine, of Behees of a model (half size) of their sugar-cane mill. The donors state that "there are now 9,500 of these mills at work in this and neighbouring districts and other parts of India, including 271 at Bunnoo, Trans-Indus. In the box you will find instructions as to the management of the mill in English, Oordoo, Hindee, and Bengalee, and also in these languages comparisons shewing the advantage worked out by the Behees mill over the several native mills."

TURNIPS RAISED AT RAMOOLLAH.

Mr. W. H. Llewhellin submits several turnips raised from "Sutton's prize Swede," as specimens of the result of a recent trial on his grounds at Ramoollah, Sarun. The quantity realised was 880 maunds per beegah of 3,600 square yards, which is equal to about 40 tons per English acre. The ground these turnips were grown on was manured with "seetee" or indigo refuse. The Secretary, in connection with this experiment, called attention to several trials, with turnips, as introduced in Lawson's Agriculturist's Manual, especially to one of the most favourable, namely, a crop of Sweedish turnip, manured with bone-dust, which yielded only 27 tons per acre. The turnips sent down by Mr. Llewhellin are of excellent quality.

DISTRIBUTION OF USEFUL SEEDS.

The Secretary announced the receipt, since the last Meeting, of a supply of seeds of Guango (*Pithecolobium saman*), from the Royal Botanic Garden, Ceylon, of *Catalpa bignonioides* from the Society's seedsman at Philadelphia, and of *Reana* (*Euchlæna*) *luxurians* from the Society's garden. These are being widely distributed, and there is still a good supply remaining for applicants. The "Guango" is known as the Rain tree (a good fodder for cattle) and the Catalpa as an excellent Timber tree. Mr. J. H. Bridgman of Goruckpore, acknowledging receipt of the latter, observes:—"I think it probable that my neighbour, Mr. Peppé of Birdpore, would much like some of the seed; and I should be very glad to send some to my friend, Mr. Cooke, of the Civil Service, who has lately been appointed to the management, under the Court of Wards, of the large estate of Awa in the district of Etah. He writes to me that he is applying himself zealously to arboriculture in that estate, and I am sure he would be very glad to have the opportunity of trying whether so valuable a tree as this Catalpa is said to be, can be successfully propagated."

Mr. W. G. Jackson, C.S., writing from Mirzapore, remarks—"It may perhaps interest you to know that I sowed the Reana last year both in the public gardens in Prome and in my own grounds. The soil was the ordinary soil of the place, and no manuring or irrigation was attempted. The plants all germinated and were transplanted without loss and flourished amazingly; growing seven or eight feet high and seeding freely. My horses ate the plants with avidity. I do not think, however, that the plant is needed in Burmah. There is such an abundance of natural fodder trees that no fodder plants are ever cultivated. I do not ask for any this year, as the Manager of the Kuntil estate here has already introduced it. The fact that the seeds are not suitable for human consumption, is a very serious defect in native eyes."

COMMUNICATIONS ON VARIOUS SUBJECTS.

1. From Dr. John Macgregor, Superintendent Central Prisons, Benares, forwarding a plough for trial.

2. From Mr. W. Crawley; Government Experimental Farm, Cawnpore, sending a plough for trial.

3. From Messrs. Octavius, Steel & Co., sending, for identification, a few specimens of a destructive crysalis which has lately appeared in tea gardens in Cachar.

4. From Messrs. Begg, Dunlop and Co., forwarding specimen of an insect which is damaging the tea bushes in one of their gardens in Cachar.

Mr. Wood-Mason, of the Indian Museum, gives the names of the insect above referred to, but is at present unable to suggest any means of destroying them.

5. From W. Aitchison, Esq., of Dooloo, Cachar, regarding the Carob tree and the Vanilla plant:—

"In the last publication of the Society's Journal, Vol. VI., Part II., New Series, I have read an interesting article on the Carob tree. It seems to be a most valuable as well as a very ornamental tree, and I think it would be well worth the trouble of trying to grow it in this district. I therefore beg leave to request your assistance in procuring some seeds; and, as grafted trees seem to be the most reliable for giving good fruit, if you could also get me some grafted seedlings, I would be very much obliged. I will gladly pay all expenses in connection with procuring and forwarding of the seeds and seedlings.

"It may be of some interest to you to know that the young plant of Vanilla, which I received from you in January 1877, has thriven well, and is now in flower. As yet there are only two racemes or spikes of flowers showing, but even this much is some satisfaction. I planted this Vanilla in the rains of 1877 against a Jack-tree, and it has now run up fully twenty feet high. I have also taken four cuttings from it and had them planted against other Jack-trees, which seem to suit the plant very well, although, no doubt, it would grow equally well on several other kinds of trees. Mangoes, I believe, would suit well; but the Jack is the only tree I have conveniently near."

6. From the Maharanee Surnomoyee of Cossimbazar, presenting a donation of Rs. 100 to the fund, of the Society, with the expression of her good-will towards the labours of the Institution.

The cordial thanks of the Society were voted to the Maharanee for her kind consideration.

7. From Mr. C. F. Creswell, of Melbourne, presenting several kinds of Eucalyptus seeds and giving some useful information regarding their quality.

8. From P. de L. Lennox, Esq., Kangra, in allusion to a form of cattle disease prevalent in the Kangra district, and his mode of remedy.

9. From Mr. Warren Sterling, some remarks relative to the foot and mouth disease in cattle, and remedy for the same.

The three last papers were transferred for publication in the journal.

MINERALOGY.

PROFESSOR REDWOOD, Chemist to the London Petroleum Association, represents that the crude petroleum obtained from the wells in the Eastern Borongo island requires only one distillation to produce 64 per cent. of refined burning oil equal in quality to American or Canadian productions.

THE Bombay papers announce that Mr. C. Millett Thomas, a mining engineer well-known in England, has, associated with Captain Archer, arrived in India with the view of opening up mining works here. A powerful syndicate has been formed in England, under the name of the Foreign and Colonial Mining Exploring Company, the object of which is sufficiently explained in name. Mr. Thomas has come to India as the representative of that company; and is about to visit and report on those mineral fields that may offer promising prospects. We are told that he will take a greater interest in copper and lead deposits than in gold. This is a promising feature in his plan of works; for attention has of late been so much attracted to the Indian gold fields, that the presence of the more useful minerals in this country appears to have been lost sight of.

THE memorandum on the right of the State to minerals is an interesting document, but will not, we fear, give much satisfaction. The only conditions sought at present to be attached to leases of land for mining purposes are in themselves reasonable enough, but the great fault they possess is their uncertainty. The Government of India in its communication to the Secretary of State for India says:—"But we consider that for the present, while the industry is undeveloped, an object should be to make the terms of mining leases of Government lands as simple and liberal as possible." This is all very well, but it seems to imply that, once the industry is developed, these terms will be multiplied and increased. And we have the greatest fear that this will be the result. The Government is wise in its generation, and does not wish to choke the industry in its infancy,—does not want to kill the goose which will lay the golden eggs at some future time. This is precisely what was done with the tea industry; the utmost liberality—we might use the word prodigality—was shown in granting leases of waste land with conditions attached regarding the opening up of a certain proportion within a limited number of years; and we, personally, knew one man who got three grants of 5,000 acres each, neither of which he had ever seen, and which only cost him Rs. 60 each, which charge was for preliminary survey expenses. No sooner, however, had the industry assumed a definite shape and large sums been invested in the dozens of concerns that sprang up, than down comes the Government with the Emigration Act, from which it realises a very handsome income, and the industry has since then been groaning under a load of injustice in connection with that Act and its successors, that would have crushed an industry having weaker energies or less inherent vitality. As it is, twice has the tea interest been nearly crushed. In 1864-66 the crisis was the result of overspeculation, and now it is the result of falling prices, which could be successfully combated, were Act VII. of 1873 (B.C.) repealed, and the planters relieved from a labour charge which is iniquitous and unfair, and which might be reduced by at least three rupees per man per month—this being the sum we believe the planter has to pay in excess of the fair value of the labour, owing to the exactions of that Act. The Secretary of State seems to have seen this weak spot in the recommendation regarding minerals, as he suggests that whatever change should hereafter be made, should not have retrospective effect. This is but fair. When a man enters into a contract, it is not equitable that the other party to the bargain should possess the power to alter the terms of it to his detriment. Any increase of taxation therefore, that may be made later on, should only affect prospective leases. We think the Government would have simplified matters by accepting a lordship instead of reserving the right to change the terms of leases by-and-by. By fixing a lordship of so much per ton of quartz raised, the matter of their interest in the minerals would have been settled once for all, and the question of future increase entirely avoided.

THE GOLD FIELDS OF SOUTHERN INDIA.

MR. BROUGH SMITH'S report on the Wynaad Gold Fields seems to set at rest a question of the first importance to India's future. Not only has gold been discovered over an area exceeding 500 square miles, but it is gold which can be profitably worked. Not only are the reefs "very numerous," but they exceed in average thickness those of other countries. Some of them extend for several miles; they are said to be "strong and persistent, and highly auriferous" up to 500 feet above the sea, while traces of the metal are found at a height of nearly 8,000 feet. In some places, "gold can be washed out of almost every dish of earth that is dug, and almost everywhere mining operations can be carried out at small cost. It is evident, therefore, that, sooner or later, gold-mining will be established as an important industry in Southern India." The sooner that happens, the better will it be for the Indian Government. A steady supply of gold from India would help to re-adjust the relative values of gold and silver, while it would do away with the difficulties consequent on loss by exchange.

FORESTRY.

A "TREE-FELLER."

IN these days of inventions it would be affectation to profess surprise at so comparatively simple an idea as that of a machine for hewing down trees. Messrs. Shaw, Finlayson & Co., of Calcutta, have imported a new invention for that purpose, called a "Tree-feller," which is destined for clearing forest land in Assam. Yesterday afternoon, at these gentlemen's Seed Godowns, opposite the Mayo Hospital, we witnessed, along with many other spectators, an interesting exhibition of the powers of this machine, of which we proceed to give a few details. The machine itself consists simply of a cylinder and piston (with necessary accessories) which are supported on a cast iron stand in a horizontal position about a foot off the ground. To the end of the piston rod is adjusted a detachable cross-cut saw, six or seven feet in length, and in shape like an ordinary hand saw—which of course does the actual work. The cylinder, piston, and saw in fact the whole machine turns on a pivot at the bottom of the cylinder (the movement being regulated by hand,) thus allowing of the necessary progressive motion of the saw as it cuts into the tree. The engine is supplied with steam from a portable boiler through a flexible hose of convenient length.

The first experiment conducted was with the trunk of a tree about 18 inches in diameter, which had been firmly implanted in the ground. This was felled in no time. The machine next performed on an oblong cross-grained block of wood whose dimensions were perhaps 30 × 21 inches. This was likewise severed in an incredibly short space of time—less than five minutes. Both experiments were in fact completely successful, and the results obtained highly satisfactory. The beauty of the machine lies, it seems to us, in its extreme simplicity and portability. It does not, we understand, exceed 3 cwt., and can easily be lifted by half-a-dozen coolies. The machine ought to prove valuable in some of the closely studded forests of Assam and other thickly populated wood lands.

GARDEN.

IN an article upon "Fruit," a London daily remarks:—"The mango, the mangosteen, the custard apple, and the durian, are known by repute to the people of this country; but while they might easily be frozen and brought here in admirable condition, dishes fit for the gods—no attempt is made to utilise these luscious fruits of India. Tamarind and guava jelly we occasionally get; but why not the fresh dates of the East, in place of the pressed and sticky fruit which comes to us from the borders of the Red Sea?" It certainly does seem strange that no enterprising person has attempted to establish a trade in the manner suggested.

FRUIT CULTURE.—A correspondent writes:—The great strawberry grounds near Blairgowrie, in Perthshire, which supply tons of fruit annually for the Scotch preserve makers, realize from £40 to £60 an acre, in a good year, from the beds that are at the best, and even average is as high as £25 per acre. The cherry orchards in Kent yield a still larger sum at times, but the crop is uncertain. So do the plum orchards in Worcestershire, especially in the neighbourhood of Evesham, where some 1,800 acres are devoted to fruit, and whence tons of plums in a green state are sent to the dye works of Manchester. But the most remarkable instance of high remuneration is that of Mr. Webb's fruit-ground at Calcot, near Reading. The extent is twelve acres, upon which very fine wheat was grown some few years ago; it was then planted with fruit, the produce of which amounted in one year to the astonishing sum of £4,000 or £333 per acre, cob nuts alone producing as much as £320 per acre.—*N. B. Agriculturist.*

APPLES FROM AUSTRALIA.

THE experiment of sending fresh fruits from Australia to Europe has received fresh development in the despatch and safe arrival of a consignment of apples, packed in boxes, which have been brought in perfect condition by one of the regular Australian line of steamers *vid* the Suez Canal. The possibility of sending the most delicate fruits, such as grapes, peaches, nectarines, &c., in a perfectly fresh state, from the Antipodes to England was first demonstrated two years ago when South Australia contributed a fine selection of fruits to the Paris Exhibition, and since then small quantities of the more perishable kinds of fruit have been from time to time received in London from different parts of Australia. The facility with which apples, in particular, may be transported, since they require none of the special appliances necessary to keep the more delicate varieties of fruits in their pristine freshness, should lead to a large development of the trade. There is always a large demand for apples in England; and the southern hemisphere has this advantage over the rest of the world in supplying the English markets, that its produce would arrive at a period when the stock from last year's harvest is almost exhausted, and before the coming crop is so much as in blossom. The apple, like many other Old-World fruits, has found a congenial home in the more temperate part of Australia, just as the warmer portions of the great island continent have proved their ability to produce in perfection all the rarer fruits of the tropics and of Southern Europe. Australia, indeed, is capable of supplying us with a regular succession of luscious fruits at a time of year when the accustomed sources of suppply are temporarily stopped. South Africa also might profit by the opening thus afforded of finding a market for some of the surplus yield of its orchards and vineyards.—*The Colonies and India.*

TEA.

A WRITER in the *Grocer*, a trade publication at home, has, with admirable tact, put the Indian tea subject before the home public. He writes evidently from a thorough acquaintance with his subject, and, after speaking of the system at present in vogue of mixing a sprinkling of Indian tea with a larger quantity of inferior China tea, he says—"Why should we be putting millions of pounds sterling into Chinamen's pockets, when the greater part of it might be diverted into the pockets of our own countrymen?" He says that the British public, as a rule, is willing to pay for a good article, but then it must be good if they are called on to pay highly for it. Now a mixture of, say, five parts low quality China tea with one part good Indian, can never, in our opinion, make a good tea. True, some may like it, and if there be many who prefer it, it is a very simple matter for them to purchase a pound of Chinese tea and a quarter of a pound of Indian tea, and each make up the mixture to suit their individual tastes. As matters go at present, the public taste is being utterly demoralised, and very few people at home can truly say that they know anything whatever of the flavour of Indian tea. Small quarter chests are sent home as presents, and a few shops here and there sell the fine article, but the great mass of the tea-dealing grocers sell nothing bearing the name of Indian tea, save a mixture that is utterly unworthy of the name. The correspondent referred to says—"Would it not be better to educate the public taste to the use of pure Indian teas, which are so much superior in quality and flavour to China growths, or at any rate to the rubbish now being sold in 2*s.* and 2*s.* 6*d.* mixtures?" This is exactly what ought to be done, but we need not expect the tea retailer to do this, so long as the rubbishy mixture yields him a large profit. He purchases 5lb. of China Congou at 1*s.* 3*d.* (including duty) and to this he adds 1lb. of Indian broken Pekoe-Souchong at 1*s.* 9*d.* and he has a mixture at 1*s.* 4*d.* which he sells freely at 2*s.*, or, if he wants a better tea he buys 5lb. China Souchong at 1*s.* 6*d.* and 1lb. India Pekoe at 2*s.* 6*d.*, and his mixture costs him 1*s.* 8*d.* and this he sells at 2*s.* 6*d.*; in both cases clearing 50 per cent. profit, which, if he is an energetic tradesman, he may turn over eight times a year. For this reason we cannot expect the distributing vendor to change his mode of dealing. If the tea companies of India wish to educate the British public to prefer their teas, they must undertake the task themselves, and they need not fear to lose by it, as, if properly gone about, it will from its very inception prove profitable. An effort should be made to procure a market here for our cheap teas; they cannot stand so well the incidence of freight and other charges which natur-

ally bear, relatively, much more heavily on cheap classes of goods. We have, or ought to have, a sufficiently extensive market in India to use up all our low class broken teas and dust, which, one year with another, might amount to, say, 7½ per cent. of our total produce. This would tend to keep down stocks at home, and, what is of more importance, in a very short time Indian tea would be represented at home solely by a superior article; no cheap or inferior Indian tea ever being placed on the market, the general opinion in favor of our tea could not help being raised, and our whole produce would gradually assume its true place on the market.

As a subject closely allied to this, we may advert to another phase of the tea market which has not received the attention its importance merits. We refer to the system, often recommended by us of avoiding the present method of over-classification. The 7½ per cent. of low class teas, referred to above, we would eliminate from the bulk on the garden, and the balance, without any further selection or classification, we would pack as Pekoe Souchong for the home market. We have no doubt that this would be the wisest thing to do. Let the whole bulk, less the low quality, red and coarse leaf and dust, be packed as Pekoe Souchong, and a very superior Pekoe Souchong it would make. A great saving would be effected in labour now engaged in ultra-classifying, some gardens having twelve sorts; a saving in dust and broken leaf would also be effected, as every handling of the tea must necessarily lead to waste; small breaks would be entirely got rid of, as most gardens would hand, as a rule, a hundred chests at a time to market; and a better chance would arise of gardens keeping a fairer general average of quality one year with another. That a good medium quality of tea pays best was clearly shown last year by the fact that such tea did not share in the general fall which, with a few interruptions, steadily took place throughout 1879. Messrs. Marsden and Walker, of Rood-lane, London, in their review of the Indian tea trade of 1879 say—"As compared with current rates twelve months ago, we quote:—

Common to good broken teas		...	1*d.* to 2 *l.* higher.
Souchongs and Pekoe Souchongs		...	2*d.* to 3*d.* ,,
Medium Pekoe and broken Pekoe		...	3*d.* to 4*d.* lower.
Fine do.	do.	...	2*d.* to 3*d.* ,,
Finest do.	do.	...	no change.

Hence, when the higher qualities were affected by the falling market, and the lowest qualities did not advance so much the medium quality, the Pekoe Souchong, rose 2*d.* to 3*d.* per lb. This is exactly what experience would lead us to expect. A demand may exist for very low or very high qualities now and again at irregular intervals, more or less affected by the state of trade, but the demand for a good fair average quality should be, as a rule, a more constant quantity increasing steadily with the increasing knowledge of Indian teas. This good medium quality of tea is consumed by the middle classes, who are not so much affected by fluctuations in trade, and whose incomes enable them to live pretty much in the same style from one year's end to another.

The people of Australia do not apparently know what they want in the way of tea. The Melbourne *Argus*, which has recently given a considerable amount of attention to the subject, says that "it may be safely assumed that a good business would be done if the teas were selected with a knowledge of the market, and if the prices were no higher than those of the China teas." Now this, if correct, simply puts a stop to any Indian tea going to Australia, as it is well known we cannot sell as cheaply—quality for quality—as the Chinese, and principally for the reason that our system of classing is so different. A sample of China Souchong and one of Indian Souchong are as unlike as possible; the Indian being an infinitely finer quality of tea. Consequently we cannot sell anything like as cheaply as the Chinese can. The *Argus* then goes on to contradict itself in a way which leads us to the conclusion that it knows nothing of the matter at all. It first says:—"Indian teas which have hitherto come to Melbourne have, as a rule, been dearer by 5*d.* or 6*d.* per lb. than the teas ordinarily consumed here. Cheaper kinds than these will of course be sent, for it seems to be now understood, by the persons interested, that there is no demand for the high-priced sorts in Australia." Just so: we could understand this easily, if it were not directly contradicted immediately after. The most suitable size of packets is described, and then the *Argus* says:—"The packages must be properly marked and numbered, so that the qualities may be easily arranged. *Pekoe-Souchongs and Pekoes would be the best varieties to send. The common Souchongs and Congous are too rough to suit the Australian market.*" What then does the Australian market want? We are first told that it is now becoming known that cheaply priced teas are wanted, there being no demand for the high priced sorts in Australia, and then we are told that common teas are too rough to suit the Australian market, and that Pekoe-Souchongs and Pekoes would be the best varieties to send.

Force is lent to this contrast, when we reflect on the fact that the taste of the Australian consumer has hitherto been satisfied by the use of China tea, which is not by any means so good as Indian; consequently, what the *Argus* asks for, *viz.*, Indian Pekoe-Souchong and Pekoes, will be vastly superior to anything the people have ever tasted before, and very much better than the corresponding classes of China, and these they must have cheap. If this be a true description of Australian wants, we are forced to the conclusion that the colonists are a particularly unreasonable class of people. We think, however, it is more likely that the *Argus* is not sufficiently informed on the subject to be a true exponent of colonial opinion, and, after all, we shall find that, whatever class of tea the Australians may fancy, they will doubtless be willing to pay a fair price for, and, judging from the comfort and fair living which characterise the people of that vast country, we feel convinced that they will prefer a good article.

The threatened war between Russia and China may possibly lead to difficulties in the delivering of tea at the treaty ports. Should the present misunderstanding result in war, we may naturally expect that Russia will do her utmost to blockade the China ports, although whether this blockade can extend to the treaty ports is another matter, and one in which other and more interested nations will insist on having something to say. Be this as it may, certain difficulties cannot fail to be thrown in the way of trade, and it will be impossible for the China tea grower to lay his tea down in the London market at his customary low rates. This is an opportunity for the Indian grower which we trust he will be ready to embrace. Let the teas now going forward be of superior quality, and the marked superiority of Indian tea over China will be abundantly apparent to the home consumer. The break in continuity of shipments from China cannot fail to reduce stocks of that variety, and this will give the Indian variety an opportunity of being much more largely placed for consumption. It is true war may be averted (we know no foundation for the rumour in town lately that it has actually been declared), still, the uncertainty which appertains to the present unsettled state of affairs must, to a certain extent, operate against business in every department. Already the price of opium shows a tendency to rise, possibly on this very account, as it may be considered desirable to get as much as possible into the country before the war. It must not be said that the rise in price of the drug, which sold for Rs. 1,404-6-1 at the June sale, as against Rs. 1,364-7-6 at that for May, may have been caused by the pretended crusade against its use, at present being made in China, especially at Shanghai, as this we imagine would tend to lower its value. If this surmise be correct, we may expect to see a gradual increase in the value of tea at the shipping ports, which will immediately re-act in London, either in a corresponding and simultaneous rise in price, or a fall in stocks consequent on decreased imports. As we have said, in either case the Indian grower ought to be prepared to benefit by the confusion which is sure to ensue.

It is very satisfactory to note the interest Government is taking in the subject of the tea blights. We observe it is proposed to depute Mr. Wood-Mason, of the Imperial Museum, to visit the tea districts at once to study the habits of the many insects that infest the tea bushes, and that afterwards he will proceed to Europe to study the latest suggestions for their cure. Later on, Mr. Scott, Curator of the Herbarium, Royal Botanical Gardens, Calcutta, will probably be deputed to study the subject from a botanical point of view, and in the course of this latter investigation we venture to think the disease and possibly its cure may be found. We have long held the opinion that the so-called leaf diseases were not idiopathic, but really root and soil diseases, principally the former. And we have on several occasions given our reasons for holding this opinion. We have offered this opinion with all deference to that of others, who may perhaps, from lengthened experience, be better qualified to judge of the matter; at the same time we have given what seemed to us strong presumptive reasons for holding the opinion we do, and we are glad that a practical botanist is likely to be associated with Mr. Wood-Mason in his mission, as we consider the whole subject to be rather botanical than entomological. We do not allude to any peculiarity in the growth or habits of the plant, but to our modes of treating it, which, while being subversive of everything approaching nature, are, by the very necessities of the industry, imperative. Instead of helping nature in her efforts, the claims of the tea industry require that we should resist nature in almost every way. Hence we need not be surprised should disease be the result. An attack of this kind would in the natural condition be repelled by a thoroughly healthy and vigorous plant, and the fact that the disease is able to destroy the energies of the bush seems to point to a state of things where the object of attack is too weak to protect itself. The worst of this view is, that, if it is true, there can be no remedy, except one quite beyond the present condition of the industry to attempt:—a high state of cultivation, and a generous nourishing of the plants with manure,—two things out of the question in the majority of instances, on account of the present financial condition of the industry.

An Indian tea-grower has written to the London newspapers to ventilate another "serious grievance." Having been engaged for many years in the cultivation of Indian tea, of which some forty million pounds are now sent annually to England, he naturally expected on his arrival in London to be able to buy some at most of the shops where tea is sold. To his surprise he found, however, that the article was not procurable at any price in the outskirts of London, and prohibitive prices are asked for it in the city. Surely, now that Indian tea is selling in bond at an average of about 1*s.* a pound, the duty on which is 6*d.* a pound, it is surprising that a tea of which the purity is unquestionable should be so difficult to obtain. "Indian tea-grower" can only account for the fact by supposing that it is kept in the background by the grocers for the purpose of being used to cover the defects of China tea, a large quantity of which is of a very inferior character. "At one of the largest tea houses in the city," he says, "I was supplied with what was called Indian tea at 2*s.* 6*d.* a pound, but this proved to be three-fourths China, not worth half the money. Is this fair to Indian tea?"

Certain proprietors and agents of tea estates in Cachar and Assam recently addressed Government on the subject of the serious injury being done to the tea industry of India by the tea-bug and red spider. The tea-bug first appeared about 12 years ago, and all efforts of the planters to check the ravages of this pest and of the redspider have up to the present time proved futile, and nothing short of matured scientific knowledge can grapple with the difficulty. It was suggested that Dr. G. King, Superintendent of the Royal Botanical Gardens, Calcutta, as Botanist, and Mr. Wood-Mason, Superintendent of the Imperial Museum, Calcutta, as Entomologist, should be deputed to ascertain the nature of these insects, and to devise measures to protect tea crops from their ravages. Information was particularly desired as to the nature of the insect, the manner of its propagation, the time of propagation, the place of propagation, the stages of existence, the stage in which most easily destroyed, the most effectual mode of destruction and whether the modes of pruning, plucking and cultivating the tea bushes are not at fault, and what changes in this direction would be likely to have a beneficial effect.

These suggestions were accepted on all hands as deserving attention. Sir Ashley Eden fully recognizes the importance of the question, and hopes later on to be able to depute Mr. John Scott, Curator of the Herbarium, Botanical Garden, Calcutta, who has given his attention to the question of blight in connection with poppy, to thoroughly investigate the subject.

In the meantime Mr. Wood-Mason is to visit the tea districts, and observe scientifically the injuries caused to the tea plants and the nature and habits of the tea-bug and red spider. When Mr. Mason has done this, he will proceed to Europe and make himself acquainted with the most recent researches in connexion with the destruction of noxious insects, and on his return the campaign will be opened. The Government has acted with great consideration and liberality in the matter, as besides Mr. Mason's pay and expenses, it accepts the responsibility of providing the funds that may be required by the Trustees of the Museum for carrying on Mr. Mason's work during the time he is employed on the special duty referred to.

The increase in the tea industry is very marked in the Sylhet district, where no less than seventeen new gardens were registered last year. The area taken up for tea cultivation was 74,843 acres, against 54,140 in 1878; and the outturn of tea is approximately estimated from the returns, which are not, however, yet complete, at 2,161, 300lb. of tea against 1,366, 100lb. in 1878.

A correspondent at Darjeeling writes to us:—"Tea is in rather a bad way up here, as the weather is most unfavourable, and all sorts of blights have attacked the bushes. Labour, too, is very scarce, as the Teesta bridge and the tramway have taken all the strong men away from the gardens. At the Teesta bridge the coolies get Rs. 8 per mensem and the sirdars 3 pice a head. A strong willing man can earn Re. 1 a day at the tramway, and the result is that all the labour is taken either directly or indirectly by the Government, as no tea estate could afford to pay coolies more than Rs. 6 a month."

In a resolution on the coolie immigration report of the Sylhet district for last year, Sir Stewart Bayley offers some remarks on the subject of the great length of time taken in the journey from Goalundo to the tea gardens, varying from a maximum of 36 days to a minimum of 12 days:—

"It is explained that this journey is always made by country boat, and never by steamer, the cost of the passage by the latter being found prohibitive. It is clear that the loss of so many days on the journey represents a considerable loss to the employer, and it would appear open to consideration whether the Steamer Company's Agents and the employers might not meet each other half way with the result of a considerable gain to both parties. If the cost of the passage were somewhat reduced, it might pay the employer to direct his coolies to travel by the steamer in consideration of the number of days which would be thus saved on the journey."

The direct importations into the district, during the year, of all classes of labourers for the gardens which submitted returns, were 1,619, and, if the importations to the thirteen gardens which did not submit returns be added, the number must have been much larger,—probably nearly 3,000. This includes the importations of the district of Sylhet alone, but if the importations for Cachar, to which the same remarks apply, be taken into account, the number will be very largely increased.

INSPECTION MARKS ON TEA.

The marks to denote quality, placed against Indian tea, after it has been received into the warehouse and sampled by the brokers' assistant, are as follows:—

Mark.	Quality represented.	Trade name of mark.
/	Ordinary	Straight stroke.
/.	Middling.	One a dot.
/.a	"	One a dot A.
//.	Good Middling	Two a dot.
//a	"	Two a dot A.
/—	Good	T.
/—a	"	T. A.
/‾	Fine	Gallows.
/‾a	"	Gallows A.
-/-	Extra Fine	Star.

The first three marks are only used for China, and the last one for Indian teas. "M" (musty) and "O. S." (odd smell) are added, when required, to the lower grades.

THE "BLENDING" OF INDIAN WITH CHINA TEA.

The following is from the *Home and Colonial Mail* and we commend it to the attention of blenders. The candour and descriptive ability of this retailer are to be admired. He magnanimously offers a skilfully blended Indian and China tea, a mixture of "Strong Moning" and "brisk *Indian Kaisow*," at 1*s.* 6*d.* per lb.; and his "extraordinary aptitude for commanding the market," what ever that may mean, enables him to offer the "buds and blossoms" or siftings of fine tea, which is "brisk," pungent, pure, good, and beggars the list of favourable adjectives generally in description at 1*s.* 4*d.*, or three pounds for 3*s.* 9*d.* He is considerate enough also to offer the consumer "skilfully blended spring foliage Rich Assam Pekoe and Moning Tea," at 1*s.* 8*d.*, and "Fragrant Assam Pekoe" and Finest Kaisow, of exquisite flavour and grateful bouquet, "the prime foliage of the Indies and China Souchong tea plant," at 2*s.* 4*d.* As Mr. Weller remarked of the sausages—its the seasoning as does it. So long as the public are offered mixtures of Indian and China tea, in which an expert would have to search with a microscope for the Indian kinds at prices like those quoted, it is hardly to be expected that pure Indian teas will command a high price in the market, or that the public will become acquainted with their flavour. On the other hand, more than one attempt to popularise pure Indian teas on a small scale has failed, and we hear of a recent venture in the direction which has collapsed after involving the promoter in considerable loss.

INDIAN TEA IN AUSTRALIA.

Apropos of a telegram from Calcutta, announcing that the Government of this country proposed applying the sum of £1,000 towards promoting the sale of Indian teas in Australia, the *South Australian Register* of the 15th ultimo devoted an article to the prospects of the trade. The conclusions drawn by the writer, while, like others which we have lately noticed, they make too much of the apparent dearness of Indian, as compared whith China, tea, may, on the whole, be regarded as hopeful. The proposal that "afternoon teas" should be given gratis, or at a minimum charge, at the approaching Melbourne Exhibition, is spoken of as a thoroghly practical one, and likely to advance the end in view. The great drawback to the extended consumption of Indian teas, the writer says, is the price, and, with regard to the suggestion that the less costly hill varieties should be forwarded, he adds: "unless these sorts are equal, or even superior to the China teas of like price, it is perfectly useless sending them into these markets. The matter is

purely one of business. Strong as is the prejudice in some quarters against the Chinaman, no merely sentimental considerations of race will weigh with the buyer. The produce must work its way upon its merits, and the difficulty of bringing it into common use here is greatly enhanced by the fact of there being another claimant for public favour in the field."

Indian planters do not, of course, suppose that any but practical considerations will weigh with either dealers or consumers, and they wish, we imagine, nothing better than that their produce should work its way on its merits. The great point is to obtain a fair trial of its merits at the hands of the public. As to price, we believe it is entirely in favour of Indian tea. What is wanted is machinery to secure its introduction to the public at a fair price, in such a form as to suit their tastes and on a sufficiently large scale to attract general attention.

Of the plan of sending ounce packages of the tea all over the colonies free of charge, the writer does not appear to think very favourably. He says:—"This plan, although feasible enough, is of doubtful utility. The bushman is not the sort of customer that is likely to bring pressure to bear upon the merchants in respect to the kind of tea to be imported. By far the more promising plan is for the growers to establish agencies for the tea, and make it worth while of the agents to push the sale. If this course is adopted, and if upon trial it is found that India can supply as good tea as China at a cheaper price, or a better tea at the same price, there will be no difficulty in overcoming the competition which has so far proven fatal to the general introduction into Australia of the produce of Indian tea gardens."

There is no doubt that India can fulfil these conditions, but probably she must not look to the Australian merchant to aid her much in convincing the public of her ability to do so. In the first instance, at least, she will probably have to put her own shoulders to the wheel and establish her own agencies on the spot, not only for selling her teas to the local trade, but for mixing them with China teas and dealing direct with consumers.—*Englishman.*

INDIAN TEA IN ENGLAND.

OUR readers will be glad to learn that people at home are becoming less apathetic upon the subject of Indian tea. The following letter signed "Anglo-Indian" appeared in the *Grocer* and will no doubt be read by many retailers:—

"Having in view the increased supply of Indian tea we may expect to receive during the coming season, and the large stock already accumulated here (six million pounds more than at the same date last year), I would ask you to lend the valuable aid of your paper in discussing some method for increasing the consumption of Indian tea in this country. The present prices do not pay producers, and, if they continue so low, next season we must expect to see many planters ruined. This no doubt would curtail the future supply, but by what a deplorable means! Would it not be better to educate the public taste to the use of pure Indian teas, which are so much superior in quality and flavour to China growths, or at any rate to the rubbish now being sold in 2*s.* and 2*s.* 6*d.* mixtures? It is a well-known fact that when once people take to drinking pure Indian tea they never willingly give it up, though at first they may hardly appreciate its superior flavour and strength. I would propose that a society be established by those interested in the Indian tea trade, such as planters, shareholders in tea companies, merchants, brokers, those dealers who make Indian tea a speciality, and as many country firms as would be willing to lend their assistance, and that the society should have for its object, to do all in its power, by correspondence in the public papers, and by its private influence, and by any other means it might think to fit, induce the public to use, and the grocer and packet companies to supply, a good drinkable mixture of pure Indian tea. I feel sure from personal experience how many would appreciate being able to buy Indian tea, fit to drink, at their grocers instead of having, as many who know about it now do, to procure it in larger quantities than they require, through some friend in the trade. I am certain you must have many influential readers who would carry this idea through with success, if only they have the public spirit to undertake the task. Why should we be putting millions of pounds sterling into Chinamen's pockets when the greater part of it might be diverted into the pockets of our own countrymen? There is plenty of room in India and Ceylon to enlarge the supply, were once a greater demand for Indian teas to spring up. I trust I have not written this in vain, but that before many years have elapsed we shall see the 160 million pounds we consume each year of China tea supplied by our own fellow-subjects in India, and not by the inhabitants of the Celestial Empire."

THE CHINA MARKETS.

THE London Commercial Correspondent of the *Bombay Gazette* writes (May 7):—A good deal of interest is felt in Mincing-lane on the question of the relations between Russia and China. I will not say that holders of tea and even sugar hope for war, but they undoubtedly contemplate the chance of it with much equanimity. For some three weeks past the tea market has been wretchedly depressed, and over 100,000 packages have been sold at public sale "without reserve," mainly on account of speculators, whose purchases, made last autumn, had resulted in an average loss of 20 or 30 per cent., and in many cases much more. It is now assumed, however, that should war break out before the new Congou is shipped in any quantity, a renewed speculative excitement may occur. During a former China war, common Congou, as it happens, was quoted even lower than it is at present, but then it is also pointed out that by July next we may probably have only two months' consumption of tea in the country, a scarcity perhaps unprecedented. There is certainly a fine opening here for speculative movements. At the same time the calculation omits a good deal, as, for instance, the doubt whether the other Powers would allow Russia to blockade the Treaty ports, and also the tolerable certainty that, in the worst event, considerable shipments might be made at Hong-Kong. The losses just referred to in tea might, I may mention, be extended to many other articles. I know several cases in which foolish speculations prolonged beyond the time of top prices early this year have led to the ruin of persons in business who have had to appeal to their friends for help, to avoid the discredit of a public bankruptcy. The commodities thus dealt in and the cause of the heaviest losses—after tea—have been sugar, silk, and hemp. In the last named case some very wild speculation went on. It seemed at one time as if the price of hemp would go much higher, and one or two operators who had bought cheap, and might then have cleared out at a good profit, held on, and not only so but went in deeper, buying at the top price of the market. It is needless to dilate on the sequel. I know one man in business, still young, who brought home £25,000 from China half-a-dozen years ago, and has since done a safe quiet commission business, but who in an evil hour for himself "went into" silk and lost £8,000. Then, by way of recovering his loss, he had another little "spec" in silk, from which, after various fluctuations, he emerged with a small profit. This encouraged him and he made a fresh essay in the market, going deeply into hemp and silk. Both rose, and he could have come out with a very handsome profit, but instead of doing so he bought more of both commodities. Immediately afterwards the reaction came and insolvency quickly followed. He held on as long as he could, then was obliged to close, and is now cleared out, penniless, and in debt to his relatives. This is but one case in point, but it is an illustrative specimen of scores, involved by the decline in many other markets as well as silk and hemp.

TEA-TASTERS IN NEW YORK.

THERE are, says Dr. Dana, probably more than a hundred firms engaged in tea-tasting in this city. In all of their offices there are large tables with round revolving tops. A circle of teacups is placed along the edge of these. The tea-taster sits down before this display of crockery and tastes one cup after another, moving the table top round. In the centre of the table is a pair of scales with a silver halfdime in one of the balances. One or two large kettles are kept constantly, with boiling water in them. When a sample of tea is to be tasted, as much is weighed out as will balance the halfdime. This is put in a teacup and the boiling water poured on. The tea-taster then stirs up the leaves, lifts them on his spoon, and inhales the aroma. At the same time he generally takes a sip of the infusion, holds it in his mouth for a short time, and then spits it out. Enormous brass cuspadores, holding two or three gallons, receive the teas thus tasted and the contents of the cups that have been examined. On some occasions, when a large amount of tea of a certain kind is to be bought, many samples of this are brought in from different houses. The buyers and sellers sit around the revolving table with the samples made into infusions in the cups before them. These are tasted all around, the "body," "fineness," "toastiness," &c., are learnedly discussed, and the poorer specimens discarded. Then those that are left are tasted again and the number further reduced. So it goes on until the article which unites the desired quality and price is obtained.

The skill displayed at these "drawings" is quite remarkable. A tea-taster will detect not only the quality of tea as regards age, strength, flavor, fineness, &c., but he can tell in which of the numerous districts in China the tea was grown. The facts regarding the different samples are sometimes put on the bottom of the cups, where they cannot be seen. The cups are then mixed up, and the infusions tasted again and sorted out simply by their flavors.

A great deal of tea may be tasted before these tea-drawings are finished. It is hard to tell the amount that a tea-taster takes during the day, for it varies a great deal with the activity of business. Few of the gentlemen whom I asked could give any idea. Sometimes, however as many as four or five hundred cups are tasted in the day. It is quite the custom to have to be tasting tea steadily for most of the day, or for hours at a time. Probably an average of 200 cups a day throughout the year is a low estimate. The poorer kinds of tea are often not sipped at all, but the sense of smell is depended on. Of the better qualities of tea, some is swallowed, and some spit out. Indeed, whenever the tea is taken into the mouth a little of it is swallowed. The tea gets into the system, therefore, in three ways, by inhalation, by absorption, through the oral mucous membrane and by the stomach. More tea is simply taken into the mouth without swallowing than is inhaled alone, but all the tea is inhaled, even it is tasted also. It is only a small proportion, amounting to not more than two or three cups a day, that is swallowed. A silver five-cent. piece weighs 1·18 grm. (gr. XVIII.) Estimating that an average of 200 cups of tea are tasted per day, about one-half of a pound would represent the whole amount used.

Japan tea has of late years become by far the most popular variety, and more of it is imported than of all other kinds together. Green tea, on the other hand, is much less extensively used than formerly.—*Ceylon Times.*

TEA PROSPECTS.

Mr. Albert Smallwood has sent the following letter to the *Darjeeling News* :—

Sir,—The result of a short visit I paid lately to the Darjeeling district, satisfied me that planters generally are not only in a very despondent state of mind, owing to the low prices their teas are fetching, but are inclined to be reckless; assuming that it matters little what class of tea they turn out, as there is only one price for the best and the worst. In fact, attributing the present serious depression to every cause but the right one.

Statistics, as a rule, are a very dreary subject, but in the case of tea, those of the last three years so fully account for the present state of the tea market, here and at home, that I will inflict them on your readers.

In 1878, the export from India was, 33½ millions of lb., the consumption at home 36¾; but in 1878 the export rose to 38¼ millions, while the consumption at home fell to 35¼. In other words, the supply exceeded the demand,—the result of bad trade and a wretched harvest at home. Now, the report for 1880 promises to be 45 millions of pounds, and the consumption to 30th April is only 12¾—*i.e.*, for one-third of the year. The effect of these low prices will of course be to stimulate the consumption of Indian tea, and until the supply and demand again approximate, planters must be contented with low prices.

The Tea industry is now suffering from the heavy extensions of 1873 and 1874.

The declining prices of the last three years have effectually checked further extensions of any moment, and I consider that after this year the quantity of Indian tea for export, is likely to fall off rather than increase.

Of the three large tea districts, Darjeeling is certainly at present in the best position. There is no reason why a full-bearing garden in Darjeeling should not sell its tea in Calcutta, all expenses paid, for 7 and 7½ annas per lb. It has been done for less,—but Cachar, so far, has failed to make and sell its tea under 9 annas ; and in most instances, last year, it was 10 annas and over. This means a collapse in the case of most of the old Teelah gardens.

Assam is as bad as Cachar, if not worse,—the coolie expenses are so enormous; and this year, owing to a good crop in the recruiting districts, the coolies are so hard to procure at any figure, that many gardens there are abandoning considerable portions of low class plant.

There is a fallacy, almost amounting to conceit, which pervades the minds of tea planters in India, *viz.* that Indian tea is superior to China. I can only say I have samples before me of Chinese tea, selling at home at 10*d.* per lb., which could put to shame some of the teas sent down from Darjeeling, as the result of their first flush this year, which planters consider sacrificed at 9 annas. Darjeeling tea, without that delicate aroma which should distinguish it from all other teas, is weak and tasteless, and China tea always has the advantage as far as make and appearance are concerned.

The demand in London at present is chiefly for Darjeeling teas, but then they must have something to recommend them, either flavor or quality, and those now coming to market have neither. Planters constantly tasting their own teas, begin to believe in their own manufactures, and only get put out of conceit when they find, on competing with others, how indifferent they are.

There is no sufficient interchange of ideas or samples in the Darjeeling district ; men fence themselves in, as if all their neighbours were robbers, and every effort to bring about a change in this respect is looked upon as interference.

A few words of hope in conclusion. The imports of China tea into London fell off in 1879 for the first time for many years, and the present low prices at home may have the same effect in 1880, and thus an improvement in the prices of Indian teas may take place in the autumn, when it will be too late for China to make up any deficiency there may be ; but if the rise comes earlier, the "Heathen Chinee" will flood the London market.

China in 1879 sent to England, Australia, and America 280 million pounds of tea. Take Russia at 80 million pounds, and the home consumption in China being estimated, at the least, at 210 millions of pounds, planters can see what a drop in the ocean Indian tea really is, and how long it will be before it is universally applied to any other use than mixing, and how necessary it is that its quality should be maintained.

COFFEE.

Coffee is more largely grown in the Madras Presidency than in any other part of India. We take the following from an official paper issued in Calcutta :—"The exports of this article, principally from the Madras Presidency, show a tendency to a steady increase, the values exported during the last three official years having been 132⅔, 154⅓, and 162¾ lakhs of rupees. Usually an increasing export trade is a sign of progress. In this case we fear it must not be taken in that light, as the consumption of this article being almost stationary, an increasing production simply means lower prices for the grower. The only increase observable in the use of coffee is that due to the normal increase of population, the consumption per head remaining stationary, while the increase in exports, as above noted, amounts to 11 per cent. per annum."

Liberian Coffee.—We learn from the report of the Madras Agri-Horticultural Society that the introduction of Liberian Coffee into Madras and its nighbourhood may, the Committee think, be declared a failure. The plants in the gardens have most of them perished in spite of every care, and those that survive still maintain the character of shrubs rather than of trees, though now upwards of three years from the seed having been received in the gardens from Kew in July, 1877. The healthiest plants the society now possesses are from cuttings made from what the planters call expressively "Gormandising suckers." The plants in the ground, amongst the shrubs in the ornamental garden are still in better health than the survivors of those that were planted in the open in the experimental garden, but they grow very slowly, and though they have two or three times flowered, any fruit which has set hitherto has burned black and fallen.

CLOSE PLANTING OF COFFEE.

On this subject a practical planter writes :—

"The place——mentions in Maskeliya was planted an unusual distance, but 6 × 4½ cannot be called close, ; 5 × 5½ gives more trees to the acre.* That about close planting to prevent sourness in the soil, I thought at the time to be great nonsense : send the writer a copy of 'Talks about Manures.' Land well drained and tilled without any crop will never get sour. But some land can be sweetened by simple tillage alone. Take the case of bog or marshy land that has often to be allowed to lie idle for a year or more after being reclaimed before any crop will grow in it. And the absence of feeding roots in coffee now-a-days is a mere idea. They are not so often seen as in the days of mamoty weeding, &c., but let a drain burst, as some of mine did the other day, and carry away one or two below it, and if it is ordinary coffee, there will be no end of roots exposed. I believe in close planting all the same, but for a very different reason. Clearings haven't the same chance in the way of shelter since the country was bared of forest, so that in close planting the one helps to shelter the other. A thickly sown nursery comes up faster and grows more rapidly than where the seed is thinly sown. 'Fruit *vs.* Leaves.'—The *Observer* gave it not long ago on the authority of Mr. Hughes that our soil was being more rapidly exhausted from the loss of leaves through leaf disease than if our coffee were giving good crops of berries."

That was not the question lately put before us ; but it was whether say 4 cwts. of coffee berries per acre or 4 cwts. of tea leaves, exhausted the soil most. Of course, a great deal depends on circumstances, and, weight for weight, in many cases the effect might be nearly the same, but nevertheless, we think there can be little doubt that fruit berries is the more exhausting crop of the two. Leaf *disease* sweeping away flush after flush of leaves for months together, just when the tree wants nourishment, may well be said to do more harm to tree and soil than a big crop grown in the ordinary way.

CINCHONA.

EXPERIMENTS IN CINCHONA ALKALOIDS.

We have been favored by Government with the first report of the Surgeon-General, Indian Medical Department, on the experimental trial of the following cinchona alkaloids in the treatment of malarious fevers, *viz.*, sulphate of cinchonidine, sulphate of cinchonine, and Sikkim cinchona febrifuge. The report embraces the period from the beginning of the inquiry till the 31st December 1879. The cases in which *Sulphate of cinchonidine* was used were as follows :—

Type of Fever.	No. treated.
Quotidian	768
Tertian	47
Quartan	113
Remittent	12
Total treated ...	970

Of these, the drug cured 819 and failed in 121 cases. The average dose given was 6·24 grains, and the average entire quantity administered in each case was 87·93 grains. The average period each case was under treatment was 5·86 days. In some instances the drug induced nausea or vomiting, effects which sometimes follow the use of even quinine. The cases treated by *sulphate of cinchonine* were as follows :—

Type of Fever.	No. of Cases.
Quotidian	776
Tertian	80
Quartan	47
Remittent	14
Total treated ...	917

Of these, 805 were cured, 109 were not cured, and 3 died. The average dose given was 9·52, and the average total quantity of the drug administered in each case was 109·57 grains. In some instances nausea, vomiting, purg-

* No : 6 × 4½ gives 1,613 trees, and 5 × 5½ equals 1,590 trees ; much about the same, but decidedly more than the ordinary number.—Ed., C. O.

ing, or headache ensued. The average time required to check the fever was 6·56 days. The cases treated by *Sikhim febrifuge* were as follows :—

Type of Fever.	No. of Cases.
Quotidian	2,235
Tertian	389
Quartan...	572
Remittent	2
Total treated ...	3,198

Of the treated, 2,915 were cured, while 270 were not cured, and 13 died. The average dose of the febrifuge given was 7·66 grains, and the average total quantity administered in each case 80·78 grains. The administration of a dose was often followed by giddiness and the signs of gastric disturbance, such as nausea, vomiting, or purging, were much more common and more severe than in the case of either cinchonidine or cinchonine. On an average it took 5·46 days to check an attack of fever with this remedy. The results of the trials are given and contrasted in the following table, but the comparison, Dr. Smith remarks, is not quite a fair one, as there were so many more cases of fever treated by Sikhim febrifuge than by either of the two other remedies :—

Cinchona preparations.	Average dose given.	Average total quantity of drug given in each case.	Average number of days each case was under treatment.	Total number of cases treated.	Cured.	Not cured.	Died.
	GRS.	GRS.					
Sulphate of cinchonidine	6·22	87·93	5·86½	970	849	121	...
Do. of cinchonine ...	9·52	109·57	6·55	917	805	109	3
Sikhim febrifuge ...	7 66	80·78	5·46	3,198	2,915	270	13

It appears that a less quantity of the Sikhim febrifuge was required than of either cinchonidine or cinchonine to cure an attack of fever. The actual average quantity used of each febrifuge was as follows :—

	Grains.
Sikhim febrifuge	80·78
Sulphate of cinchonidine	87·93
Do. of cinchonine	109·57

From these figures it appears that the Sikhim drug is the most active of the three, sulphate of cinchonidine the next active, and sulphate of cinchonine the least active as a febrifuge. The Sikhim febrifuge had also the advantage as regards the time required to effect the cure of paroxysm of fever—a point of great importance as regards the soldier and also as regards some of the labouring classes. The following are the figures :—

	Days.
Sikkim febrifuge	5·46
Sulphate cinchonidine	5·86
Do. cinchonine	6·55

In this respect, also, therefore, the three preparations hold the same relative positions.

The relative curative merits of the three drugs, as shown by the figures given above, may be illustrated as follows :—

Preparations.	Rate per cent. of Cured to treated.	Not Cured to treated.	Deaths to treated.
Sikhim febrifuge ...	91·15	8·44	·40
Sulphate of cinchonine ...	87 78	11·88	·32
Sulphate of cinchonidine ...	87·52	12 47	...

This places the Sikhim febrifuge first on the list as a febrifuge, cinchonine next, and cinchonidine lowest. These results, says the Surgeon-General, are somewhat unexpected, and must not be regarded as final. Further experiments are in progress, and in due course the available data will be sufficiently numerous to indicate authoritatively the respective merits of the three preparations. The unpleasant effects caused by the Sikhim preparation were marked, and still form the chief obstacle to its more extended use.—*Madras Times.*

CINCHONAS IN GENERAL AND C. CALISAYA IN PARTICULAR.

I.

As far as our observation goes, and it has had an extensive range not only in Ceylon but on the Neilgherries and in British Sikhim, *C. succirubra* remains everywhere true to type, the variations in size and appearance of foliage being due to circumstances of age and locality, this plant flourishing in a zone of altitude extending from 2,000 feet or even lower to considerably over 6,000 feet. On the Neilgherries there are very fine trees at an elevation of 6,400 feet, and in British Sikhim we saw splendid trees at an altitude which (latitude also considered) might be considered more trying to the plant. From young succulent plants rhubarb, or cabbage-like leaves of enormous size (approaching if not exceeding 2' X 1½') can be gathered, and the coolies greatly value them as platters for their "*choru.*" At high altitudes or, as in Sikhim, in latitudes beyond the tropics, the leaves become smaller. But, big or little, they always present the same corrugated appearance, and we have never seen it stated that any special variation has been observed in the more distinctly botanical tests of the appearance of flowers and fruits. Of the common red bark there seems to be but one species and one variety or form, differences even in the quality of bark being due only to the principle generally recognized that the higher the altitude at which these as well as other alkaloid-yielding plants are grown, the richer they are in quality, if not also in quantity, of alkaloids. Unless, therefore, in what we believe to be the rare cases in which hybridisation has taken place (and *C. succirubra* seems to be more an active than a passive agent in such cases), the cultivator is not called on to exercise further care in the selection of the seed of the *C. succirubra* than that of seeing that the seeds were gathered from trees of mature age, and that they were well ripened before being gathered. These conditions premised, and the seeds speedily sown and properly treated, seedlings of one type can be calculated on, and the resulting trees and their quantity and quality of bark will differ only according to the soil, climate, and altitude in which they are grown, the age to which they are allowed to attain, and the processes by which the bark is harvested,—renewed bark being ever double, at least, the value of "natural." Curiously enough, at the commencement of the experiment in India, this tree was ranked first, even good above *C. calisaya* as a *quinine* yielder. This it becomes only when it is made to produce renewed bark, and even then the quantity of quinine in the bark is not to be compared with that in good calisayas or even crown barks (*C. officinalis*). It is as a yielder of cinchonidine (an alkaloid but slightly inferior to quinine in therapeutical value) that the red bark tree is valuable. Unfortunately the extraction of the alkaloids is rendered difficult to the chemist by the presence of a large amount of colouring principle and of intractable tannin to an extent which suggests the use of this bark by leather dressers, should its price go lower than, we apprehend, it ever will. It is for tonic and other decoctions that the natural bark of *C. succirubra* is therefore chiefly valued in Britain, and the reason why it ranked No. 1 in the price currents of 1860, when Mr. McIvor commenced his wonderfully successful experiments, was that so reckless had been the proceedings of the Andesian cascarilleros that the red bark trees, yielding anything like good marketable produce, had been practically exterminated in accessible forests. Some of our readers may remember a communication by the veteran quinologist, Howard, to the editor of this journal, describing the welcome which the druggists gave to large thick pieces of red bark from New Valley, Dikoya, and Nanuoya. Such pieces were valued not only for exhibition in druggists' windows, but so excellent were the appearance and quality of the first consignments of red bark from Ceylon, that Mr. Howard suspected it would in some cases be substituted for *C. calisaya*, the richest of the quinine yielding barks. In recent years the character of this bark, equally with that of *C. officinalis*, has suffered in the London market, from the large preparation of bark from prunings exported from Ceylon. From what we observed in a recent tour through Lower Dimbula, Dikoya, and Maskeliya, we suspect the balance will speedily be restored in favour of stem bark. Finer pieces of such bark, we believe, it would be impossible to shew than those we saw at Ythanside, regular in length, and almost uniform in thickness. The trees in this case were coppiced, and the stems, cut into lengths of 4ft., were placed on supporting posts to be barked. In this way, the work was better done and in less than one-half the time occupied when the strippers are allowed to assume their favourite squatting attitude. Ordinary pruning knives seemed to answer well in this case, but stripping knives, or spokes—shaves, of an improved form have been invented by Mr. W. R. Waller. As our journey extended into Maskeliya, however, we found thousands of plants of this species being uprooted, the hardness of the times, no doubt, necessitating a process, by which, judging from experience in the Sikhim gardens, one-third is added to the produce and that of a superior quality. Those who fear that the cultivation of cinchonas may be over-done and the market glutted within the next quinquennial or decennial period should take note of the extent to which at present cinchonas in Ceylon, especially the red barks, are being cut down or rooted up. This may lead to a temporary lowering of prices, but we submit that it clears the way for the large cultivation now going on.

II.

In the preceding article we speak of the red bark trees as occupying a zone of altitude extending from 2,000, or under, to 6,000 feet or over. We had Ceylon and Southern India in view, of course. In the account of the experiment tried on the Khasia hills, we find it stated that these plants grew freely from 4,800 feet (above which the cold was too much for them) down to 800 feet,—down, in fact, to the level of the plain of Assam which is but slightly elevated above sea-level. Here, as elsewhere, however, the trees refused to grow on perfectly level ground. We have no information as to the quality of the bark grown so low as 800 feet. The difference of latitude, however, and the effect of that difference, have to be taken into account. The influences of local aspect, shelter, &c., are so powerful, that we suppose no fixed formula can be adopted to shew the equivalents of altitude and latitude. But we can refer to a very interesting

case which must largely govern that now referred to. In round numbers, the mean temperatures of Dimbula at 4,600 feet, and the Rungbee Valley in British Sikhim, 20° further north, are represented by the same figure, 65°. The difference of altitude between the two places is 4,268 feet, Rungbee being so much lower than Dimbula, and Dimbula so much higher, than Rungbee. For each parallel of latitude, therefore, there is a fall or a rise, as the case may be taken, of somewhat over 63 feet. The difference of latitude being as nearly as possible 20°, Dimbula being in 7°, and the Khasia Hills, like British Sikhim, in 27° we have to multiply 20 by 63 to get the equivalent in Ceylon, at 7 from the equator, of 800 feet in Assam, 27° north of the line. We, therefore, find that to get the same conditions of temperature as exist at the foot of the Khasia hills at 800 feet altitude we must not go lower in Ceylon than 2,060 feet, indeed, 2,100 would be nearer the mark. It would seem, therefore, that, even if *C. succirubra* not only grows readily but yields good bark in north-eastern India at 800 feet, we cannot expect equivalent results here below 2,000 feet. We have however admitted the great influence of local circumstances, and we should shrink from dogmatizing on such a subject in view of the extraordinary results yielded by Mr. Roberts's low-grown calisaya in Ceylon, knowing as we do, that this species in its native habitat flourishes rather above than below 5,000 feet. We believe that trees of *C. succirubra* have been grown and are growing in Ceylon considerably below 2,000 feet altitude. Have any analyses of such low-grown bark been made, and with what results? While on this subject of the effect of latitude in qualifying altitude, we cannot help noticing an astounding statement which occurs in Dr. King's report on the Ledgeriana plantations in Java. Those plantations are exactly the same number of degrees south of the equator which the district of Dimbula counts north of the line. The mean temperatures of two places so situated ought to be identical, or, allowing for some local influences, ought not certainly to differ by more than a couple of degrees. And if anything, Java, with active volcanoes, ought to shew the warmer temperature. But, if there be no mistake in Dr. King's report, the contrary is the case to such an extent that at 7° south in Java the climate at 5,100 feet above sea level is 10° colder than at the corresponding elevation under 7° north latitude in Ceylon! Dr. King's report states distinctly that "at Tjinirœan (6,100 feet above the sea) the mean average of the whole year is 53·5 Fahrenheit." Even if 53 should turn out to be a misprint for 58, which the other figures quoted do not render probable, a difference of temperature is shewn against Java as compared with Ceylon (latitude and altitude being similar) of 5°. Mr. Heelis' careful observations, extending over nine years, resulted in a mean temperature of a little over 65° at 4,600 in Dimbula The equivalent at 5,100 feet would be 63. Our reasons for so affirming are these. Nuwara Eliya with an altitude of 6,150 feet has a mean temperature of 57° We have thus a fall of 8° in 1,550 feet greater elevation, or less than 200 feet to every degree. But as the mean temperature of a damp grassy plain, such as Nuwara Eliya is (heat rapidly radiating into space and damp favouring frost), must be considerably lower than that of forestland a a similar elevation, we submit that the adoption of 63 as the mean temperature of Dimbula at 5,100 feet is fully justified, especially as Mr. Heelis' figure exceeded 65° by more decimals than Dr. King gives over 53°. Taking the report figures as correct, then, or even allowing that 53 may be a misprint for 58, why should an altitude of 5,100 in latitude 7° south in Java, be 10° or even 5 colder than a similar altitude, in the corresponding latitude north be in Ceylon? The greater mass of land in Java and Sumatra can scarcely account for the difference. Indeed the absence of volcanoes from Ceylon and its proximity to the great continent of India ought to counterbalance such conditions. Confessing our inability to solve the meteorological problem, we can now quite understand why the Dutch in Java are inclined to go lower with the cultivation of Ledgerianas.—*Ceylon Observer.*

CALISAYA LEDGERIANA IN UVA.

ONE of the most satisfactory experiments in the cultivation of Cinchona Ledgeriana we have yet heard of in Ceylon is that made on Cocagalla plantation in the Madulsima district. Two ounces of seed were obtained direct from Mr. Moens of the Java Gardens. This seed was sown in a nursery on 15th January 1879, and resulted in 40,000 fine healthy plants fit for putting out in the field. This is just the ratio laid down by the late Mr. McIvor—we may mention in passing,—namely 20,000 plants from each ounce of good seed. In the case of Cocagalla, the seedlings were transplanted in April, May, and June, and those plants again were put out in the clearing chiefly in November 1879. The manager now reports that the largest plant reaches 3½ feet in height from the ground, while a great many measure from 2½ feet to 1 foot, the largest and strongest being those originally put out in baskets. There can be no doubt that the Cocagalla clearing of this the finest description of cinchona is the most extensive as well as perhaps the most flourishing in the island. It remains to be seen how the trees will be affected at the critical period after the third year, but even at three years old such calisaya trees ought to be very valuable. We are assured that no difficulty whatever has hitherto been experienced in Madulsima in getting cinchonas to grow at any stage:—the seed in the nursery, the seedlings when pricked out, and the plants in the clearing, all seem equally to flourish. It will probably be found that the soil and climate of Uva are better suited to the growth of the Ledgeriana than those of any other district in the island, and, if possible, we must get Mr. Moens to pay a visit to Madulsima to pass an opinion on the fine clearing planted from his seed. But not only calisayas but crown bark trees flourish exceedingly well in the Uva districts. We lately mentioned officinalis trees which realized to their owners a *net* return of Rs. 5 each. Now we learn that trees grown on Craigellachie, Haputale have each yielded about 1½lb. of bark which realized in London 7*s.* 10*d.* per lb. so that each tree was worth Rs. 7! There is every encouragement therefore to plant crown and yellow bark cinchonas throughout the principality. We should like to know if experiments have been made in planting in the Uva patanas, and with what results. We may mention that in Ramboda district the average height of officinalis trees, four years old, is 13 feet, while the finest tree measured is one 16½ feet high and 14 inches in circumference a span from the ground; a tree three years old when rooted up. gave 17 ounces of dry bark including root, stem, and branch bark. All this experience is gained at between 4,500 and 5 500 feet elevation in a district where neither succirubra nor calisaya apparently succeed—at any rate so well as officinalis.

CINCHONA CALISAYA ON THE NEILGHERIES.—Mr. W. Forbes Laurie is good enough to send us (*Ceylon Observer*) the following memorandum on the results of his visit to the Neilgherries:—

"My visit to India has settled my mind very much against the growth of Calisayas. They may, and do, grow well when young, but the Neddiwuttum experience is that after they have attained a certain age, they die down from the top, and this too in soil far finer and more absorbent than anything of the kind I have ever seen in Ceylon, and where officinalis and succirubra not only do not die out, but are stripped of their bark every 18 months. Ceylon, however, holds the palm for quick growth. The finest succirubra I saw at 4,000 feet, measuring 55 feet in height. The finest officinalis 35 feet at 5,500 altitude—W.F.L."

Mr. Laurie must not attach too much importance to the Neddiwuttum experience in considering the cultivation of the calisaya in Ceylon. No doubt the finer kinds are more delicate and more difficult to cultivate successfully; but several experiments in Ceylon—in different districts and at different elevations—in Pussellawa, Dikoya, Maskeliya, and Upper Dimbula—are so far most encouraging. The gentleman who will be best able to speak with authority on this question, and on many others more or less allied, is Mr. Moens, of the Buitenzorg gardens, Java, and from a long letter received from him to-day, we are glad to learn that he will visit Ceylon and India during this year. His present intention is to start from Java about the middle of August, arrive at Ootacamund in September to be in time for the stripping on the Neilgherry Government plantations, visit British Sikhim in October-November, and take Ceylon on his way back, by which time he will be able to compare all the great fields of the cinchona planting enterprise in the East. We have little fear of Mr. Moens condemning the cultivations of Calisaya under certain conditions in Ceylon.

A NEW ENEMY TO PLANTERS.—The diseased seedling cinchona plant, enclosed by our Wynaad correspondent in his letter which we published last week, was forwarded by us to a scientific gentleman at Madras, who has kindly favoured us with the following as the result of a careful examination. The brown fringe-like substance growing on the cinchona leaflets is a curious fungus growth. The parasite is attached to the hairs of the cinchona, and consist of a net work of fibres and large numbers of spores, the equivalents of seeds in flowerless plants such as fungi. The fungus growth on each hair forms a clublike body, quite distinguishable by the naked eye. Owing to the large number of spore, the fungus, if once introduced into a nursery, would spread rapidly The cause of this disease, for so it may be called, is likely, excess of damp. The nursery in which the seedling grew is probably badly drained or too much in the shade. I do not think the fact that the site of the nursery is an old coolie burial ground, has any connection with the appearance of this enemy. I would say to the planter "look to your drainage and see that there is not to much shade."—*Madras Times.*

CINCHONA.—A good deal of Cinchona will be cut down and shipped during the present season, and be the means of returning a good income to the fortunate owners Already the export of the bark amounts to 377,182lbs., as compared with 132,307lbs. at the corresponding period of last year. It is probable, however, that the cuttings of the present year will leave very little old cinchona on the ground: by far the larger portion of that now growing is very young and not likely to yield bark for some time to come.—*Ceylon Times.*

TOBACCO.

EFFORTS have been made, but not with very great success, to cultivate tobacco of superior quality in parts of Arracan in British Burmah. The soil there is said to be as good as the soil in the Phillipine islands, but the Burmese are too conservative to adopt any new fangled schemes. It is thought that if the Government takes the entire scheme in hand, tobacco cultivation might be successfully carried on, and a decided improvement will be apparent in the quality of the leaf available.

CULTIVATION OF TOBACCO.

WE have already remarked that good tobacco soil is friable, it is absolutely necessary that the soil of the nursery be so; when time will allow of it, the soil should be broken up repeatedly, for some months before the seed is sown, to depth of at least eighteen inches. In districts, such as the Eastern, enjoying the North-East monsoon, this should be done not later than [illegible], the seed sown after the burst of the monsoon and the p[illegible] into the field, while the soil is still saturated and mo[illegible] tion; unless the soil is ri[illegible] humus, the [illegible] with cattle manure, the soil of the nursery can not [illegible] in organic matter; having dug up the soil once, after a few [illegible] operation should be repeated, drains should be cut, and beds [illegible] twenty-five feet by four feet (such a bed will accomodate sufficient seed for an acre), and all weeds must be kept down until sowing time; this time having arrived the seed should be sown as cinchona seed is, that is to say the beds are dug up again to a depth of six inches, all stones removed, and the beds bevelled and surface mould sifted; to ensure equal distribution, and also to keep off insects mix the seed with twenty times its bulk of fine ashes, press down with a board, and cover over with a preparation of dried moss or grass, make the roofs to the beds so that no sun and ample light shall be admitted, and prick out the seedlings as soon as practically (the sooner the better) into prepared beds under cadjans. We have found the "transplanter" patented by Mr. Laurie, so effective that we should advise that each plant be pricked out in a two inch space and his smaller sized transplanter used in the planting out. The small seedlings will at first require watering at least twice a day with a very fine rose, when they are two to four weeks old they will require less care, and to harden them before putting out, should be watered less frequently. If a very fine and large [illegible] tobacco is grown, the plants will have to be not closer than 3 feet by 3 feet, or 4,840 plants to the acre; for the smaller leaf 3ft. by 2ft. will suffice, giving 7,260 to the acre.

It must be borne in mind that no crop repays care and trouble in the preparation of the soil as tobacco does. If the land is ploughed three months before it is planted, so much the better. The soil must be ridged before planting, and this is done best by the plough, *in* the ridge the plant might be one foot closer than the distance *between* the ridges. Tobacco is a very delicate plant and the greatest care must be used in planting out the seedlings. We can recommend no better system than the transplanter referred to already. The plants which should be put out in the evening require water at once and shade for the first few days. In dry weather and poor soil, water them twice every day until the plants have recovered transplanting, after which, little or no water will be required unless the soil is very poor and the weather very dry. After having rooted, the plants grow rapidly, when they have attained, a height of 9 inches, they should be dug round and the soil, washed into the furrows, returned round the stems; unless the soil is very rich, saltpetre should be applied in solution, with a watering pot, a small depression having been made round each plant to retain the manure; the soil must never be allowed to crust but must be constantly hoed up; insects must be carefully looked for and destroyed.

When the flower buds appear they must be broken off, and with them the upper and lower leaves of the plant. This process will force out suckers which must also be carefully removed or otherwise the size of the leaf will be effected; in going through the lines (holing, weeding, suckering, &c.,) great care must be taken not to tear the leaves, as they are valueless if torn. In about three months after planting, the marbled appearance and yellowish colour of the leaf will denote that it is matured and ready for harvesting.

We shall conclude our remarks upon this product by describing the processes observed in preparing the leaf for the market.—*Ceylon Times.*

THE PREPARATION OF TOBACCO.

WE have treated of the selection and of the planting of tobacco, and it remains for us to describe the best method of preparing the leaf.

The leaf having matured, it is only necessary to cut down the whole plant with a long knife (wetta-catty) close to the ground. This can be done only in perfectly fine weather, and when the morning dew is upon the plant. A frame-work of posts and horizontals should be fixed up under any clump of shade-giving trees, and the plants tied together by plaintain fibre in pairs, and gently placed across the bamboos, which are in turn placed on the frame work, so that the pendant plants do not touch the ground; in placing the plants on the bamboos it is well to see that they are not pressed together; the frame-work should be large enough to accommodate one day's cutting; the plants should be left there until they are withered which operation will probably take one day; care must be observed during the process that the leaves are not allowed to dry too quickly or they will become shrivelled and remain green. The withering being done and the leaves having acquired an old-rag-like feeling, the bamboos, with the plants hanging upon them, are carried to the drying shed. Before we can state the drying process, it is necessary to describe the dryingshed; we suppose that on each half acre plot of tobacco there should be built a shed 50 x 20 feet, but as the most temporary building will suffice, this need not prove a serious drawback, the walls of the shed should be 17 feet high roofed with cadjan, and having shutters in three tiers one above the other, and opposite each other, so as to regulate the current of air through the building; flush with the window heads of each tier should be erected frames to accommodate the bamboos upon which the withered plants hang. When there is a hot breeze blowing, the windows must be closed so as to avoid the danger of too rapidly drying. The plants should remain on the lower tier "close hung" until the leaves have turned yellow, which will be between six to ten days, they are next hung upon the upper tier, the windows opened and the plants "free hung," so that the air may circulate well around them until the light yellow has deepened in to golden or light brown. When at this stage all windows may be thrown open, and the plants may be hung close together on the highest tier; the evaporation from the leaf will be very little now. The drying and changing colour of the leaf generally begins from the margin to the mid-rib, when the mid-rib is entirely dried up and pliable, the tobacco is ready for the next process "stripping." As before said for stripping the leaf must be perfectly soft and elastic (a damp moist vault would make a good stripping-room), In the early mornings when the plants have absorbed some moisture, they should be first heaped to check evaporation, and stripped when the leaf can be best rolled and bent without breaking. The leaves, when stripped from the stem are at once "sorted." There should be four sorts thus, No. 1, large equal coloured and untorn; No. 2, large equal coloured and torn; No. 3, bottom leaves of inferior colour, and No. 4 refuse and shrivelled up leaves. Nos. 1 and 2 are used for wrapers. The leaves are next carefully smoothed down on a flat board, and tied up in "hands" from ten to twenty leaves each, according to the size of the leaf. Should the colour of these "hands" not be uniform, to give them a brown colour they may be "bulked" that is loosely heaped, so as to encourage a slight fermentation, but in this operation great care must be taken to avoid over-heating and mouldiness. If the tobacco has been carefully dried, and is of a good variety, it may be smoked a week after curing. Many ingredients are used in the trade for improving colour, flavour, &c., but it is wiser, we think, to leave all this to the cigar manufacturer. It should be remembered that a good cigar depends much more upon the rolling and wrapping than is generally supposed, and many a good quality cigar is thrown away in disgust, although the tobacco is of the finest and the leaf has been carefully tended and cured.—*Ceylon Times.*

TOBACCO CULTURE IN AMERICA.

APROPOS of the cultivation of tobacco, we give the following notes on its cultivation in America.

1. Requires a light loamy soil.

2. Kinds of manure must be adapted to the quality of the tobacco as to its strength or mildness.

3. In temperate climates (*e. g.*, America), sown about beginning of March in a hot-bed, ready for transplanting by fir[illegible]k in Ma[illegible]

4. Is then "pricked" out singly, each plant [illegible] allowed [illegible] square feet of surface.

[5. That would be roundly in rows both ways 42 inches (3 feet 6 inches) apart. Four plants therefore form a square, of which they are the corners, having a side of 42 inches.]

6. Thus there will be 1,613 plants in an acre, no more if broad and vigorous leaves are required, such as will yield half a pound of prepared tobacco from each plant, on 800 lb. to the acre.

7. Transplantation requires great care, so as not to injure the delicate fibres of the young plant.

8. Carefully destroy all grubs, earthworms, and insects (which generally make a very virulent attack on the young tender plant), with lime, or sawdust for one month, when the plant is strong enough to take care of itself.

9. As it grows, every weed dies off beneath it, it occupies its space without competition.

10. A parasite in shape of a peculiar caterpillar will eat off the leaves, if you are not a vigilant morning and evening visitant to nip him in the bud!

11. Rapid growth must be discouraged and checked, a dozen leaves at the most are sufficient for each plant. Having developed this number, it must be "topped" off; and every flower-bed must be repeatedly removed to prevent it flowering, which would impair quality of leaf.

12. Early in September or later is the time for gathering. In hot climates at the time of maturity there is an odour of tobacco round about the plant.

13. The leaf when gathered is rich in juice, greenish as any autumnal leaf, and very brittle; the telling little story of rolling a cigar and smoking it from the fresh leaf is B O S H.

14. The leaves are then hung up in covered sheds or lofts admitting light and air freely on all sides, and there they remain for six or seven weeks until perfectly dry and withered.

15. A better plan, however, is to lay them in heaps, and give them a sweating for a week before suspension, the drying process will thus be more rapid, and flavour improved.

16. Thoroughly dried a moist, "juicy" day (as the Yankees call it) is chosen, the leaves are thrown in heaps on the floor covered with mats or blankets, and thus retained for the purpose of setting up the fermentation which results in the peculiar odour of tobacco, this aroma being due solely to the process of fermentation, and not naturally belonging to the leaf as supposed).

17. The speed of this process will depend upon temperature—48 hours will sometimes suffice.

18. The fermentation must be stopped at attaining a precise degree of heat, which is ascertained by shoving in the hand, above or below that point, which practice makes easy of detection, the tobacco would be "foxy," and depreciated in the market.

19. The fermentation is stopped by uncovering, spreading out, and turning over the leaves.

20. Various modes of packing. In America the leaves are pressed by a powerful lever into hogsheads, which has an advantage in the effect of spreading the oil of the leaf uniformly through the [illegible].

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.
Proprietor.

Calcutta, 1st Feb. 1876.

CONTENTS:

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

CORRESPONDENCE.

MALIQUATA PEPPER.

TO THE EDITOR.

SIR,—I would feel obliged if you will kindly tell me which is the best market to sell Maliquata Pepper in; if there is much demand for it, and what price it fetches per lb.

C. SHODALAMOOTO PILLAY.

Sindoola, Ceylon, 5th July 1880.

NOTE.—We do not know the article; but if it is of general consumption, London cannot fail to be the proper market. If the consumption is purely local, then it ought to sell at the nearest sudder station to the centre of consumption.—ED., *I. A.*

"A NEW CEREAL."

TO THE EDITOR.

SIR,—In your issue of the 1st instant mention is made at page 195 of "a new cereal." Could you oblige by letting me know, if you are aware, where a small quantity can be had in India, for seed. I am anxious from the description given to make a trial of it in these parts.

W. A. POWELL.

Saharanpore, 22nd July 1880.

NOTE.—The cereal is new to America, but pretty well known here, being the *Sorghum Saccharatum.*—ED., *I. A.*

INFORMATION WANTED.

TO THE EDITOR.

SIR,—Can you oblige me with the following information through the medium of your widely circulated paper.

1. Is wood ash injurious to the cinchona plant? if so, why?
2. What manures are most suited for cinchona? and in what manner ought they to be applied?
3. Is it usual to find borer in cinchona?

My reason for asking the latter question is that a few days ago, while visiting an estate, my eye came across a tree looking very much withered up and in cutting it down to ascertain the reason, I found a red borer, similar to the coffee grub but longer; it was evidently this that was destroying the tree.

INQUIRER.

NOTE.—Our correspondent had better purchase the manual on cinchona cultivation published by Messrs. Higginbotham & Co., Madras, which will give him all the information he requires.—ED., *I. A.*

WOOD ASHES.

TO THE EDITOR.

SIR,—In reply to your correspondent STEPHEN HONLEY, I can state what my experience has been in the use of ashes from fuel burnt in an engine. I tried it on about fifty mango trees, one application to the roots every three months, for two years, and found that the trees were more healthy and free from vermin than those planted alongside. I have also used the same ashes as manure to some paddy land, and the crop was equally as good as the same kind of lands manured with stable litter. The value of wood ashes as manure is not in much esteem in these parts, probably from the facility with which horse and cattle manure can be purchased in Bangalore; but I agree with STEPHEN HONLEY that the belief that the ashes from wood burnt in the open air or on ordinary native hearths is in any way superior to the engine shed ashes, is a mistake—one thing is certain the latter does not kill trees.

A fine clump of trees close to the railway station here has grown up entirely fed on engine shed ashes; their appearance denotes vigor, and they are now between seven and eight years old.

THOS. T. LEONARD.

Bangalore, 7th July 1880.

THE GROUND NUT.

TO THE EDITOR.

SIR,—For the information of AFRICA, whose letter appears in your issue of the 1st instant, I send the following with reference to the planting of the ground nut (*Arachis hypogæa*).

The nuts being shelled, three, more or less, seeds are found, these are sown in the field prepared to receive them by two or three courses of ploughing. The seeds in these parts are dropped one by one in the furrow made by the plough, at intervals of about one foot, and the parallel plough furrows are about that distance apart, so that any four seeds ought to form the four points of a square of one foot. After two months, sometimes earlier, the plots must be weeded; the tendrils of the plant are thereby encouraged to shoot out luxuriantly.

The ground nut will yield a crop for three successive seasons, and on this account is considered to be very remunerative to the sower. In the second and third years, a sprinkling of manure and one course of ploughing, with the first fall of rain, serves to ensure the success of the crop.

A very good paper on the cultivation of the ground nut was issued by the Government of India, dated 2nd November 1877, and was republished, if I mistake not, in your much valued journal.

THOS. T. LEONARD.

Bangalore, 7th July 1880.

SHADE FOR COFFEE.

TO THE EDITOR.

SIR,—Will you or any of your correspondents be good enough to favor me with their views on the following subject, *viz.*, that of destroying superfluous shade trees? A portion of my estate was planted some ten or twelve years ago, with cuttings of various kinds of trees of the fig tribe as well as with jack seedlings. These all grew, and now throw such a dense shade upon the coffee, as greatly to interfere with its crop-producing power. I want to find some poison that, by inserting it in augur holes, will kill a portion of the trees, and which at the same time will not spread through the roots and poison the soil. I have tried girdling, but the trees seem little the worse for it, the sap apparently flowing through the pith, and roots being thrown down from above the incision. Felling destroys the coffee beneath, and necessitates the grubbing up of the stumps, a tedious and expensive process. Would salt, sulphate of copper, or sulphuric acid be likely to answer my purpose, and what quantity would be required for trees of about 9" diameter?

SHADE.

Coorg.

NOTE.—We are afraid our correspondent will have to prune his shade very heavily, or remove it altogether. His attempts at girdling have failed, because he has not cut deep enough. It may be noted that girdling in the early part of the rains does not take effect so speedily as if done at other seasons, for obvious reasons. Our correspondent must be joking when he speaks of killing only a portion of the tree by injecting strong poison into the trunk.—ED., *I.A.*

THE MANGO.

TO THE EDITOR.

SIR,—In answer to your Quilon correspondent's letter in your issue of the 1st instant, I would say, that instead of "notching the bark *on* two rings," it is stated that the notching was "*within* the two rings of chalkmark," each ring being 12 inches apart from the other, the circumference of the tree being 24 inches; and that, on this superficial area, 80 notches of about one to one-third of an inch were made. The rings of chalkmark merely serving as a sort of boundary beyond which there was no necessity to wound. I also stated that it was the *first time* that the tree was in bearing, and consequently did not state the largeness of the fruit, was the result of the process. I also stated that while another tree of the same age did bear, then, for the first time, all fell off, prematurely, notwithstanding the advantage it had of having a considerable amount of shelter about it, while the tree that was notched stood away by itself without the least shelter on any side.

I never heard any one complain that either fruit or vegetable lost in richness of flavour by being well manured and carefully attended to. How is it possible then that it can be so to fruit growing on trees that have neither water nor manure at any time? I would however, recommend the digging up of the soil of all fruit trees with a pickaxe, allow the clods to remain unbroken for a week or fortnight then manure with high or strong stuff, and run a stream of water on it. Continue the watering once a week, or a fortnight at most. Those that do so, will find that they will have ripe fruit long before those who neither manure nor water, the fruit meantime gaining in richness of flavour. I witnessed this as a fact for four years in Chittoor, 100 miles west of Madras. This station is about 30 miles N.-W. of Arcot, and 20 N. of Vellore—the stations that Dr. Short states the people were in the habit of suspending the heavy fruit, pumalees, &c., &c. I believe the doctor states what he saw, still it is strange that in a station only 25 miles away, such a thing was not practised during the four years that I was in it. Nor had anyone any idea there that notching trees would prevent the fruit from falling off *prematurely*, and yet there were gentlemen such as Sir John D'Acre and Mr. Peters, the Collector; both of whom took a great interest in the cultivation of fruit, mangoes being called by their name to this day. Now though I did not state that notching increased the size of the fruit, still there cannot be the least doubt that when it serves to keep the sap up, and thereby prevents the fruit from falling from want of nourishment, it must as a matter of course enable the fruit to grow large from the full measure of nourishment it is able to supply it with. The first place where I saw the process, was in the hill ranges of the Ganjam district, by the hill men called "Coors." The Telegus people on the coast did not understand or practice it, though the mangoes from the wounded trees were not only the largest, but in reality superior to all the rest of the fruit in the district. I recollect seeing some graft trees that sent out all their main branches so low down, that left no main body to wound. In such instances operate on the main branches as low down as possible; this would answer the purpose, but when it can be done on the body of the tree, the labour and time taken to do so on four or five branches is saved.

OBSERVER.

15th July 1880.

"CHALKMARK" AND ROOT JACK.

TO THE EDITOR.

SIR,—The two lines of "chalkmark" drawn round the bark of the tree at the distance of 12" from each other, was intended to confine the wounding process within that limit. The circumference of the tree was 24," and the number of cuts was 80," on this surface within these two lines, each cut being from half to three-fourths of an inch in length, and not penetrating deeper than the bark. Take care to wound in a fresh place for three or four years, so as to give time for the thorough healing and filling up of the wounds, after which time the same place can safely undergo the same operation again.

"Live and learn" is a motto we ought all to abide by. I quote this with reference to the statement of PLANTER OF COONOOR, from whose statement I learn for the first time that the jack tree that yields fruit on the root is a distinct tree from all others.

I never saw more jack trees or fruit in any place than in Coongul, the Government Horse Stud, forty miles west of Bangalore, where business would take me from village to village throughout the year, and where the fruit would be heaped up in piles. Every individual on being asked, always assured me that the tree that bore at the root, was *not* of a different kind, but all were alike, and that bearing at the root depended on the age of the tree. While in Wynaad I used to go to the *coorchers* (landed proprietors). One gave a jack from the root. There were several of the same age planted from the seed of the same fruit, but only a few had borne at the roots, up to that time; there were others that the man showed that were planted by his father, of which only one bore at the root, and other trees that the person planted when a young man, all from the seeds of the fruit of the same trees, but none of which had up to that time borne on the root.

In Bengal, a zemindar living at the N.-E. angle of the Vindian range of hills, gave the same information when giving me a fruit from the root of the tree. But since reading the statement of PLANTER, I have made fresh inquiries. Only one native gentleman agreed with PLANTER in stating positively that a tree in his garden yielded fruit at the root "for the first time," *i. e.*, that the tree bore at the root on the *first* occasion of its yielding. On a few questions being put to him, he asked for time to make further inquiries, to be certain, when it turned out that the tree had been bearing for years past, over trunk and branches, but that this was the first time it bore at the root! Now the question is, was the tree that PLANTER describes as having "borne on the root at the fifth year" a tree that sprang up direct from seed in the same place in which it now stands, or was it transplanted from the nursery? A mango tree does not bear fruit before the 12th or 14th year, if it has *not* been transplanted, while if, when in transplanting, you either break or intentionally cut the tap root, then the tree will bear within eight or nine years, "Nature as it were making an extraordinary effort to reproduce the specie."

Now if that tree of PLANTER'S has been transplanted, and at that time had its tap root broken or injured, then this may account for its yielding on its root at such an early age. I do not claim to be infallible,

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Yours very truly,
T. SANDERS WORBOYS, M. R. C. S., L. S. A.

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but state what I know from personal experience and information. We had better call on the children of the soil, they ought to be able to set us right on such subjects. We are here as strangers, simply concerning ourselves with such things as we can turn to account, and then leave all behind us when we retire to rest. The fruit on which the prickles are large and somewhat widely separated, gives the most pulp or edible substance on the seed, while that on which the prickles are close, has only a meagre quantity of pulp on the seed—just as with the custard-apple. The greater the division of the squares on the surfaces, the better the fruit, while that which is close marked on the surface is but very indifferent.

OBSERVER.

CINCHONA NURSERIES.

(To the Editor of the Ceylon Observer.)

SIR,—Your correspondent "Verbum Sap," in recommending seedlings to be picked out 6in. by 6in., seems to overlook that (allowing for stumps, paths between beds, &c.) only 100,000 plants per acre could be planted. How would many of us manage here, who have two and three millions of seedlings to put out, for acreage?

I have tried corrosive sublimate: it is very useful, applied to beds *before putting in the seed*, to kill grub, but dangerous to apply after the seedlings are up (as Mr. Wilton at Kew will, I believe, agree).

As to planting, my greatest success has been with plants 1½ to 2 inches high. I find they suffer less both from wind and sun, and have now far surpassed plants 8 inches to 15 inches planted at the same time.—Yours truly,

Agra Patana. R. W. N.

BLACK ACACIA.

(To the Editor of the Ceylon Observer.)

SIR,—Your correspondent "Terræ Filius" is mistaken in supposing that this tree seeds in Nuwara Eliya. It buds yearly, but the blossom very seldom opens, and I don't think it has ever been known to bear a single pod of seed. Propagation from the root is very well if a few plants only are required, and the earth must be dug, or the root in some way brought to the surface before plants can be obtained. It is not like the common wattle in this respect.

As to its "voracious habit," I know an instance in which trees eight years of age have penetrated the soil to a depth of 20 feet, and that in patana land where the subsoil had never before been opened by any root. If it is desired to plant very close to the black wattle, it is only necessary to cut a drain or trench by the side of them, when the roots not being able to spread laterally will penetrate the subsoil.

Your correspondent refers to the parasite with which this tree is often infested, but should remember that it is only from years of neglect that this occurs. The wood is tough and stringy, and suitable even for shafts and wheels, and is very ornamental in furniture and cabinet work. The bark of the tree is used for tanning, and quantities of it are, I believe, shipped from Australia for that purpose.—Yours truly,

EXPOSED LAND.

BOILED HORSE GRAM.

(To the Editor of the Madras Mail.)

SIR,—I heard from a friend of mine, regarding the authenticity of whose information I have no reason to doubt, that in one of the annual reports of the Sydapet Farm it is stated that boiled horse gram, though in other respects excellent and beneficial to horses, is open to objection on two grounds:—

1st.—In boiling, a good portion of the substance of gram passes off with water strained away from gram before it is given to the horse.

2nd.—It is heating and productive of many diseases.

The soundness of the first objection must be patent to all, but, perhaps, it is not a very weighty one, as it only concerns the question of economy, and as, with a little care, it is possible to reduce the wastage to a minimum. As regards the second objection, it is not uncommon that, especially in hot weather, horses from excess of heat, caused by boiled gram, get what are technically known as purigo, ring worm, mange and lice, ulcers, &c. To avoid this it has been suggested that gram soaked in water should be substituted, particularly in hot weather. But it is the belief among the natives that this would produce colic, inflammation of bowels, &c.

I therefore request that you or any of your numerous readers will be so good as to state whether raw gram soaked in water is a good substitute for boiled gram, particularly in hot weather, and if it is not, whether there are any means of mitigating the heating quality of boiled gram.—Yours, &c.,

Seringapatam. S. R. S.

GUTTA PERCHA.

(To the Editor of the Ceylon Times.)

SIR,—In answer to your correspondent, and because I consider the product likely to be a valuable one in Ceylon, I will endeavour to answer his queries.

The gutta percha of commerce is known as the *gutta taban*, and, to botanists, as *Dichopsis gutta*. Mr. Munton, the Superintendent of the Singapore Botanical Garden, who has written some notes on this product, will probably supply seed to those requiring it, its habitat is Perak and Malacca, and it will grow from the plains to an elevation of 3,500 feet; each tree will yield about 16 lb., the gutta is worth about 70 cents. a lb.; as it has a very long tap root, it must be transplanted when the plants are very small, or, better still, planted at stake; in obtaining seed, care must be taken to get the gutta taban as there is another variety closely resembling it, exuding a very watery milk and worth only a quarter of the other; the leaves of this spurious kind are shorter and broader and more ovate in outline, and the wood is much whiter and softer.

Another gutta, closely allied to caoutchouc or India-rubber, is a large woody climber, indigenous to Perak. There are two kinds, one having a very dark, coloured, corky bark, and the other a smoother and lighter bark; the former is the more valuable. To obtain the milk the stem is ringed at intervals of 10 to 12 inches, and the milk is received in vessels placed to catch it as it flows, this (gutta senggarip) is not nearly so valuable as the gutta taban and the yield of milk is about half the quantity, but I believe is more easily grown than the tree. It is found in the Malayan peninsula. There are various kinds of gutta-yielding trees, but the two named are the ones most valuable to the grower. I hope these few remarks may induce others, better informed on the product than myself, to say what they know about it.

P. W.

The Indian Agriculturist.

CALCUTTA, AUGUST 2nd, 1880.

GOVERNMENT CINCHONA PLANTATIONS.

WE are not aware of any industry having assumed such vast proportions in such a short space of time, as has the cultivation of cinchona in India. The latest report of the Government plantations in British Sikhim, that for 1879-80, tells us that the extensions made during the year were 196 acres, and that the number of young trees so planted was about three-quarters of a million. This was at the rate of one plant to 11½ superficial feet. Besides these extensions, large numbers of plants were put out to replace those that had been uprooted for barking purposes. The above were principally *C. Succirubra*. At the same time it is satisfactory to observe that the extension of cultivation of the best class of plants, *C. Calisaya*, has not been overlooked. Of this valuable species and its hybrids no fewer than 88,862 plants were put out. At the same spacing these ought to have filled about 23 acres. The nursery stock, too, was attended to, there remaining at the close of the year 16,000 stock plants, and 403,000 young ones. Dr. King's recent trip to Java, at the instance of the Bengal Government, resulted, among other matters, in the discovery that the *C. Calisaya* yielded the richest and most valuable bark, and that too in larger quantity. In procuring bark from the "red bark" trees (*C. Succirubra*), considerable difference of opinion exists as to the best method, three plans being followed, *viz.* :—uprooting, coppicing, and thinning. The former of course necessitates the replanting of the land, the second makes it impossible to get a steady annual crop, as coppiced plants require time to recover themselves. The last mode is the best, as will be seen at a glance by any one acquainted with the habits of the plant; but whether it results in giving the best all-round yield over a series of years is a point not yet decided. It has, however, been satisfactorily shown, that in the case of the yellow bark (*C. Calisaya*), thinning is the best plan. This is another

point in its favour. We hope, therefore, to see this favorite *jât* more commonly planted. It requires no more attention than the others, and the chemical properties of the bark are very much superior to any other class of cinchona. The only extra cost is in the price of seed, but this is an infinitesimal item in the account current.

There seems to be a deal of ignorance flying about among planters as to the yield of bark per acre. In coffee we know exactly how many cwts. of berry may be looked for on an average, and we have a fair idea how many lbs. of tea an acre in full bearing and good "heart" will yield. But we seem to have no definite idea of the outturn of bark per acre per annum. In the reports we read that a certain plot produced at the rate of so many lbs. per acre, but we are not told how many years must elapse before the next crop is gathered. In the matter of new plants we must of course allow some time for the seedlings to assume the form of trees, and to be in fit condition for thinning, stripping, or coppicing. It would be an item of useful information, if the Superintendent of these gardens would tell planters how many years had elapsed since the preceding crop was gathered from mature plants. In this report we are told that from a plot of "100 acres of 11-year old trees uprooted, the average yield of bark of all kinds was 1,680lbs. per acre." If another period of eleven years must elapse ere a fresh crop can be collected, we arrive at the conclusion that the average annual outturn of that plot is 153lbs. per acre. Another plot of 26 acres of 10-year old plants yielded 1,482lbs. per acre, and a third, also of 10-year old, gave 1,560lbs. so that we may say the annual outturn of these was about 152lbs. per acre. At the prices obtained in London for this article, such an outturn ought to pay well. Hitherto the manufacturing department has been confined to the production of a cheap substitute for quinine, and which has become known under the name of the Government febrifuge. This consisted of several ingredients, the best mixture having latterly been found to consist of "four parts sulphate of quinine, eight of sulphate of cinchonidine, and nine of sulphate of cinchonine." Previous compounds resulted in a febrifuge which, while of great value as a substitute for quinine, in fevers frequently produced a feeling of nausea in the patient which was found to operate materially against its use. The above mixture was, after several trials, found to be a vast improvement on all others. The nauseating quality being almost entirely eliminated without impairing the value of the compound as a curative agent for fevers.

In noticing the corresponding report of these plantations last year, we pointed out the fallacy of the bark being, for purposes of manufacture, valued at its net cost price, instead of at the price it would have realized in open market, and we would again draw the attention of the authorities to this point, as we observe it is repeated in this report. A small quantity of sulphate of quinine has already been made by Mr. Gammie, the intelligent Superintendent of the factory, and this, we are told, has been pronounced on analysis "to be equal to that of the best European makes." With such a future before this industry, we are not surprised to observe that it is being freely taken up in various parts of India and Ceylon.

THE OPIUM REVENUE.

THE opponents of the opium traffic had their innings in the House of Commons on the 4th of June, and a long and warm debate took place, with the usual lack of result. Both its length and its heat were chiefly due to the Secretary of State for India, who, after confessing that he knew little or nothing about the subject, having only had three weeks of office and no time to take up the opium question, managed nevertheless to say a good deal about it and very effectually to ruffle the equanimity of the opponents of the traffic on moral grounds. If he had, after confessing his ignorance, promised to give the subject his attention when he had time to do so, there would have been an end of the discussion. But it is hardly to be regretted that he allowed himself to talk, and talk freely, and that "with that ingenuous courage which," said the Prime Minister, "is characteristic of him almost beyond any other man in this House," he expressed some candid contempt for the "cheap morality" which would abolish an evil (admitting the evil of it) which the English have introduced into India, but would abolish it at the expense of the Indians. It should not be forgotten by the reformers, that we have established in India a very costly machinery of government, far too costly for the country; that we have been able to carry on this government by means, in a great measure, of the large contribution to our revenue which our power on the ocean enables us to draw from China; that it is not the people of India, but their present rulers and the people of England who supported Lord Palmerston in his China war, who are responsible for the opium traffic; that it is not the people of India who want the opium money, but England that wants it to enable her to maintain her Indian Empire without paying for it; that if we give up our opium revenue, the people of India cannot by any endurable fiscal means be made to contribute a substitute; and that therefore, if the opium reformers insist on our giving up the opium traffic, they must do one of two things—either get England to make up the deficiency in the Indian revenue, or show us how to govern India for several millions a year less than our present system of Government requires. Now every one admits that the connection of the Indian Government with the opium traffic is open to serious objections, and if, as Mr. Gladstone put it, the people of England will submit to an addition of 3*d*. or 4*d*. to the income-tax and send us the proceeds—that is to say, if England will cut seven millions away from our home charges, then the Indian Government will gladly give up its opium revenue. What earnest reformers may say, however, is that they are bound to denounce what they regard as an evil, even though they may not be able to show us the practical way to get rid of it. Enough that it is an evil; get that acknowledged, and then let Government, as best it may, find *some* way of abolishing the evil. This is an intelligible enough position for mere moralists and preachers. It is the preacher's business to denounce evil and warn the sinner to put the evil away from him under unspeakable penalties, and it is the sinner's business to get over the difficulty of dispensing with it. But though vague denunciations of the opium traffic may be proper enough in the pulpit, something more than vague denunciation is expected from a legislator speaking from his place in the House of Commons. What we want from a Member of Parliament is, that he will show us the way to get a less objectionable source of revenue than our present opium traffic is. But any one who attempts to show us that, very soon gets to see the enormous difficulties that surround the whole question, and learns, as a general rule, to hold his tongue about it.

While it is readily admitted that there are objections to the manner in which the Government of India is connected with the opium traffic, and while there is no doubt that there are evils produced by it, we are not prepared to admit that the Government of India is so peculiarly guilty as Mr. Pease would have us believe. We do not see that this trade is so much worse than the spirit licensing trade at home, about which much less is said. At home we license shop-keepers to enable them to retail wines and spirits to the masses, and we have little hesitation in affirming that the spirit trade at home does more harm to, and entails more misery upon, the people of Great Britain, than can be affirmed of the opium trade as regards the Chinese. But this is ever the case; we fail to see the beam that is in our own eye, while we have a keen appreciation of the mote in our neighbour's. We do not think that these would-be philanthropists will succeed in putting a stop to the traffic. But there are other two considerations which should not be lost sight of in looking at the revenue obtained from this source; and these are—the growth of the poppy in China, and its extending cultivation in Persia. With regard to the quantity of land under the poppy in China, it is of course impossible

to speak with any reasonable approach to certainty, but there can be no doubt that large and increasing areas of land are year by year put under cultivation, and this in spite of the half-hearted orders from Pekin regarding the growth and consumption of the drug. These orders, we know, are to a large extent issued to blind the foreigners to the real intention of the Mandarins, for while we find, on the one hand, these strict commands totally inoperative, on the other we find the cultivation of the plant winked at by the officials, and our merchants are finding the China made drug opposing them in the market. True it is inferior and does not realise so high a price as the Indian article, but this is only a matter of detail. The quality will improve, as we know the quantity is increasing, and some day—not very far off—we may find our revenue seriously interfered with. With regard to Persian opium, we are in less doubt, as we know exactly how much goes round in the mail steamers from the Gulf. Last year 7,000 chests were forwarded to China, and the estimate for the current year amounts to 10,000 chests, which quantity is equal to about 18 per cent. of our supply. We know how the percentage of Indian tea is gradually gaining on the China supply, and we may reasonably expect the same result from this drug, which the Persians are cultivating and making with great care. At first the price obtained for the Persian drug was low, but it has increased in value with marvellous rapidity, and we may expect to find it rivalling the Indian article in value, in a very short time. Where then are we to look for a fresh source of revenue in the event of this source drying up? We look hopefully to salt. A great cry has been made over this tax too, but only by those who are ignorant of the lightness of its incidence. Sir John Strachey's one beneficial act to India has been his salt scheme. The abolition of the salt patrol line has been practically effected, and it now only remains to complete the equalisation of the tax throughout the land, in which consummation we anticipate the commencement of a steadily increasing consumption of this necessary of life. At the present moment the consumption per head in India is not more than 40 per cent. of the corresponding consumption in the United Kingdom, and if the generally reduced rate of tax, coupled with a cheaply manufactured article, leads to an extended use of the commodity, we may look forward with confidence to the future, even if it embraces the total abolition of the China opium trade.

This opium question may be profitably examined from the point of view of the Indian cultivator. A cry is frequently raised that he is ruined by the growing of the plant, inasmuch as the whole business being a Government monopoly, a certain amount of *soolum* attaches to everything connected with it. There is possibly just as much truth in this idea as to keep it afloat; but, that the cultivator grows the poppy under compulsion of any sort, we most emphatically deny. The only time when the ryot may possibly be subjected to a little pressure is when the plant arrives at that stage when the crude juice is in a fit state for extraction. At this time it may sometimes be necessary to exert a little pressure to overcome the ryot's laziness and indifference, and his apparently natural habit of doing everything in as slovenly a manner as possible, for all who know his character well, will bear us out in the remark that if there be nine right ways of doing a thing and one wrong way, he will somehow contrive to find out this latter and pursue it with a zeal worthy of a better cause. At this stage of the process the utmost care is necessary, in order that the result may be a good and carefully prepared article. As to compulsion being exercised in inducing him to grow the poppy at all, there is not an atom of truth in the statement. The cultivator makes a large profit out of it, and he is not so blind to his own interests as to refuse to take advantage of such an opportunity. He pays a very materially enhanced rent for land for the cultivation of the poppy, and he would not do this if he did not see his way to reimburse himself from the crop. It is also affirmed that the cultivation of the poppy is one cause of famines, as much land is taken up with it which would be much more usefully employed were it under food grains. This is likewise a fallacy, as the amount of land under poppy is only *one-quarter per cent.* of the cultivated land of India; so *that* argument falls to the ground. In fact all the arguments now against the trade are futile, with the exception perhaps of the ethical one with which we have dealt already.

BAMIEH COTTON.

An exceedingly small measure of success seems to have followed the recent attempt to introduce the Bamieh cotton from Egypt into India. In a very large number of instances, the attempt turned out a complete failure, the plant giving evidence that the climate was not adapted to its habits. A goodly number of experiments were made in Upper India, and these on the whole seemed the most promising; that at Saharunpore, conducted under the careful management of the late Mr. Duthie, is particularly to be commended. Notwithstanding the comparative failure of these trials, we think the attempt to introduce this valuable cotton ought not to be given up, and for the following reasons. The greatest failures took place either under the management of gentlemen comparatively unacquainted with agricultural pursuits, or, where failure occurred, under the hands of more intelligent experimenters, under climatic influences of a deleterious nature. For instance, we find a splendid crop in one locality perfectly ruined as soon as the pod commenced to form, by heavy and persistent rain, clearly showing that the experiment had been tried at a wrong season. Had the crop been planted, say, a month earlier, the result might have been vastly different. Again, the value of the fibre makes it a matter of moment that we should not thus lightly throw up the scheme. The produce was valued by eminent merchants in Bombay as worth 9½*d.* per lb. in London. Now, ordinary Indian cotton is not usually worth more than 5*d.* in London, and besides, this new variety yields more freely than Indian cotton.

The manager of one of the cotton mills of Cawnpore stated that the staple was so long and good that there was no machinery in India adapted to spinning it, and he added "such cotton is used in England for counts ranging between 100*s.* and 200*s.*, and requires particularly delicate machinery;" whereupon Mr. F. N. Wright, Officiating Director, Department of Agriculture and Commerce of the N.-W. P. and Oudh, says—"This report is not encouraging as to the advisability of extending the cultivation of this breed of cotton," and receives a well-merited rebuke from Mr. A. O. Hume, for a remark so wanting in commercial insight. The cotton is so very good that it is not advisable to cultivate it! It is so very much superior to anything we have ever known in India, that we had better have nothing more to do with it! During the American war, when the vast crops of the United States were denied to Lancashire, and when almost the only cotton reaching England was the exceedingly short-stapled variety of India, the spinning machinery was speedily adjusted and adapted to suit the inferior article; and surely if an article markedly superior were offered, the spinners would scarcely grudge the trouble and expense entailed in adapting their machinery to suit its manipulation. It may be true that a considerable time might elapse ere India could produce counts up to 200*s.*, but there would be no difficulty in finding a market for this cotton in Lancashire and Glasgow.

An interesting memoir, translated from the French, is included in the Government Report, whence we glean these particulars, and in this is discussed the genesis of the new species, the generally received opinion being that it *is the result of a hybridisation* between the common Egyptian cotton (*Hibiscus barbadense*) and a plant known in Egypt as Bamieh (*Hibiscus esculentus*). This latter is well known in India as the *bhindi*, or lady's fingers, which is seen so frequently as a cooling vegetable on our dinner-tables, and this is considered an exceedingly interesting instance of hybridisation, the two plants being dissimilar in habits. Most of us have seen both growing. The cotton plant, although a bush, has all the characteristics of a tree, as to its modes of throwing out its lateral branches; the *bhindi*, while throwing out many laterals, does not do so at right angles to the parent stem, the laterals all inclining to grow upwards and parallel with the main stem. If we compare the cotton plant to a miniature sycamore or plane tree, the *bhindi* might be called a miniature poplar as to habits and style of

growth. Another marked dissimilarity is in the shape of the relative seed-pods, the cotton seed pod or ball having not the slighest resemblance to the *bhindi*, which is the seed-pod of the *Hibiscus esculentus*. The result, however, is a cotton pod, without any trace of the *bhindi* in its structure. A little surprise is expressed at such an instance of hybridisation between two plants so unlike in habits of growth ; but there is another illustration of a similar kind in the hybrid tea-plant. The two plants from which the hybrid is formed are *Thea Sinensis*, the common China variety, and *Thea Assamica*, the Indian indigenous variety. The former is to all intents and purposes a bush or shrub, about six feet in height, commencing to throw out laterals the moment the shoot shows above ground ; on the other hand the latter is a tree, growing thirty feet high and growing with a clean trunk. The hybrid plant partakes of the characteristics of both, and is, like most hybrids, not so fruitful in the matter of seed as is the common variety. On this point the Bamich hybrid is anomalous, as it seeds more freely than either of its parents, although from those Indian experiments it seems to develop a tendency to allow the seed pods to rot before they arrive at perfection, at the slightest appearance of untimely weather. Notwithstanding all these drawbacks, we trust we have not seem the last of the experiments with this useful plant, as we are convinced that most of the so-called drawbacks would disappear if a little more care and intelligence were displayed in conducting the experiments, and if they were placed in the hands of men not already overburdened with official work.

IRRIGATION IN BENGAL.

IN his article on Indian Finance in the *Nineteenth Century*, Mr. Laing lays special stress upon the confusion introduced into the accounts by the intermingling of so-called productive public works with guaranteed railways, ordinary public works, local works, and so on, until even an expert is puzzled to discover the true result. Certain broad facts, however, are taken by him from the statistical abstract published annually by the Home Office, and these he makes the text of a disquisition on public works generally, according to his own views. The theory of productive public works which the *Statesman* has consistently advocated differs widely from Mr. Laing's simple principle of cutting down all public works to a minimum ; but his figures are unimpeachable, and the immediate inference he draws from them cannot be gainsaid. It appears, for instance, that an expenditure of £9,650,000 on irrigation works during ten years up to 1878 produced no net return at all, but a dead loss of £67,000 a year, being the excess of working expenses and repairs over gross receipts. The papers more recently published by the Parliamentary Committee on Indian public works, while taking a wider range of years into account, showed much the same general results. Mr. Laing, therefore, infers that the Indian budget can never be really balanced while expenditure of this sort is classed as if it were no real burden upon the finances, as if, in short, it were reproductive in the financial sense of the word ; for it is not denied that irrigation works, whatever their normal character, are reproductive in years of drought, though the saving due to them on such occasions cannot be brought to account, as a return on capital invested. Indeed, if the gains and losses of all kinds, due to canals, could be reckoned up, it is by no means certain that the balance would not be still more unfavourable than the mere comparison between direct expenditure and direct return. If the canals deserve to be credited with saving human life, and consequently obviating expenditure on relief works, in famine years, they also ought to be debited with the destruction of human life by fever, and the diminution of the cultivated area by the spread of *reh*. Dismissing, however, these more general considerations, let us examine the financial results of canal irrigation in Bengal during the year 1878-79, as recently given to the world in the *Gazette of India*.

The general results may be very succinctly stated. The capital sunk in Bengal canals stood at £4,937,319 in the year under review, but part of this was classed as belonging to 'ordinary' works, and the capital invested in productive works amounted only to £4,824,793. The net return upon this capital, *i.e.*, the surplus of income over working expenses, was £4,552 in 1878-79. In all previous years there had been no surplus, but an annual deficit. This return is less than one-tenth per cent. on the capital expended. But as this capital has all been borrowed and as interest at the rate of 4½ per cent. has to be paid on it by the Bengal Government, this income of £4,552 is a poor consolation to the provincial finances for the annual drain of £216,474 on account of interest. It may be worth while to turn aside here for a moment to admire the astuteness of the Imperial Government in dealing with canals under the last decentralisation scheme. All decentralisation schemes have for their object the conversion of local and provincial funds to imperial uses. The last and most notable scheme—that of 1876—swept some £400,000 a year into the imperial exchequer in this manner ; but the gain becomes much greater if we count the saving effected for imperial purposes by the provincialisation of canals. The Government of India got rid of its bad bargain by the simple plan of attributing to canals a fictitious productiveness, and making provincial Governments responsible for the interest due on canal capital, with the minimum of help in the shape of an imperial subsidy. The interest being x, and the net return being xy, the amount of the imperial subsidy was fixed at something less than $x-y$; and obviously the value of this quantity decreases, as y increases, 1 remaining constant. The policy of canal decentralisation was to over-estimate y freely, and hence to reduce the subsidy to the lowest figure compatible with provincial solvency. Provincial Governments of course protested, and no attention was paid to them ; but provincial irrigation reports are still found to contain reproachful allusions to the burden thus thrown on provincial finances. The Government of Bengal, in the present report, sadly reminds its officers that they must do their best to make canals more promising, for the local Government "is responsible for the payment of the interest on the large sums which have been expended on the irrigation works in the province." It is quite evident, however, from the tenor of the report, that no substantial improvement in the prospects of Bengal irrigation is expected. Were the net returns even quadrupled, they would still be the merest drop in the bucket, as compared with the huge interest charges. The loss which the province has already sustained on account of interest and unpaid working expenses, amounts to no less than £1,386,139 ; and it is plainly hopeless that any good management should ever reimburse the Bengal treasury for this money sunk in canals. For all *financial* purposes, it might as well have been sunk in the sea.

Bengal canals are divided into three classes, but one of these, the Hidgellee Tidal canal, is so small that it may be left out of consideration ; and the Orissa, Midnapore, and Sone canals practically make up the whole area of irrigation. It might, indeed, be questioned whether the Orissa canals should be counted as primarily irrigation works, for some of them are brackish, and fit for nothing but navigation. Irrigation, however, was their original intention, and about two-thirds of the Orissa canal revenue is derived from irrigation fees. It is perhaps unnecessary to remark that these canals do not pay their working expenses. The latter amount to about £24,000 a year, and, by one method of calculation, the income from all sources appears to exceed this by £480, but if the calculation be made on the year's income as actually realised, the result is a deficit of £5,708 on the year's operations. This is irrespective of the charge for interest, amounting to £81,252 annually. The Midnapore canal is still more extensively used for navigation, and owes nearly half its income to this source. Income and expenditure here are more nearly balanced, both being about £17,000 ; but there was a deficit of £212 on making up the accounts of the year. This is in spite of the fact that the area irrigated was the largest hitherto recorded. The Sone canals alone shew a surplus ; it amounts to £6,712 on a working expenditure of £37,050 ; but of course the fact is quite exceptional that there should be any surplus at all. During the brief existence of the Sone canal system, a capital expenditure exceeding two millions sterling has entailed a dead loss of more than £27,000. Navigation plays a comparatively small part in these canals ; nearly all their earnings are due to irrigation ; and it is noticeable that the area under

sugarcane in the Patna, Gya, Buxar and Shahabad districts, largely increased since the canals came into full working order. The number of maunds of coarse sugar exported from Shahabad by the East Indian Railway has been multiplied more than tenfold since 1873;—a result which ought to be remembered in estimating the profitableness of the canal, impossible though it may be to estimate such a result correctly. There can be no question that the value of the produce of the land has been greatly increased by the canals. A rough calculation, by way of example, might be made in the following manner.—The increase in the export of coarse sugar from Shahabad alone amounts to about 400,000 maunds, and coarse sugar may be assumed to be about four times as valuable as grain; thus the land which produced the cane yielding this sugar, was put to four times as valuable a use as if it had not been irrigated; and the gain in value of out-turn would be about 18 lakhs, or £180,000; and this, of course, from a single district. Without laying any undue stress upon a calculation couched in such extremely general terms, we may safely infer that the advantages of canal irrigation are much more extensive than the few heads of income which figure in annual reports. But it is with the latter only that the financier has to deal, and as a Government speculation, apart from all considerations of popular benefit not reducible to the formulæ of the ledger and balance-sheet, canal investments in Bengal are decidedly bad. We do not wish at present to enter upon the wider question of the advisability of canals for administrative reasons, but simply to regard them from the point of view of the holder of canal debentures (supposing such things to exist). So regarded, Bengal canals cannot appear anything but the most signal failure. Zealous canal officers, we are well aware, look upon any such avowal as rank heresy, in fact as an insult to the department; they are prepared to make a canal pay anywhere, even in Eastern Bengal, or in the rainiest districts of Assam. But if one questions these ardent partisans, it always comes out that they reckon upon a certain wholesome exercise of authority to persuade the people to take water. Left to themselves, the attitude of the people in this matter may be judged from what is written of the zemindars of Arrah, who, when a new distributary is to be made across their lands, "invariably offer the most obstinate resistance to the alignment originally selected, and to any modification of it that is proposed." This unwillingness of the people seems the more repulsive when one remembers the ingenuity, trouble and expense with which the water has been brought, not from the traditional sources of Indian irrigation, the perennial snows or the vast uplands of Central India, but from a stream fed in the low hills of Bundelkund, nourished by no great affluents, and parched so by the summer droughts that the water has to be sparingly distributed in May and June. Sentimental considerations, however, have little weight with the Indian cultivator; and we may boldly pronounce Bengal canals, as a financial speculation, to be a mistake. On their other aspects we may have something to say hereafter.

EDITORIAL NOTES.

IT is said that Mr. Buck, Director of Agriculture, who is now on furlough, will accompany Mr. W. S. Halsey to Java, whither the latter is going on three months' leave. Thence Mr. Buck will proceed to Melbourne, where he is to represent India at the exhibition.

WE have much pleasure in acknowledging receipt with thanks of the annual volume of the "Proceedings of the Royal Colonial Institute for 1878-79." It contains a large amount of interesting matter, and besides lists of members and other memoranda relating to the working of the Institute, there are nine valuable papers as subjects of interest to all colonists. Nor is India forgotten, as one of the papers read at the ordinary meetings is on "Life in India," by an old Bombay Civilian, and contains much matter for reflection.

THERE has just come into flower at the Edinburgh Botanic Garden, a plant of great interest to botanists. It is the *Rheum nobile*, or Sikhim rhubarb, and is believed by Mr. Sadler to be the first specimen of the plant that has flowered in Europe. It was grown in the open border, without any protection, from seeds received from Dr. King, of Calcutta, about seven years ago. It is about two feet high, and it is covered with beautiful straw-coloured tracts. A drawing is being made of this curious specimen, with the object of having it figured in the Edinburgh Botanical Society's Transactions.

THE Report on the Revenue Administration of the Punjab and its Dependencies for 1878-79 is to hand, and is more than ordinarily interesting, so many details are given, and given in a succinct form that does not tire the reader, nor lead him to search for a grain of information among a bushel of verbiage. We have only to find fault with the lateness of the publication of this information. This was evidently brought about by a variety of causes. For instance, the first district report was received on June 7, 1879, but the last settlement report was not to hand till 22nd September 1879. The finished report reached the Lieutenant Governor on 3rd January 1880, and the usual orders were passed thereon on 17th March 1880. Surely it is not too much to expect a little more expedition in connection with such important matters which frequently lose their interest with their freshness. The land revenue collection amounted to Rs. 1,89,69,173, being Rs. 94,001 over that of 1877-78; while what is known as fluctuating and miscellaneous land revenue was Rs. 1,79,954 in excess of 1877-78. This latter consists of grazing dues, sales of wood, saltpetre, fees on licenses, fisheries, and sundry collections from various miscellaneous sources. The total excess over 1877-78 was, therefore, Rs. 2,73,958. Advances continue to be freely made for the purpose of helping cultivators to purchase bullocks and seed-grain. In the year under notice the amount so advanced was Rs. 1,62,467. The land under *rabi* cultivation was much less than in 1877-78, the crop having been 8,48,401 acres deficient; on the other hand, the land under *kharreef* crop was 22,74,701 acres over that of the preceding year. During the year the cultivators had two calamities,—the floods of August 1879, and a visitation of rinderpest and foot and mouth disease which destroyed about 30,000 cattle. Of the whole area of the Punjab, amounting to 1,07,010 square miles, only 36,656 or 34¼ per cent. were under cultivation. The experiments in improving the breed of cattle seem to be working well, the value of stock generally having materially improved, the only failure being with sheep, but renewed efforts are being made with a view to improve the breed of these useful animals.

Prices of food-grains were considerably higher, the demand for the war in Afghanistan doubtless having helped to bring this about. The efforts that were made to develop the iron industry of Kangra resulted in failure on account of the difficulty in procuring fuel. This is becoming a crying evil all over India, and the subject of *reboisement* is bound to become a prominent one ere long. Enterprise in silk seems to be on the increase, some home firms having established agencies for the collection of cocoons. Taken as a whole, the Report is encouraging, and it is satisfactory to note the impetus which has been given to agricultural improvements since the accession to office of the present Lieutenant-Governor, who deserves much of the Punjab for his enlightened efforts to improve agriculture generally.

KURRACHEE seems determined to take advantage to the uttermost of the opportunities coming in its way through the completion of the Indus Valley State Railway, and is making great effort to improve its harbour. A contract to the extent of 4¾ lakhs has been entered into with a firm of contractors for the construction of a ship pier, and this is doubtless but a beginning. Kurrachee is favorably placed for intercepting the trade of the Punjab and of the Upper Provinces generally. The wheat trade of the Punjab is sure to assume large proportions shortly, and Kurrachee is likely to secure the bulk of the trade. The competition will in the meantime be between Kurrachee and Calcutta, Bombay being practically out of the running, for reasons which we will state further on. The distance from most of the Punjab stations by way of Kurrachee will save a railway journey of from 200 to 500 miles, an item that must tell in favor of Kurachee. Besides it appears that freights are

usually lower from Kurrachee than from Calcutta, the difference being frequently as much as two shillings per quarter, which, in most cases, would of itself make all the difference between profit and loss. The reason why Bombay is meantime out of the competition is that, by way of Allahabad and Jubbulpore, the distance is 281 miles longer than to Calcutta, and the double breaking of bulk, consequent on the Rajpootana narrow gauge section, makes cheap and expeditious traffic impossible. But for this break of gauge, a large amount of the grain traffic would clearly go that way. From, say, Umballa south to Cawnpore almost all trade would naturally find this the shortest and most economical route, and there can be no manner of doubt but that the entire narrow gauge section of Rajpootana will have to be replaced by a broad gauge line within a very few years, in order to meet the requirements of trade, the present system being utterly inadequate. To enable Kurrachee to meet this competition, she will have to improve her shipping facilities, and this she is evidently doing. In the hurry of all this wholesome competition, it behoves Calcutta to look to her railway and shipping facilities. These have been very materially improved of late by the erection of the jetties, but much yet remains to be done, as the jetties at present constructed are not by any means sufficient for the immense traffic of the port.

WHAT her coal-fields are to Great Britain, the superabundance of solar heat may some day become to India. It appears that, since May last year, a M. Mouchot has been carrying on experiments near Algiers with his solar receivers, and various important results have been obtained. But perhaps the most interesting results are those relating to the mechanical utilization of solar heat. Since March the receiver has been working a horizontal engine (without expansion or condensation) at the rate of 120 revolutions a minute, under a constant pressure of 3·5 atmospheres. The disposable work has been utilized in driving a pump which yields six litres a minute at 3·50m. or 1,200 litres an hour at 1m., and in throwing a water-jet 12m. This result, which M. Mouchot says could be easily improved, is obtained in a constant manner from 8 A.M to 4 P.M., neither strong winds nor passing clouds sensibly affecting it.

THE subject of the breeding of sheep, or rather of the improvement of the breed of our sheep, is at present under the consideration of the Government of the North-Western Provinces and Oudh, and, notwithstanding the attempt of Sir Ashley Eden to throw a wet blanket over the scheme, it is just one of those improvements which is not calculated to shock the prejudices of the ryots. If any glaring innovation be introduced to their notice, their prejudices are up in arms at once. Hence it is advisable in all proposed alterations and improvements affecting his very conservative individual—the ryot, that the thin end of the wedge should be very cautiously inserted. Now the great object in view is to improve his condition; and various plans are proposed with this object in view. These plans usually involve a demand for such improvements in the modes of cultivation as involve an expenditure of money quite beyond the power of the cultivator to furnish; hence they prove abortive. One demands that heavier ploughs be used in order to effect deeper cultivation. This means an expenditure out of all proportion to the ryot's ability; another wants heavy manuring, again seeking what the villager has not to give. For heavier manuring resolves itself into a question of his purchasing firewood, and putting his cow-dung to its legitimate use. But the proposal regarding the improvement in the breed of sheep is quite within his reach, at least with what help he will and must get from Government. Two things will be necessary;—the Government must provide a better class of rams, and, wherever these are introduced, all village rams must be castrated; and on the part of the villager, he must contrive somehow to feed them a little better. These two changes will effect a wonderful improvement in our sheep in a very short space of time. One object which ought to be kept in view is, the improvement of the fleece, and from experiments we have ourselves observed, we apprehend this to be as much a matter of feeding as breeding. The sheep are usually fed by being driven to the nearest forest land. There they are driven in the early morning by a very small boy, who brings them back at night. This boy usually passes the day sleeping, instead of driving his charge from place to place, and all that is required of the cultivator is that he should have his sheep driven by some one who will move them from place to place that they may enjoy fresh pastures, of which there is usually enough in these forests. Besides improving the value of his sheep in weight, the village farmer will have the satisfaction of increasing both the quality and quantity of the wool. In England the average weight of a fleece is six pounds, and here it is not more than three and-a-half pounds, and East Indian wool realises about a shilling per pound at home. From the immense herds one sees up-country, one would expect to find a large export trade done in wool, but there is little, and the only outlets for this wool are in the making of coarse blankets, and in the manufacture of *bunnath* cloth; but neither of these industries is carried on so largely as it might be, and as it ought to be, considering the demand that must exist for these useful articles, especially during the winter months.

TOO much importance can hardly be attached, now-a-days, to the subject of adulteration, especially in respect of food and drink, matters which so largely affect the domestic interests of the people. In France the practice of adulterating articles of food and drink is said to have been common long before it spread to England. But the French Government took prompt measures for the repression of the evil, and the severity of the law has been instrumental in suppressing the practice to a very great extent. In England, too, of late years, the subject has happily received more attention. Ever since the labours of the famous *Lancet* Commission and the startling exposures which resulted therefrom, public opinion has declared itself upon the subject which was thus forced upon the attention of Government. Scientific means were employed for the detection of the fraud, and the skill of the analyst was rapidly followed by the hand of the law. Legislation was called for on the subject, and now, throughout the British dominions, the penalties for adulteration are sufficiently severe, and, as a rule, rigidly enforced. To-day no publican dare adulterate his beer without rendering himself liable to a fine of £50, which is, indeed, the lowest penalty inflicted; while a dairyman found adding water to the milk he sells is mulcted to the extent of £10. These fines have frequently been enforced in full; but, notwithstanding the severity of the punishment, we are afraid that adulteration is still practised to a very considerable extent and in various forms. The importance of the question of adulteration has, we see, lately been attracting much attention in the United States, where the Committee on Manufactures, appointed by Congress, lately furnished a report, upon which has been prepared a "Bill to regulate the Manufacture and Sale of Articles of Human Food and Drink." We have not seen a copy of this report ourselves, but the *Japan Mail* tells us it "is long and interesting, and is predicated upon analyses made of many articles of food by Professor Collier, the well-known chemist to the Department of Agriculture, and other eminent scientists,—men of world-wide fame in their respective specialities." The disclosures made by Professor Collier and his *confrères*, respecting the extent to which adulteration is carried on in America, are said to be positively alarming. Some experiments were conducted with so apparently simple an article as coffee. The report informs us that six packages, each containing two small boxes of coffee berries, were purchased. The berries were then weighed, washed, and the turbid washings evaporated to dryness. By this treatment, added substances were removed, and the following table indicates the percentage of the total weight of berries:—

	Colored berries.	Uncolored berries.	Per cent. of difference.
No. 1	147	79	68
" 2	72	53	19
" 3	90	82	8
" 4	128	64	64
" 5	114	51	63
" 6	91	33	58

The residues were then treated, and left, when burned, "a yellowish residuum which contained in every case chromate of ead, phosphate of calcium (indicating bone black), and insoluble sulphate of barium. Those salts were added to those berries for the purpose of 'facing' them, and, by improving their appearance, to enhance the market value of the berries. These salts were in no case found in the residues of the uncolored berries."

The outlook for the lovers of "pure mocha," is not, under the circumstances, an agreeable one; but, as the *Japan Mail* remarks, they have at any rate the negative consolation that tea-drinkers are in an equally bad, if not worse, condition. Regarding the adulteration of tea, the report affirms that, "our own citizens have far surpassed the Heathen Chinee in successfully adulterating this article. Samples of what seemed good gunpowder tea—found in Washington market, New-York,—under microscopic examination, seemed to be fully one-half Prussian blue. In analysis only enough tea dust was found to impart a smell."

The *Rangoon Gazette* acknowledges the receipt of some Karen Hill tea and coffee grown by Mr. Petley, an enterprising resident of Toungboo. There is no doubt an admirable field here for the growth of tea and coffee, if our land laws were made more liberal. But Government is so chary of giving away any waste land now, only leasing it in small quantities, and even then making it difficult to get, that capitalists naturally shun having anything to do with land in Burmah; and, except for paddy cultivation, hardly any land is taken up for tobacco, tea, and coffee, all of which, it has been proved over and over again, would thrive in many parts of this province. It is to be hoped that with a "Liberal" Viceroy, and with Mr. Aitcheson removed to the Council, we may shortly have a more enlightened system of legislation with regard to land in British Burmah, and have the line of railway to the Toungboo frontier commenced without further delay. Private capitalists offered to construct this line some eight years ago, but were snubbed for their offer and told that the Government of India would in future construct all railway lines for itself. The consequence is that we are without any railway to Toungboo, and that our means of communicating with this district are as backward as when we first annexed the place in 1853. It takes in the rains about a fortnight for a boat to get to Toungboo, whilst the distance by rail, 180 miles, could easily be got over in a few hours.

It must strike all that if the red abandoned hills of many of the low lying districts had only been planted with jacks (*artocarpus integrifolia*) some years ago, the properties would now have become very valuable indeed, instead of being, as so many are, worthless eyesores. We hope that the proverb, better late than never, will be acted upon, and that planters will, if only for the sake of posterity, plant jack seeds throughout their low lying estates. There is some doubt as to whether it is possible to transplant young jack trees. We have seen this successfully done near Panwila, but we should advise that the seeds be placed in bamboo pots (the earth being mixed with Hora saw-dust to keep white ants away) and removed to the field when the plants are about 6 inches high. The best variety of jack tree is said to be that which produces fruit at the roots, such fruit selling for three to four times the price of the ordinary jack tree.

The State Legislature of New Jersey has passed an Act designed to encourage the growth of fibrous plants, including jute, ramie, flax, hemp, and various other plants and grasses grown elsewhere in the United States, or imported. Its principal features are as follows:—

For every ton of 2,000 pounds of *Abutilon avicennæ*, stalks grown in New Jersey, not less than 3 feet long, 5 dols.; for every ton of 2,000 pounds of what is known as rose, or marsh-mallow, not less than 3 feet long, and not more than one inch in diameter at the butt, 5 dols.; for every ton of 2,000 pounds of ramie stalks not less than 2½ feet long, 10 dols.; for every ton of 2,000 pounds of flax stalks for fibre of the ordinary lengths, 7 dols.; for every pound of decorticated or cleaned flax of first American quality, 3½ c.; for every ton of hemp stalks of the ordinary lengths, 6 dols.; for every pound of decorticated or cleaned hemp, of best American quality, 3 c. In each case fractions less than a quarter of a ton are paid for at the same rate. The bounties will cease the 1st day of April, 1885, or in the event of the total amount paid reaching 15,000 dols.

The London papers call attention to a remarkable "rig" which is now proceeding in medicinal opium. Is it represented that an Anglo-American Syndicate, controlling very large funds, is buying up all the drug that can be procured. There are said to be about 4,000 cases in existence, and the coming crop in Turkey is a short one which will only yield about 3,000 more. The speculators say they hope to run the price up to 48s., and they have already succeeded in putting it up in New York from 18s. to 26s. The medicinal journals say that this manipulation of the opium market should stimulate scientific enterprise to utilise Indian opium for medical purposes. At present the Indian drug is too refined and weak in narcotic force to be used in medicines; but perhaps this may be overcome.

It is stated by the Chief Engineer that the results of the irrigation operations in Bengal for the year 1878-79 were on the whole satisfactory. The receipts exceeded the working expenses by Rs. 45,523; thus for the first time Bengal irrigation has shown a profit which would have been greater had the outstanding balances been collected. Calculated by earnings of the canals, the surplus on the year's operations would be Rs. 2,66,758 as follows:—Orissa canals, Rs. 4,783, Midnapore canals, Rs. 5,134, Hidgellee canals, Rs. 36,880, and Sone canals, Rs. 2,19,961, total Rs. 2,66,758. "For the spread of irrigation in Orissa we must look to the extension of the distributaries and the completion of the canal system. In Midnapore the limits to which irrigation can be expected to extend have been nearly reached; further development must depend on the construction of reservoirs in the hills to supplement the supply in the river Cossye. On the Sone canals the eventual increase of the irrigated area is certain; but the rapidity with which it is likely to be developed will be dependent, in a great degree on the seasons and the amount of the rainfall; much will also depend on the speedy construction of village channels, and it is expected that the introduction of a satisfactory system of leases for long periods will have a most beneficial effect."

A planting correspondent writes to the *Ceylon Observer*:—"I find that *Uritusinga* is the largest form of *officinalis*, and not *Condaminea*: the latter coming second only. This is what McIvor says in his book, and what is still true in India. Those who are now planting *Condaminea* under the idea that it is the largest variety, are mistaken. What do you say to this? There can be no question that the large-leafed variety is what we must cultivate, and it is very important to know what it is called in India." [Howard was the first to send out *Uritusinga* to India.]

The cultivation of the ground nut appears to have been extensively carried out this year in the Bangalore district, and it is not unlikely that the outturn will exceed that of the Kolar district, which has always gone in largely for the nut cultivation. Some time last year the Government of India sent a circular round to all local Governments, pointing out the value of the nut as an item of export, and asking what steps should be taken to induce ryots to cultivate it more extensively; this has borne some good results; for, as we stated, the area of cultivation this year has been much increased. The cultivation of the nut is very profitable, and, once sown, a crop for each year for three years will be yielded. The oil is used by natives as an edible, while the cake is a fattener for cattle or poultry.

Fair dhollerah having passed into the sere and yellow leaf no longer possesses the charms she once did, and "Prima in Indis" is anxious to get up a trade in some other staple. The *Bombay Gazette* points to wheat, and says that ought to be their largest item of export. But Bombay is heavily handicapped against Calcutta:—

"The G.I.P. Railway which runs through the heart of the wheat country from Sohagpore to Jubbulpore and Nagpore, is in direct through traffic with the East Indian Railway to Cawnpore; the distance is less from Jubbulpore to Bombay than to Calcutta, by

168 miles. Yet it is cheaper to send it to Calcutta. The charges are as follows :—

			as.	p.	
Nagpore to Bombay,	520	miles	11	9	per cental.
Jubbulpore to Bombay,	616	" ...	12	8	"
Jubbulpore to Calcutta,	784	" ...	10	3	"
Cawnpore to Calcutta,	684	" ...	11	0	"

"This shows clearly how excessive the G.I.P. Railway charges are. Although the old excuse will doubtless be urged, of the extra expense this railway incurs through having to traverse the Ghaut, yet add 40 miles more to the distances of Nagpore and Jubbulpore for the extra expense of the Ghaut traffic, and it will still be seen the G.I.P. Railway rates are far in excess of the East Indian. Wheat is an article which has to enter into keen competition with other countries, and the slightest addition to railway charges takes away the small margin of the trader's profit."

The *Gazette* urges the Bombay Chamber of Commerce to take up the subject.

OFFICIAL PAPERS.

THE OPIUM OF PERSIA.

THE following memorandum is taken from a lately published report on the Persian Gulf Political Agency :—

For the last two years the Persians have shown unprecedentedly great activity in extending and improving the cultivation and growth of opium in the country. The heavy losses which they suffered on more than one occasion from their badly-prepared and adulterated stuff, and the tempting profits which they found were obtainable from better produce, have apparently impelled them to the course now taken. While a few years ago a case of Persian opium weighing 18 Tabreez mun. or 140 lb., would not fetch in China more than 280 to 350 dollars, it has recently realized from 500 to 615 dollars. This change cannot, of course, be attributed altogether to the improvement in the quality of the Persian drug, as prices are regulated by the state of the Indian produce and by the demand in the China markets. The Bengal and Malwa crops failed in the last two years, owing to drought and other circumstances, and the limited outturn, coupled with heavy speculation, tended towards the increase of prices. The prospect of the crops of the current year is said to be favourable, but the trade in opium is not expected to be very remunerative.

To return to the Persian opium, from the time the attention of the native merchants was attracted to the trade in this article about 25 years ago there has been, with two or three exceptions, a gradual annual increase in the production of the drug. But this increase has never before been so very considerable as to become prominently noticeable.

It was reported in 1859 that about 3,000 Shah mun, or 300 cases of opium were produced in Persia, and in 1861 that about 10,000 Shah mun. or 1,000 cases were expected to yield from the crops of the year, a quantity which was then noticed to be double the outturn of the previous year.

In the trade report of this Residency for the year 1874-75, the fluctuations of the annual estimated produce of opium in Persia from the year 1868-69 to 1874-75 were shown in a tabular statement attached to a special report on the subject. The largest produce for any one year did not exceed 2,600 cases (a quantity inappreciably small in regard to the demands in China), and in 1874-75 it had fallen to some 2,000 cases. In the following year there was a further decline, the exports amounting to about 1,899 cases. Since 1876-77, however, a re-action appears to have taken place, as in that year 2,570 cases were exported from Bushire and Bunder Abbass alone

In the early part of 1877 78, the probable yield of the crops was estimated at 3,500 cases, but the actual number exported from Bushire and Bunder Abbass amounted to 4,730 cases.

Last year (1878-79) the outturn was stated to have been 6,700 cases, while 5,900 were exported from these ports.

The probable yield of the crops of the current year 1879-80 is at present estimated to be as follows :—

		Shah mun.		Cases.
In Khorasan, about	... ...	14,000	equal to	950
" Kerman "	... ...	4,500	"	300
" Yezd "	... ...	15,000	"	1,000
" Ispahan "	... ...	37,000	"	2,400
" Neereez "	... ...	0 0	"	400
" Shiraz "	... ...	20,000	"	1,300
" Kazrun "	... ...	1,500	"	100
" Shushter "	... ...	1,500	"	100
Total "	... ...	99,500	"	6,550

In addition to the above 6,550 cases of opium, about 8,000 Shah mun. or say 550 cases are expected to come to Yezd from Herat, making the whole stock 7,100 cases. The Shushter opium is sent through Mohammerah direct, and sometimes *viâ* Bushire to Muscat for transmission to Zanzibar ; but a part of it is supposed to be smuggled into the Indian frontier-provinces *viâ* Mekran Beluchistan. Thus 7,000 cases are expected to be available during the current year for export, through Bushire and Bunder Abbass, to China and England.

Small quantities of opium are said to be grown in Tehran, Tabreez, and Kermanshah, but these mostly find their way to Europe *viâ* Turkey, Smyrna being, it is alleged, the port where it is mainly taken to, and where it is mixed with the local drug and forwarded to the Continental markets.

Opium is made up into cakes varying in weight from ¾ to 1½lb., and in number from 96 to 192 or more ; and these are packed in fig or vine leaves and sometimes in poppy seeds or stalks, into cases containing each from 10½ to 11 Shah muns., a Shah mun. being equal to about 13⅓lb. English.

The object in so packing in cases, as regards weight,' is that the contents after the deficiency caused by the drying up in course of transit, which is calculated at from 5 to 10 per cent , may realize at destination, China, one "picul," which is about 135lb. Another reason is that the weight is arranged for convenience of carriage by pack animals,—generally mules employed in these regions.

About 5 6th. of the produce of opium prepared in Persia are intended for China. The drug suitable for that market being required to be fine and prepared with oil, and not rich in morphia, permits its being swelled up with foreign substances, and thus being, as far as practicable adulterated to the extent to preclude discovery by the modes of testing or "touching" used in China.

It is said that pure and superior opium, though not so finely manipulated, has been rejected in China, while the fine opium containing admixtures has found favour and fair market.

The preparations made for the China marts, being, say, of a quality of 80 "touch" (containing 80 per cent. pure juice and 20 per cent. foreign substances) yield from 9 to 10 per cent. morphia.

The preparations for England which have recently been specially made pure, and which have come into favour in Europe and America, have, it is said, yielded morphia averaging about 12 per cent.

The average price for fair quality of opium suited for the China market has been for the last two years about Rs. 950 per chest ; and for the special preparations for England, about one hundred rupees more.

To these are added the charges of transit and other contingent expenses from the place of product to the port of shipment, amounting to about Rs. 30, and further a custom and octroi or other duty of about twenty rupees payable by a Persian, or 5 per cent. *ad valorem* by a British or other foreign merchant.

G. LUCAS,
Uncov. Assist. to the Pol. Resident,
Persian Gulf, Bushire.

MEDICINAL PLANTS IN INDIA.

FROM A. JAMIESON, Esq., Superintendent, Government Botanical Gardens, to R. W. BARLOW, Esq., Commissioner of the Nilgiris, dated Ootacamund, 1st April 1880, No. 498.

With reference to paragraph 8 of G.O. No. 1992, dated 3rd October 1879, and G.O. No. 295, dated 8th ultimo, and your endorsement thereon, I have the honor to report that the utmost care and attention continues to be bestowed on the medicinal plants under cultivation in the Government gardens under my charge.

2. In addition to Jalap (which continues to thrive most satisfactorily), the plants noted in the margin are being propagated and planted out as rapidly as young plants can be produced. Of these the most important are Peppermint and Rhubarb.

Peppermint.	Lavender.
Rhubarb.	Digitalis.
Rosemary.	Taraxicum.

3. *Peppermint.*—After fully a year's trial, I have abandoned the cultivation of Peppermint at Ootacamund, the climate being too cold to produce a luxuriant growth. The plant grows rapidly during the autumn months, but becomes stunted and withered as soon as the dry frosty weather sets in. I am, therefore, having the entire stock transferred to the newly-formed nurseries in the Kalhatti Garden, where we have a more forcing climate and an abundant supply of water at command throughout the year. The present year's crop of Peppermint will, I believe, yield several pounds weight of oil when distilled.

4. *Rhubarb.*—The stock of Rhubarb plants have not, I regret to add, increased so rapidly as I anticipated. The original plant having not yet borne seed, the propagation has in consequence been confined exclusively to the division of the older plants. In June last year, I put out one plant in the Kalhatti Garden, which has grown very much stronger than the plants in the Ootacamund Gardens. The plants now in Ootacamund will be transferred to Kalhatti as soon as the weather is favorable for transplanting, and every means adopted to increase the stock as fast as practicable. At Banbury in England, where medicinal Rhubarb has been cultivated for many years, it is considered advantageous to allow the roots to remain in the ground until they are six or seven years old, but they are seldom allowed to attain more than four years' growth, at which age I have no doubt our plants will commence to yield a return.

5. *Rosemary and Lavender* grow freely in a friable loamy soil in Ootacamund, and are easily propagated by cuttings. When the plants already put out have made a sufficient growth, they will be cut over, and the produce dried and forwarded to the Medical Department for distillation.

6. *Taraxicum and Digitalis* grow so freely in Ootacamund as to require no special care. The demand for these drugs by the Medical Department is at present supplied from plants growing spontaneously in the gardens. Should the present demand be largely increased, it could easily be met with little expense in cultivation.

7. *Jalap.*—With a view to further extending the cultivation of the valuable drug, one-and-a-half acre of land immediately within the northern boundary of the gardens have been broken up, terraced, and manured. The land will be first cropped with potatoes, then planted up with Jalap. When it comes into bearing there will be a sufficient area under Jalap to meet the requirements of the Indian Medical Department

8. In August last year, I received from Surgeon Major Bidie a packet of seed called Barbung, believed to belong to a species of plantago, and which Dr. Bidie says is largely used in Persia and Central Asia as a cure for dysentery. The seed was sown immediately after receipt and germinated freely. As soon as the plants were large enough, they were transplanted in the Kalhatti nurseries, where they are making satisfactory progress. When the plants have flowered and seeded, specimens and a packet of seed will be forwarded to Dr. Bidie for identification and analysis.

9. During the present year I hope also to undertake the cultivation of the following drugs, all of which are in considerable demand by the Medical Departments, and I have no doubt will be found to thrive either at Ootacamund or Kalhatti:—

Aconitum Napellas.	Hyocyamus Niger.
Atropa Belladonna.	Convolvulus Teammonia.
Colchicum Autumnale.	Artimesia, sps.
Gentiana lutea.	Valerиana officinalis.

THE GROWTH OF THE CORN TRADE OF ANTWERP.

SOME thirty years ago the production of breadstuffs in Belgium generally exceeded the demand for home consumption. We exported Belgian grain occasionally, and after the repeal of the corn laws in England pretty regularly. Imports of foreign grain took place only on a notable scale in case of a failure of crops, and on the whole our grain business was quite unimportant.

This could, however, hardly be otherwise.

The corn trade had until then been prevented from developing, by injudicious legislative interference. The measures which were decreed in turn for the protection of the producer and of the consumer proved fatal to both. The sliding scale, imported from England into France and Belgium, acted as a prohibition of imports and combined with prohibitions of exports which were always impending whenever there was a serious apprehension of scarcity, introduced an element of uncertainty into every transaction connected with the corn trade which produced a disinclination on the part of the merchant to import, and discouraged production beyond the wants for home consumption.

Railways and other artificial means of communication were still in a relatively rudimentary state, and the cost of transport of such a cumbrous article as grain, to any great distance, was enormous. The development of industrial life was stunted by the protective system flourishing everywhere, the working classes were mostly poor and indifferent consumers, the growth of population slow.

The economical reforms inaugurated in England and imitated on the continent rather timidly at first, but by-and-by at a more rapid pace, especially since the conclusion of the commercial treaty between France and England in 1860, wrought a complete change in this situation.

We witnessed then a marvellous increase of the industrial activity and of the international exchanges, railways were constructed, canals dug, rivers regulated, ships and steamers built and their machinery improved, capital was rapidly accumulating and credit expanding, wages were rising, and the population fast increasing. The home production of cereals grew more and more insufficient, first in the United Kingdom, afterwards elsewhere, and the corn trade acquired gradually that volume which is one of the greatest marvels of the age.

Belgium was one of the first countries on the continent that adopted the free trade policy of England, and although the reforms were not here so rapid, nor so sweeping, the effects were hardly less wonderful than in the United Kingdom. Among the many benefits we reaped from the reduction of tariffs, not the least important was the development of the corn trade which, promoted besides by the eminently favourable topographical position of Antwerp, made rapid progress.

As we stated above, we had as good as no regular corn trade some thirty years ago, and Antwerp has now already become one of the largest corn markets of Europe. This fact is of so recent a date that it may not be so generally known abroad as it would seem desirable for this market. Some statistics about the growth of this trade and a few remarks respecting its prospects of future progress may therefore be a welcome contribution To offer some is the object of this notice, and we should be happy if, by rousing or stimulating the attention of shippers, it could in any measure promote the direct intercourse, especially between distant corn-growing centres and our port.

What our trade was formerly, and what it has become in the relatively short space of time which has elapsed since the inauguration of the free trade era, will be best shown by the comparison of our imports in the ten years from 1845 to 1853, and in the last ten years which we give in the two following tables:—

Imports of Cereals into Antwerp from 1844 *to* 1853.

Year.	Wheat.	Rye.	Barley.	Oats.	Maize.	TOTAL.
	Hect.*	Hect.	Hect.	Hect.	Hect.	Hect.
1844 ...	101,090	67,230	3 1,230	19,500	...	549,050
1845 (1)...	768,720	87,000	253,620	7,980	...	1,117,320
1846 (2)...	1,741,440	811,920	185,100	32,490	...	2,773,950
1847 ...	1,453,500	1,037,670	104,120	17.370	...	2,612,660
1848 ...	151,920	64,860	72 150	2,010	...	290,940
1849 ...	127,521	22,388	28,544	400	...	178,853
1850 ...	42,553	43,477	60.602	......	...	146,632
1851 ...	197,113	53,190	64,368	5,977	...	320,648
1852 (3)...	829,607	264,298	110,023	6,911	...	1,210,838
1853 (4)...	820,095	322,714	178,041	......	...	1,320,859
	6,233,559	2,777,747	1,417,793	92,638	...	10,521,712
Averages	623,356	277,775	141,779	9,264	...	1,052,174

(1) First appearance of the potato disease.
(2) Failure of crops all over Europe which pushed up prices of wheat to Frs. 61·25, and of rye to Frs. 46·75 per 100 Kos.
(3 & 4) Failure of crops.

Imports of Cereals into Antwerp from 1870 *to* 1879.

Year.	Wheat.	Rye.	Barley.	Oats.	Maize.	TOTAL.
	Hect.	Hect.	Hect.	Hect.	Hect.	Hect.
1870 ...	2,020,179	411,112	853,675	1,321,297	...	4,639,263
1871 ...	5,547,477	1,591,887	1,315,672	2,374,162	...	10,832.198
1872 ...	2,128,275	362,503	210,377	2,000	...	2,703,155
1873 ...	3,868,221	860,183	1,180,638	526,544	...	6,735,586
1874 ...	4,329,380	1,069 972	1,478,277	1,187,621	...	8 065,250
1875 ...	2,387,012	786,149	1,281,198	733,419	...	5,138,078
1876 ...	5,452,183	1,016,169	1,499,312	1,556,675	...	9,554 639
1877 ...	3,808,486	1,612,182	1,320,380	1,399,273	177,139	8,317,460
1878 ...	5,501,127	2,077,962	2,174 558	2 255,090	424,678	13,032 415
1879 ...	8,257,855	2,993,584	2,085 825	2,350,837	661,676	16,352,777
	43,300,495	12,824,703	13,999,212	11,009,918	1,266,463	85,400,821
Averages	8,330,049	1,282,470	1,399,921	1,400,991	126,649	8,540,080

Average total importation 10 years 1844-53 all grain 1,052,174 hect.
" " " 10 " 1870-79 " 8,540,080 "
Total importation of grain in 1879 16,352,777 "

The above figures speak so eloquently for themselves that we need scarcely comment upon them. They supply also ample proof of the exact truth of our assertion that Antwerp has really become one of the largest corn markets of Europe. The following comparison of our last year's imports with those of Liverpool and London, undoubtedly the two largest emporiums of the European corn trade, will render that fact evident :—

Imports of Foreign Wheat in 1879.

Liverpool.	London.	Antwerp.
Qtrs. 3,845,721 —	Qtrs. 2,855,128 —	Qtrs. 2,857,389 — (hectol. 8,257·845)

This comparison shows that our imports of foreign wheat were last year fully as large as those of London and interior to those of Liverpool by only qtrs. 984 858. But this inferiority to Liverpool even is only apparent. In fact, while in England the population lives exclusively on wheaten bread, in Belgium and still more so in Germany, our principal customer, a good deal of rye is still consumed. To get a correct view of the matter, it seems to us that all grain serving for human food ought to be compared. We would then have to add to our above imports of wheat, hect. 2,993,584 —qtrs. 1,035,584 of rye, of which article the import is *nil* in Liverpool. This will make our total qtrs. 3,892,973 wheat and rye against qtrs. 3,845,721 imports of wheat into Liverpool, or a surplus of about qtrs. 50,000 in our favor. Such argument may also be justified on the ground that the substitution of wheat for rye is progressing rapidly in Germany, and the consumption of the latter grain will very likely soon become there as trifling as it is already in Belgium; in future the imports of wheat will therefore be correspondingly increased at the expense of rye.

Our trade, as shown by our imports in the years from 1870 to 1879, and especially by those of last year, is already sufficiently important to be worth the while of shippers in all corn-growing centres to compete for a share of it But they will have the more reason for doing so, if they consider that this trade is as yet only in an early stage of its development and that it bids fair to increase still very considerably. In fact, Antwerp is not only the commercial emporium of Belgium, it is also the most favorably situated port for a large part of Germany and France. A glance at the map will show that our market extends far beyond our southern and eastern

* The Hectolitre is equivalent to 2¾ bushels.—ED., *I.A.*

frontiers and comprises large territories with dense industrious and wealthy populations which may be considered as our natural customers. No other continental port except Rotterdam, and that only as far as the navigation on the Rhine is concerned, can in those quarters compete successfully with us. What we have said in the beginning of this notice of the transformation of commerce and industry applies in every respect to these countries. Our trade with them has augmented considerably, especially since the annexation of Alsace-Lorraine to Gemany, which secured for us the cheapest, because it is the shortest. railway route to these provinces and Switzerland. The consequent accession of trade is one of the chief reasons of the enormous increase of our corn imports. (a)

That this trade will go on developing there is no doubt. The progress realised until now was obtained under a system of partial free trade. We may reasonably hope to enjoy one day the blessings of complete commercial freedom. What might then be the expasion of our trade? There is certainly every reason to believe that it would develop in a similar manner as the British corn trade has done since 1846 when the great economical reform of Sir Robert Peel was completed by the repeal of the corn laws. It may therefore be interesting to give here some statistics concerning this trade.

We extract from M'Culloch's supplemental notes to Adam Smith's "Wealth of Nations" the following table of the imports of wheat and flour of the 12 years ending 1846 :—

Imports of Wheat and Wheat Flour into the United Kingdom during each of the 12 years ending 1846.

1835 ...	Qtrs,	42,628	1839 ...	Qtrs.	2,634,556	1843 ...	Qtrs.	941,902
1836 ...	„	168,647	1840 ...	„	1,993,383	1844 ...	„	1,100,361
1837 (*b*)	„	455,871	1841 ..	„	2,409,754	1845(*c*)	„	871,256
1838 ...	„	1,241,460	1842 ...	„	2,722,349	1846(*d*)	„	1,436,686

The average of these 12 years is ... ... Qtrs. 1,334,904
According to the official returns the average importation of the last 15 years, 1865 to 1879, amounted to „ 10,736,110
The increase has therefore been in the ratio of 1 : 8.

From a comparison of the above tables of our imports for the years of 1844 to 1853 and 1870-79, it will be observed that a similar growth has taken place in our trade.

The average of our imports in the former period was Hect. 623,356
and in the latter 4,330,049
thus an increase in the ratio of 1 : 7

If such an increase has been realised under much less favorable circumstances than those which existed in the United Kingdom, what would be our progress, if our trade were allowed to develop freely?

Every experienced merchant will perceive at once the immense margin for expansion still existing here.

There is, however; another stimulus which has come into play quite recently, and which may in the end prove more poworful than all the internal causes which favored the development of the international corn trade in the past.

A good deal of uneasiness has been created in agricultural circles by the enormous importation of foreign grain, especially from America, in 1878, in spite of the low prices then ruling. The question has been earnestly discussed since, whether the old European agricultural system will be able to stand the competition of the large, new and cheaply producing countries, foremost of which stand the United States. This competition was not very dangerous as long as the cost of transport was so heavy that only with pretty high prices ruling in Europe an extensive import from such distant countries could take place. But, now that railways have been so extensively constructed and freights have become so much reduced by the building of large sized vessels and steamers, all supplied with improved machinery, there can hardly be any doubt that whenever crops are abundant in such new countries (and they will very likely always be so in one or the other), a large supply of grain from thence may be expected even at such moderate prices as were current in 1878. It must not be lost sight of that the United States will very likely not remain the only country producing grain on an immense scale. Canada seems to have good prospects in this respect; in India and Australia the production is fast increasing, and last, not least, the River Plate States bid fair to become soon an important source of supply.

Very competent authorities in Europe (1) have contended that, unless the old European agricultural system be entirely reformed, the landed interest is threatened with complete ruin, and that protective duties, and even much higher ones than those recently introduced in Germany, would be quite unavailing to prevent this. The exclusive growing of corn is condemned, and the substitution of green crops combined with cattle breeding and the industries connected therewith, is recommended. This would imply a large reduction of the European production of grain and a corresponding increase of foreign imports.

From the foregoing we think we may safely draw the conclusion that the continental corn trade is more and more deserving the full attention of grain shippers in all parts of the world, and that of all the European continental markets, where an extensive and regular business in grain may be done, the most important is indoubtably Antwerp.

BERDOLT & Co.

Antwerp, January 1880.

(*a*) As long as Alsace and Lorraine were French provinces, and the railways there dependencies of the "Chemin de fer de l'Est," the French ports enjoyed tariff favors which deprived us of our natural advantages and rendered competition extremely difficult. This was changed immediately after the war.

(*b*) In 1837 and succeeding five years the crops were considerably deficient.

(*c*) First appearance of the potato disease.

(*d*) The worst crop on record.

UTILIZATION OF CITY REFUSE AS MANURE.

No. 1 51, dated Poona, the 31st March 1880.

MEMORANDUM—By J. H. E. HART, Esq., C.E., Superintending Engineer for Irrigation.

Submitted for the information of Government in the Public Works Department, Irrigation, with a copy of this office No. 5026, dated 12th November 1879, and Govern ment Resolution No. 3222, dated 29th November 1879 (General Department).

2. The Superintending Engineer for Irrigation is induced to draw the special attention of Government in the Irrigation Department to the importance of the information furnished in these reports by the officers of the Poona Municipality on the subject of the use of poudrette as a manure.

3. The précis of correspondence, circulated under Government Memorandum (General Department) No. 2633, dated 31st August 1875, shows that the use of poudrette was up to that time almost entirely unknown in this presidency, except on a restricted scale in a few places.

4. The development of the revenue realised by the Poona Municipality from the sale of poudrette, since the opening of the Mutha Canals, is of great importance. The manure supplies a want essential to any great extension of garden cultivation, and the revenue realised by the Municipality is so considerable that it may fairly be hoped other Municipalities will make some endeavour to turn to account the sewage of their towns, more especially in places like Sholapur, Karar, Satara, &c., situated in the vicinity of large irrigation works. It is believed that at the instigation of Mr. Burke, the manufacture and sale of poudrette has been taken in hand by the Sholapur Municipality within the last few years, and with satisfactory results. Detailed reports on the subject might be asked for.

5. It appears from the papers that originally a system of preparing the poudrette by heating the night-soil in furnaces was experimentally tried at Poona, but was subsequently abandoned as being too elaborate. The "sun-drying" process was then reported to, and the result is approved both by sanitary and medical officers and by the purchasers. It may be noted that this process is almost exactly that described as followed in Nasik *vide* the précis referred to in paragraph 3.

6. The following are some of the most important matters on which information is obtainable in connection with the manufacture and sale of poudrette in Poona :—

Population of city 90,436.

Night-soil 44 cart-loads=575 cubic feet per day. This shrinks in drying to 430 cubit feet.

Street sweepings 65 to 75 cart-loads=1,950 cubit feet per day. When burnt and sifted produce is 300 cubic feet of ashes.

Poudrette 436 cubic feet of night-soil mixed with 300 cubic feet of ashes produce 730 cubic feet of poudrette per day or 266,450 cubic feet per annum.

The price realised is Re 1 per cubic yard or 27 cubic feet. The annual value of the poudrette is thus Rs. 9,8,0 at current rates. This is incorrectly stated by the Secretary, Poona Municipal Committee, as Rs. 4,934.

The cost of conveying night-soil and sweepings to the depôt is shown as Rs. 11,786. The cost of manufacturing the poudrette is stated as Rs. 6,264. The cost of convoyance has of course to be incurred in any case. The manufacture of the poudrette will yield a very handsome profit to the Municipality. The Municipal Secretary notes that the price of the manure is susceptible of increase, and the cost of manufacture of reduction.

The revenue from the sale has increased from Rs. 766 in 1874-75 to Rs. 7,438 during the first 9 months of the current year (1879-80).

7. The remarks in paragraph 10 of the Secretary's letter are worthy of particular attention. He states that 5 years ago cultivators "would not touch the poudrette" and "I could not be induced to take it away at even a nominal charge. At the present moment the outturn of manure is not enough to keep pace with the demand, and it has become necessary to take special precautions that the poudrette is not taken away in its raw state which the cultivators sometimes attempt to do. They frequently pay for manure to the Municipality from 4 to 6 months *in advance* in order to ensure a timely supply."

8. The Superintending Engineer recomm ends that Mr Plunkett's letter and the report by Mr. Narso Ramchandra, Secretary, Poona Municipal Committee, be printed and copies circulated to all Presidents of Municipalities and to Cantonment Committees. Also that the papers be printed in the *Government Gazette*. Copies might also be furnished to the Government

of India, *vide* Government Resolution (General Department) No. 850 of 23rd March 1880 and to the Inspector-General of Prisons.

No. 98, dated Poona Municipal Office, the 14th January 1880.

From A. H. PLUNKETT, Esq., City Magistrate and Chairman, Poona Municipality, to the Collector, and President, Poona Municipality.

With reference to Government Resolution No. 8222 of the 20th of November last, in the General Department, I have the honor to report that the following sums were realised by the sale of poudrette manufactured by the Poona Municipality during the past five years :—

YEAR.	Approximate quantity manufactured in cubic feet.	Amount realised in Rupees.	REMARKS.
1874-75	60,000	766	All sold during the year.
1875-76	90,000	1,308	
1876-77	120,000	2,632	
1877-78	150,000	2,840	About 2,500 cubic feet remained unsold.
1878-79	220,000	4,356	About 100,000 cubic feet remained unsold. The selling price was increased 50 per cent.
1879-80 (up to 1st January 1880, 9 months.)	200,000	7,438	About Rs. 2,300 were obtained from the sale of old stock.

2. The mode of preparing the poudrette advocated by Rao Bahadour, Professor Koru Luxman Chatre in his report (copy of which is appended for ready reference).* was abandoned as too elaborate and expensive after a very short trial. The mode now adopted is described in the accompanying report of the Municipal Secretary.

* Not printed.

3. I beg to remark that the present mode of preparing the poudrette has the approval of the medical profession and the Sanitary Commissioner of Bombay, and to add that the value of the poudrette as a manure is recognized by the agricultural classes, the demand for it being steadily on the increase since the opening of the Mutha Canals.

Report on the disposal of the night soil of the City of Poona and its Preparation into Poudrette.

The process adopted may be called the "sun-drying process." It consists in exposing night-soil in shallow beds covered with ashes to the sun to dry, and, when perfectly, dried in heaping it away to be sold to agriculturists for manure.

Night-soil.

2. About forty-four cart-loads of night-soil are daily collected in the city, and carted out to a depôt at the village of Dhankodi, 2¼ miles away to the south of the city from its extreme limits. Twenty-two carts each of a capacity of 18 cubic feet are employed. They make two trips a day. They are barrel-shaped (5' 9" long and 2 diameter) and are perfectly air-tight. They have a mouth for filling on the top at the fore end covered with an air-tight trap lid and an opening at the left end at bottom for emptying, covered by a close fitting short piston, which is worked up, and down by a screw worked from the top of the cart.

3. The carts are taken away three-fourths full, each containing about thirteen cubic feet of matter. The space left vacant is required partly for the location of the gas which is generated in the night-soil when exposed to the sun and stirred by the jolting of the carts, and partly for preventing the night-soil from spilling or overflowing as it rises while fermenting and while the gas is produced.

4. The night-soil collected is in a semi-liquid state, as a great quantity of water used by people for ablution mixes with it, from which it cannot be separated. About 575 cubic feet of such soil is collected daily.

Ashes.

5. Street and house sweepings collected from the dust-bins of the city are carted out and burnt into ashes, which are afterwards carted out to the depôt referred to in paragraph 2 above. The carts are of open box form, 5 feet long, 8 feet broad, and 2 feet deep, which make a capacity of 30 cubic feet, 25 carts are employed, and they make three trips daily. Allowing for stoppages, accidents, &c., about 65 cart-loads of sweepings, consisting of house ashes, stable litter, sweepings, and a quantity of road dust and brickbats are taken out daily. The total refuse thus taken out is about 1,950 cubic feet. When burnt, it is reduced to 2/13ths of its bulk, or about 300 cubic feet of pure ashes.

Deodorisation.

6. At the depôt, beds are formed with a floor made of moorum or other hard substance to receive the night-soil; the beds are 18 feet square and 1 foot deep. A layer of ashes one inch thick is first spread over the floor of the beds; night-soil is then poured on, about 5 inches deep, and is covered over with a layer of ashes also an inch deep. It is then allowed to remain for 24 hours in the sun during the fair season and for three days under sheds during the rainy season. The night-soil is, after the lapse of the time mentioned above, stirred and well mixed with the ashes spread above and below it, and a fresh layer of the latter, ½ inch thick, put on, when it is allowed to lie for three days further in the fair season and eight days during the rains. The mixture is then again stirred, taken out of the beds, and spread on dry open ground exposed to the sun to complete its drying. It is then stored in heaps for sale, and is in dry weather fit for immediate use.

7. In the rainy season the drying has occasionally to be done under cover, and consequently the process occupies as many as 12 days, whereas in the cold season it takes six days, and in the hot season only four days.

Remarks.

8. Experience has shown that ashes form the most efficient and cheapest deodoriser of the noxious gases generated from night-soil, and the depôt when there is no uncovered night-soil in it, is free from stinks at a distance of 50 yards on its windward, and not more than 150 yards on its lee-ward side, provided always that the supply and use of ashes is sufficient.

9. It will be observed that 575 cubic feet of semi-liquid night-soil is obtained daily from the city, and only 300 cubic feet of ashes, that is, the latter is a little over one-half of the former. Experience has shown that to ensure thorough deodorisation, complete freedom from stink, and the best poudrette, the proportion of ashes to night-soil should be about equal, and the Municipality are trying to augment their collection of ashes to the required quantity.

Poudrette.

10. The manure prepared in this manner is much valued by cultivators, and is in great demand. Applications for the manure have been increasing since the opening of the Mutha Canals, and consequent extension of wet cultivation. Five years ago, agriculturists would not touch the poudrette thus prepared, and could not be induced to take it away at even a nominal charge. At the present moment the outturn of manure is not enough to keep pace with the demand, and it has become necessary to take special precautions that the poudrette is not taken away in its raw state, which the cultivators sometimes attempt to do. They frequently pay for manure to the Municipality from four to six months *in advance*, in order to ensure a timely supply.

11. The poudrette manufactured by the Municipality is clean and free from brickbats, broken glass, and other rubbish or common earth. This is secured by the ashes being sifted before being mixed with night-soil.

12. It may not be out of place here to quote a paragraph from a letter, No. 618 T, dated 8th November 1879, from the Sanitary Commissioner of Bombay, on the mode of preparing the poudrette now followed by the Poona Municipality :—

"Before the depôt is removed it is only fair to place on record that hitherto its management reflects the highest credit on all concerned. I have visited it often and unexpectedly, and remembering how rude are the means as they generally are in India, I can answer for it that every process is very carefully conducted."

Quantity manufactured.

13. Five hundred and seventy-five cubic feet of semi-liquid night-soil and 300 cubic feet of ashes are collected daily at the depôt and mixed together. The night-soil shrinks in drying to ¾ths its bulk or about 430 cubic feet. The daily outturn of poudrette is therefore 430 + 300 = 730 cubic feet, or 266,450 cubic feet in the year.

Financial results.

14. Before concluding this report, it will be of interest to note the financial results of this branch of work of the Poona Municipality—

	Rs.
44 cart-loads of night-soil conveyed daily to the depôt by 22 pairs of bullocks at Rs. 24 per pair with driver per month, cost per annum	6,336
65 to 75 cart-loads of street sweepings conveyed daily to the depôt by 25 pairs of bullocks at Rs. 18 per pair with driver per month, cost per annum	5,4 0
Cost of sifting refuse, burning, preparing ashes, mixing night-soil and preparing poudrette, per annum	2,064
Maintenance of sheds and beds at the depôt, per annum ...	900
Repairs to night-soil and refuse carts, per annum	2,500
Tools, plant, and contingencies	200
Total cost per annum Rs. ...	18,000

15. The poudrette is now sold at 27 cubic feet, forming 96 ordinary iron baskets full for a rupee; the annual revenue from the 266,450 cubic feet of poudrette prepared is Rs. 4,934, say 5,000.

16. There is thus at the present moment a net loss to the Municipality of Rs. 13,000 per annum. It should be borne in mind that the Municipality would have as its first duty to remove the night-soil and refuse of the city in some way or other; what therefore has been mentioned as a net loss to the Municipality is only what it costs them to get rid of the filth of the city in the best manner possible. The price of poudrette is yet susceptible of increase and the cost of preparing it of decrease, and it is possible that the cost to the Municipality might be reduced in three or four years to Rs. 7,500, only by reducing charges from 18,000 to 15,000, and increasing sale proceeds of poudrette to Rs. 7,500. The sale of poudrette will thus pay half the cost of the removal from the city of its night-soil and street and house sweepings.

NARSO RAMCHANDRA,
Secretary, Poona Municipal Committee.

SELECTIONS.

THE LATE ROBERT FORTUNE.

ONE OF THE FATHERS OF THE INDIAN TEA INDUSTRY.

MR. ROBERT FORTUNE who took a large share in the cultivation of tea in the Himalayas, and introduced a very large number of useful and ornamental plants, died on April 13th last. He was a botanical collector of no ordinary merit. He was born in Berwickshire on September 16, 1812, and was educated in the parish school of Edrom. Showing an early preference for gardening, Fortune served his apprenticeship in the gardens of Kelloe, the residence of Mr. Buchan, whence he went to Moredun, near Edinburgh, and after some time he entered the Botanic Gardens, Edinburgh, under the elder MacNab. Here he remained between two and three years, and in 1842 he left that city and came to London, being appointed Superintendent of the Hot-House Department of the Royal Horticultural Society, at Chiswick, an appointment he vacated on being commissioned in February 1843, by the Society, to proceed to China to collect plants. In July of that year he arrived in China, and at once began that career of collecting which afterwards proved so fruitful. In that year began his communications to the *Gardeners' Chronicle* which, together with his official report in the *Journal of the Horticultural Society*, formed the basis of the books by which he is best known to the general public. Touching at Java on his outward voyage he collected a fine variety of Dendrobium secundum, which was afterwards sent home, and specimens distributed among the Fellows. A fortnight later he was at Macao, and thence proceeded to Hong-Kong. During his stay in this island he collected Chirita sinensis, Spathoglottis Fortunei, Habenaria Susannæ, Arundina chinensis, Mussændas, and other plants. Finding, however, that Hong-Kong and the Southern districts of China had been already ransacked, so that there was little hope of getting novelties, Fortune proceeded in the autumn of this year northward, to Amoy which district he found more barren than that around Canton. In consequence he proceeded again northward by sea, narrowly escaping shipwreck on two occasions in the Formosa Channel. Compelled to refit, Fortune availed himself of the delay to explore the country around Chimoo and Chinchew, where, in spite of the hostility of the natives, he collected some attractive plants. After some time he arrived at Chusan. He availed himself of an opportunity of visiting Shanghai, at that time closed to Europeans, and explored the rich plains of the Yang-tse Kiang, where, although the cultivated state of the country was generally unfavourable for botanizing, he was fortunate enough to procure, and ultimately send home Cryptomeria japonica and Anemone japonica as well as many Chrysanthemums and Tree Pæonies. He returned to Hong-Kong early in 1844, and occupied himself in packing his treasures and in transmitting them to England. At the end of March he proceeded northward again, and was once more struck with the gorgeous beauty of the Azalea-clad mountains of Chusan, with Daphnes, Wistarias, Weigelas, Bamboos, and various other plants of great beauty and interest. At this time he visited the tea-growing district of Ningpo—his first introduction to a department in which he was destined to reap so much honor to himself, so much advantage to his country. Here he discovered in a garden the beautiful double yellow rose which bears his name, and a curious sporting variety interesting in relation to the controversy as to the rose called Beauty of Glasenwood. Of this sporting rose, Fortune says: "Sometimes it produces self-coloured blooms being either red or French-white, and frequently having flowers of both on one plant at the same time —while, at others, the flowers are striped with the colours already mentioned." In the autumn of this year he returned once more to Hong-Kong to pack and despatch the plants he had collected.

In January 1845, as it was still winter in the Northern Provinces, he sailed for Manilla, the general vegetation of which he states to be similar to that of Java. Here he collected a quantity of the lovely Phalænopsis amabilis, including one plant "with ten or twelve branching flower-stalks upon it and upwards of a hundred flowers in full bloom." In March he left Manilla for Northern China once more. During the summer of this year he visited Foo-chow-foo, and the black tea districts in the Fokien province. On the voyage from Foo-chow-foo to Ningpo, the Chinese boat in which he was, was attacked by pirates on two different occasions, and, had he not been well armed, he must have fallen into their hands. On arrival at Chusan he was suffering from fever, but managed to proceed to Shanghai where, in addition to the plants he had collected in the various districts in China, he had managed to get sundry importations from Japan, and brought the whole once more to Hong-Kong. Thence he despatched half his collection, taking with him to Canton the other half. Leaving Canton at the end of December 1845, he arrived in England in 1846. On one of his visits to Hong-Kong the Governor availed himself of his services in replanting the bare hillsides of the island. His adventures, as stated in "Men of the Time," were full of romance; and whether feasting with Mandarins, enjoying the hospitality of Buddhist priests, battling with the swarming natives, fighting single handed with pirates, or gaining admission to the city of Loo-Chow in the disguise of a Chinaman, he seems to have exercised equal energy and sagacity."

The results of this journey were summarised in his "Three Years Wanderings in the Northern Provinces of China," published in 1847. Chinese gardening and agriculture of course took up a principal portion of the book, and in particular the history of tea culture was made known, Fortune having had the rare opportunity of dwelling in a monastery or temple in the heart of the tea districts. The whole process of manufacture was examined by him, and the important fact made known that black and green teas are both produced from the same plant—in the northern districts from Thea viridis, and in the southern from Thea Bohea—the difference in their quality depending entirely upon the manner of preparation. In this volume we find accounts of the mode of dwarfing trees, and of their system of gardening their glorious Azaleas, their many coloured Chrysanthemums, their noble Pæonies. A second edition of this volume was soon called for.

Shortly after his return to this country he was appointed, in 1816, on the recommendation of Lindley, to the Curatorship of the Botanic Garden of the Society of Apothecaries at Chelsea, and during his tenure of office set himself to work to reform that establishment. Two new houses were built, and heated on the Polmaise system, which was soon abandoned.

In May 1848, at the instigation of the late Dr. Royle, Fortune was commissioned by the East India Company to proceed to China again, and to collect tea seeds and tea plants for transmission to India. He applied for two years' leave of absence to the Apothecaries' Society, but as this could not be consistently granted, Fortune resigned his appointment, amid expressions of regret and good will on the part of his employers, and proceeded once more to China.

In 1849 we read of his success in collecting tea plants, and in 1850 he communicated to our columns his discovery of a primrose-yellow Camellia, and his description of the graceful Cupressus funebris. Several of the plants collected in this journey were transmitted to Mr. Standish for distribution.

In 1851 he arrived in Calcutta with nearly 2,000 young tea plants and 17,000 germinating seeds; with these he proceeded to the North-West Provinces of India, where he served to lay the foundation of the Indian tea industry.

In 1852 he paid a second visit to China, in the service of the East India Company.

In 1857 appeared another work from Fortune's pen, entitled "A Residence among the Chinese, Inland, on the Coast, and at Sea." Here we have a *resumé* of his travels in the tea districts of Chekiang (second visit Shanghai, Canton, Foo-chow-foo, and Formosa. Subsequently he visited the cooler districts of China, including the silk districts, where he carefully observed the whole process of silk manufacture. The book goes on to record his second journey to India and his return to England.

In 1858 he again proceeded to China, in the service of the American Government, and in 1859 he was awarded a medal by the Paris *Société d'Acclimation*, in acknowledgment of the number and value of his introductions.

In 1862 Fortune returned from Japan and Northern China, bringing with him various specimens, amongst other things an Artemesia used as a stock by the Chinese whereon to graft the Chrysanthemums as standards.

In the following year (1863) appeared a book descriptive of this his fourth and last journey to Japan and China, under the title of "Yedd and Peking; a Narrative of a Journey to the Capitals of Japan and China, with notices of the Natural Productions, Agriculture, Horticulture, and Trade of those Countries, and other things met with by the Way."

Thus ended the wanderings of this keen botanist and most persevering collector.

Mr. Fortune formed one of the Committee of the International Exhibition, 1866, but from that time gradually retired from horticultural pursuits, and betook himself to farming in Scotland.—*Home & Colonial Mail.*

THE OPIUM TRAFFIC OF ASIA.

IN a review of the British Opium trade in India and China, Professor Christlieb, of Bonn, gives the following statistics showing the magnitude of the trade, and its effects upon Indian agriculture.

Since the conclusion of the Treaty of Tientsin, in 1860, the quantity of opium imported into China from the East Indies has increased to 80,000 chests. In 1875 as many as 85,454 chests, worth £10,000,000, were brought into the Chinese market, 8,943 of which were sent to Malacca, while the consumption of the drug for medicinal purposes in Great Britain in the same year reached only 165 chests. The progressive growth of the trade during the past 80 years is thus shown. In the year 1800, about 5,000 chests; in 1825, 12,000 in 1850, 50,000, and in 1875, 90,000. Among the most striking effects caused by the expansion of poppy plantations in India are the diminution of the quantity of land available for other crops, and the consequent curtailment of food products. In Benares and Behar, immense tracts of the finest and most fertile land in Northern and Central India have been gradually covered with poppy plantations. Quite recently 100,000 acres of the richest plains in Central India, and 55,000 acres in the valley of the Ganges which formerly used to produce corn, sugar, and indigo, have, to the impoverishment of the soil, been devoted to opium culture. The acreage devoted to that purpose to-day is estimated at 1,033,000 acres.

Apropos of the drug, Mr. Arthur Pease expressed his intention some little time ago of bringing the opium question in its relation to China before Parliament. We presume the telegram respecting the discussion which took place on the 5th instant had reference to Mr. Pease's motion, and it does not seem that the opponents of the traffic have gained much thereby. On the other hand, the Society for the suppression of the Opium Trade is

actively at work now that a Liberal Government is in office. We see that the last annual meeting was very influentially attended; but the newspapers were incorrect in stating that the Chinese Ambassador was present. His Excellency, though sympathising with the object of the meeting, rightly deemed that his official position precluded the possibility of his attendance. The annual report of the Society was, it must be confessed, drawn up in a spirit of thankfulness for small mercies. As to our own Government "there was no improvement to announce;" as to India "there was nothing good to report;" as to China "there was singular indifference." Moreover "there had been a marked increase in the opium trade." Nevertheless "the labours of the Society have been cheered by evident signs of awakening interest," and consequently it was hoped that "friends would assist the Society with funds so as to spare the committee the necessity of a second special appeal." The speeches, which were most warmly applauded, were of the usual calm and judicious character. The Earl of Shaftesbury prophesied that if this national sin were not done away with, Divine vengeance would assuredly afflict England and India. The resolutions declared that it was the opinion of the meeting that the support of the opium trade by the British Government is immoral and unjust—'immoral, inasmuch as the Indian Government does not confine itself to 'taxing a deleterious article, with the intention thereby of diminishing its consumption, but directly promotes the manufacture and sale of opium for the sake of gain, although cognisant of the injury thereby inflicted upon China, and in a less degree upon its own subjects in Burmah and elsewhere; unjust, because the British Government prevents China from defending herself in her own way against the introduction of a demoralizing drug." Further, "opium being recognised and declared by Act of Parliament to be a poison, the Indian Government ought at once, without rescinding its existing law against the production of opium by unlicensed individuals, to cease from in any way promoting or encouraging its cultivation for other than medicinal purposes; also, that the Chinese Government ought to be left entirely free to act as it pleases in reference to taxing opium, or altogether prohibiting its introduction in China."—*Lucknow Times.*

ON LOSS OF NITROGEN IN LAND.

Dr. J. B. LAWES, F.R.S., writing to us from Rothamsted on the 15th instant, says:—

Your correspondent, Mr. Melvin, asks for further information respecting the loss of soluble nitrogen. We have in our possession a great number of analyses of the drainage waters from the variously manured experiments in our permanent wheat field, and also from an unmanured and an uncropped soil, and we hope to write fully on the subject before the end of the present year. In the meantime, the few observations which I am about to make, may possibly be interesting to your readers, and also, to a certain extent, supply some illustration of the subject with regard to which Mr. Melvin is anxious for further information.

So long as agriculture depended upon the nitrogen stored up in the soil or that obtained from the atmosphere, the loss of this substance was comparatively unimportant. When, however, nitrogen is placed upon the land at a cost of something like one shilling per lb., the whole question relating to it assumes an importance second to none in practical agriculture.

Before I enter upon the subject of nitrogen, I must first make a few remarks upon the distinction between natural vegetation and agriculture.

There is no doubt but that a most luxuriant vegetation may exist in connection with an enormous rainfall, provided there is at the same time a sufficiently high temperature; but this vegetation is perennial; the roots have complete possession of the soil, and can take up their food, it not during the whole, at all events during the greater part of the year.

When annual crops are grown in tropical climates, or even in climates which, although not tropical, have a rainfall and summer temperature much higher than our own, we do not find great luxuriance of growth; in India for instance, the average yield of wheat is 10 bushels per acre, and in the United States it only amounts to about 12 or 13 bushels.

Agriculture differs from natural vegetation in two very important characteristics—(1) it substitutes annual for perennial vegetation; (2) by constant stirring of the soil it liberates and makes use of the fertility stored up by previous generations of plants; but when the nitrogen obtained from these sources is not sufficient to grow the crops required, a further supply from other sources must be brought upon the land.

Vegetation takes up, and converts into organic compounds, the salts of nitric acid; but in the absence of vegetation, we have reason to believe that with sufficient rain, it is entirely washed from the soil.

There is not a single operation in agriculture which is not, more or less, connected with the liberation of nitrogen from some insoluble compound, or the reconstruction of the soluble nitrogen into living vegetation; and the process of liming, of fallows, and of rotation of crops, must all be studied in connection with the properties of nitrogen before any clear comprehension of the subject can be arrived at.

Perennial vegetation, such as exists for instance in a permanent pasture, would therefore waste less nitrogen than any rotation of crops, and the nearer the rotation approached to a perennial character, the less would be the loss of nitrogen. Assuming that the purchased nitrogen always suffers more or less less and that the ultimate amount of such loss is closely connected with the character of the crops grown, it is obvious that the selection of the manure suited to the particular crop, and also the choice of the time most suitable for its application, must have a great influence on the result

I have hitherto dwelt upon the loss of nitric acid incurred by drainage; there is however, another source of loss, which, though not so obvious, cannot be ignored in practice. I allude to the fixation of ammonia by the soil. When salts of ammonia, or any manure containing ammonia, is placed on the land, it unites with the soil, and, provided that the moisture in the soil is favourable, the ammonia, by the action of a minute underground vegetation, is converted into nitric acid, in which form it is taken up by the growing crop.

For some years we have had parallel experiments going on in our wheat fields; in one, the salts of ammonia are applied in the autumn; in the other, they are applied in the spring. In 1874, when both the winter and spring were dry, the wheat crop was considerably larger with the autumn than with the spring sown ammonia, one being 39, and the other 29 bushels; and from certain indications I am by no means sure that the same result may not occur during the present year.

Between the time of sowing the spring manure in 1874 and the end of June, five inches of rain fell, so that the spring sown ammonia had abundance of water to dissolve it, and yet from the result, as shown in the crop, its full action was not available. We have here evidence that the crop may suffer from want of activity just as it may from too much activity in the nitrogen.

In farmyard manure, we have no nitric acid, only small quantities of ammonia, but a large proportion of organic matter which yields ammonia by decomposition. As, however, the action, and the ultimate exhaustion of farmyard manure, extends far beyond the period generally assigned, there is very great difficulty in measuring the loss of nitrogen that actually takes place.

At present we have no evidence derived from our experiments to show that the loss of nitrogen in nitrate of soda is greater than it is in any other form in which nitrogen, is applied to the soil.

Mr. Melvin in his letter of April 26th, remarks that there was no want of straw in the Lothians, in the wet, cold years of 1877 and 1879, but a want of power or force in the life of the plants fully to develop the grain.

It would appear that a certain, but a different amount of temperature is necessary to produce the same substance in different plants. For example, the cereal grains all produce starch; but rice and maize will not thrive in England, nor will wheat thrive so well in Scotland as in the English southern counties, and the same may be said of mangels. While, therefore, a certain amount of heat is essential to ripen a crop, we do not know how far the loss of nitrogen, due to previous rains, may have influenced the amount of yield.

The facts I am about to relate will serve to illustrate my meaning.

In 1878 the highest produce of our permanent wheat field was 38 bushels of corn, and nearly 3 tons of straw per acre. In an adjoining field of 18 acres, the same variety of wheat, sown almost the same day, gave 59 bushels per acre, or an excess of 21 bushels over the experimental crop, but the straw in both crops was equal. There was no probability of a mistake about either produce; and, further, in the same field of 18 acres, about 20 varieties of wheat were grown, some of which yielded considerably more than 19 bushels, while the whole produce of the field, which was thrashed and weighed, reached the amount of 60 bushels per acre.

At the first sight, those facts seem very hard to reconcile; but when we come to examine the circumstances under which these two crops were grown and the character of the season, we shall be able to form some judgment regarding the great difference in the produce.

The experimental wheat received every year alcaline salts, phosphates, and more nitrogen, in the form of salts of ammonia or nitrate of soda, than the largest possible crop of wheat contains; but all the produce (above 12 to 15 bushels grown by the minerals alone) is entirely due to the soluble nitrogen. Now, the adjoining field of 18 acres, where the varieties were grown, had received in 1877 a heavy application of farmyard manure for a crop of mangels; but the land not being ready in time, white turnips were sown in their place, and the crop, which was small, was carted off. In the autumn, wheat was sown which the following spring received a top-dressing of 2 cwt. of nitrate of soda. The ammonia and nitrate in the experimental field, and the nitrate of soda in the other, were both sown in the month of March; and, between that month and the end of June, nearly 12½ inches of rain fell, six of which passed through five feet of soil, and were collected in a guage placed at that depth for the purpose.

During the month of July the weather was brilliantly fine; and the straw, although over six feet in height, stood perfectly upright at the time of harvest.

Now it is quite evident that a great deal of nitric acid was washed out of both fields; but while the wheat in the experimental field depended entirely on the soluble salts, the wheat in the 18-acre field could fall back upon the store yielded by the nitrogen contained in the farmyard manure.

In the experimental field there appeared on the wheat from day to day at the time of blooming, a quantity of small black flies, and the eggs laid by them ultimately produced maggots, which fed upon the young grain. They also appeared on the wheat in the 18-acre field, but did not multiply there. At a certain critical point in its life the experimental wheat showed a want of vigour and health, which ended in a yield of straw out of all proportion to the grain; while in the 18-acre field the crop, as regards the yield both of grain and straw, was one of the largest ever grown upon the farm.

With a summer competent to produce so large a crop, we must seek for some cause to account for the general produce of the country being but little over the average; and I think we cannot be wrong in assuming that the washing away of the nitric acid by the great rainfall in the spring and early summer may have been one of the causes which produced this result.

In my previous communication I pointed out why I considered that the improvement of the Highlands should take the form of pasture rather than that of arable land. Even where the rainfall is not greater than it is in the south of England, the atmosphere in Scotland is far moister, and I should expect to find that more drainage would take place there for an equal fall of rain.

In Scotland about 40 per cent. of the arable land is under a rotation of grasses; while in some of the southern counties of England this system of cropping does not exceed 10 per cent.

If the results obtained at Rothamsted with regard to the loss of nitric acid have a general application, it must be evident that where a rotation of grasses occupy 40 per cent. of the arable land, the loss of nitric acid must be very much less than where it occupies only 16 per cent.

It would appear as if the selection of the special form of nitrogen to be used should have some reference to the character of the crops to be grown.

For instance, if seeds were sown with the corn, and an application of salts of ammonia, or ammonial guano, failed to produce its full action upon the grain from the weather being too dry, there would be the comfort of knowing that later in the season the seeds would take up the residue.

If, on the other hand, a grain crop alone was to be taken, or ryegrass, for hay, was required, an application of the more active nitrate of soda might probably produce a better result.

Upon my own farm I have always obtained better crops from nitrate of soda than from ammonia in any form; but the recent high price of nitrate has caused me to use soot for my wheat, and guano containing 10 per cent. of ammonia for my spring corn and roots; with what result remains yet to be seen.—*North British Agriculturist.*

CULTIVATION OF THE COCOANUT.

Mr. G. E. LAYTON, Secretary of the Queensland Commission of the International Exhibition, has kindly forwarded to us (*Sydney Mail*) the following interesting paper on the "Cocoanut Palm" by Mr. Walter Hill, Director of the Brisbane Botanic Garden:—

I have elsewhere referred to the fact that there is a natural growth of cocoanut trees on some of the islands, on the north-east coast of Queensland. From Fraser's Island North, nuts are found on the shore that have floated from some island of the Pacific, but generally they are in a decomposing state, beyond the possibility of germinating. On our coast islands the palms are not sufficiently numerous to lead to the supposition that they are indigenous, and they are probably derived from nuts carried from the distant place where they grew by the action of currents and assisted at one time of the year by the wind.

When I accompanied the N.-E. Coast expedition in 1873, I planted cocoanuts on several of the Islands we touched at, and have since sent others to be planted on Islands where there are light houses, or otherwise people residing on them. There is no doubt, but that the palm will grow anywhere to the north of Rockhampton. It is to be found so far as eighteen miles back from Keppel Bay. Plantations were successfully formed at Bowen, and afterwards at Mackay.

I do not think it probable that in Queensland, at least, regular plantations of cocoanut palms will be found anywhere than at the sea-side. It is stated that in the West Indies and elsewhere, the tree grows better and yields a larger produce when brought under cultivation in a rich soil, moist and yet naturally or artificially drained. But, in addition to the increased trouble and expense, the crop and the trees in an inland plantation are more liable to the attacks of insects, and of larger animals, than when the palm grows on the edge of a sandy shore, exposed to the wind and sometimes drenched with the sea spray. In some countries within the tropics, cocoanuts are grown in mangrove soil on the banks of salt water creeks, and, although the milk is brackish, yet they yield as much oil as those grown in sandy soil, and the tree bears sooner. The only cultivation required under such circumstances is to cut drains, so that the tide can flow in and out and, as stagnant water, lodge at the roots. It is said that the tide is found to deposit amongst the trees a very fertilising matter.

There are at least thirty known varieties of the cocoanut. The one that I think will be best suited for this colony is a small kind, indigenous to the Maldive Islands, and much valued in Ceylon. A few years ago, in the latter island, there were 200,000 acres of land devoted to the growth of cocoanuts, the annual return from which was two millions sterling, including exports, and the estimated value of home consumption.

The average produce of a tree may be put down at 100 nuts per annum. In Jamaica, under favourable circumstances, the yield is double that number. Forty nuts yield a gallon of oil—of course, when small, the quantity is not so great, but this is made up by the trees producing a greater number of small nuts. The trees live for a century—it is under the average to state that they bear for forty years, taking into consideration the number of those in cultivated plantations which cease to yield at an early period through the ravages of insects, plant diseases, &c.

I do not anticipate that at present, where there are so many other openings for the profitable employment of capital, the formation of plantations and the preparation of oil and coir will be entered into unless on a small experimental scale. But every one who owns or occupies land on the islands or shores of our Northern coasts, could derive a good addition to his income by planting cocoanuts in the otherwise waste and useless land along the seaside, and disposing of the "copra," or dried kernel of the nut, of which although an immense quantity is exported from the Pacific Islands and elsewhere, the demand is practically unlimited. The "copra" contains from 50 to 60 per cent. of oil. It is cut up fine, steamed, and the oil expressed from the pulp by a powerful hydraulic press. The resulting oil-cake is used to fatten cattle, fowls, &c., and all animals eat it eagerly.

I have generally supplied the commanders of the surveying schooners with cocoanuts, yams, sweet potatoes, &c., to be planted on the islands at which they touched. I have done so invariably when I received notice of the time of departure of the vessel. It is probable that the beginning of a cocoanut plantation may be found on some of those islands. It will be a great pleasure for me, as well as a duty, to assist in promoting the success of such an enterprise.

W. H.

WILL COTTON CAKE, GIVEN TO THE COW, IMPROVE THE QUALITY OF THE MILK?

I PROPOSE to give my dairy cows 3 or 4 lbs. daily of decorticated cotton cake, while upon the grass. My object, of course is to increase the quantity of butter; but would this feeling not also have the effect of leaving so large an amount of flesh-formers and phosphates of lime in the skim-milk as greatly to increase its feeding value for the calves, and so obviate the necessity of adding any feeding stuffs to the milk?—R. C.—[Three or four pounds of cotton cake will certainly prove of much service to your cows, especially whilst these ungenial east winds interfere so seriously with the growth of grass, and, indeed, with vegetation generally. It will add alike to the quantity and quality of the milk; it will raise its standard of nutritive value, but not to such an extent as to persuade the calves fed on the skim-milk to thrive, as you hint, as if they were receiving new milk. The larger amount of cream from rich milk, moreover, rises faster, than it does from poor milk; so that whilst with the use of cotton cake you would have more butter, your calves would not have any increased amount of the oleaginous elements which are so essential for their growth, and which, in an artificial dietary, consisting mainly of skim-milk, has to be made up to them by the addition of boiled linseed, of finely crushed linseed cake, or of such wholesome saccharine materials as treacle and locust beans. The percentage of flesh-formers and phosphates in the skim-milk, as ingeniously suggested, would certainly be somewhat increased by the cotton cake, but the increase would not justify the attempt to bring up the calves without oatmeal or other such helps. Even with the best of food given to cow, it is difficult to raise the nutrient value of milk beyond the normal standard. Excess of the elements of nutrition are not concentrated in the milk, but rather go to add to the weight of the cow's own body, or increase somewhat the proportion of waste materials. Besides the good purposes named, decorticated cotton cake, as you are aware, contains a large proportion of albumenoids, which, under ordinary circumstances, are not assimilated by animals; and, hence, about one-third of the cost price of the cake may be credited to the value of the manure heap.—VET. ED.]—*N. B. Agri*:

SWALLOWS AS FARMERS' FRIENDS.

A WELL-KNOWN naturalist, M. Florent-Prevort, who has been engaged for a series of years in making observations on the contents of the stomachs of various insectivorous birds, recently communicated to the French Senate the following interesting details in the food of swallows. He examined with the utmost care the stomach-contents of eighteen of these, which he captured for that purpose, at different periods of the season, with the results here appended. In the stomach of a swallow killed on April 15 he found 422 insects; April 19, 649 insects; April 27, 301 insects; May 1, 704 insects: May 4, 660 insects; May 18, 680 insects; May 29, 300 insects; June 3, 420 insects; June 14, 244 insects; June 28, 400 insects; July 11, 420 insects; July 20, 501 insects; July 24, 500 insects; August 5, 742 insects; August 19, 690 insects; and August 29, 384 insects. The eighteen birds together, therefore, devoured no less than 8,390 insects, which were recovered undigested or at the rate of 466 each per diem; and it must be remembered that these probably represent but a small portion of the total number they had eaten during the day. When we reflect that among all this mass of indigested insects there was not a single grain of corn, or the least particle of fruit, or a trace of any vegetable *débris*, we have some slight conception of the invaluable services which these little creatures render to agriculturists and fruit-growers.—*Farmer.*

THE BEST TIME TO PLANT TREES.

THERE is nothing, perhaps, on which most of us are more prone to dogmatize than on the subject of tree-planting. If we plant in spring and the tree dies, we are very likely to attribute the loss to the season, and decide never to plant in spring again. Or, if we plant in fall and have no success, then we are quite as decided against fall planting.

There is no doubt but that fall-planting has risks from which the spring is free. Trees which have not been transplanted, but have grown well in

the one place for twenty years, have been destroyed by the dry cold winds of winter. Not only evergreens, such as arborvitæ, balsam fir, hemlock spruce, and even Norway spruce, but deciduous trees, as cherries, tulip-trees, oaks, and many others with the best established reputation for hardiness. And then small things besides the risks of those frosty winds to dry up the little sap in them, are usually so much drawn out as to be seriously injured. The one great argument in favour of fall-planting is that where the trees escape all these risks it generally grows much stronger and more vigorous in spring than one planted at that time, as the bruised roots seem to heal, and the tree is ready to push out in the spring almost as well as many not transplanted. It saves a year.

But, after all, spring with most people will ever be the favoured time. The hot dry summer may come and destroy, just as the cold dry winds of winter may, and thus in some measure equalise the risk, but yet it is at this season that planting will be the most popular.

But there is one thing on which people need cautioning. A large number of persons start to plant as soon as the first bright sun shines through a snow-cloud, and before the earth is dry enough to powder about the roots. No matter how fine overhead, the earth should not be wet or frosty at the time of planting.

As a general thing the best time to plant trees in the spring season is just before the buds push, or even after they have started. This implies an active condition of the root, and generally occurs at a time when the earth is in the best condition for working in about the roots. As evergreens push later than deciduous trees, their removal may be extended long into May.—*Germantown Telegraph*, U. S. A.

AMBER.

THE complete history of amber is yet to be written, but when written it will form a most interesting and instructive volume. Known and valued from the very earliest times, it has a name in most languages, and its Greek name, *electron*, has left its impress upon our own and most other tongues. Nearly 2,000 years ago Pliny, the naturalist, wrote that amber was the fossil resin of an extinct cone bearing tree, and modern science can say of it but little more. In a short paper on this subject, laid before the last meeting of the American Association for the Advancement of Science, Erminnie A. Smith gives an epitome of what is known on the subject. The original amber-producing forest probably reached from Holland over the German coast, through Siberia and Kamschatka, even to North America. One of the most celebrated deposits is on the Peninsula of Samland, a portion of Prussia, nearly surrounded by the Baltic Sea. The northern part of this region, constituting the promontory of Brusterort, is hilly, and the coast banks are often from 150 feet to 300 feet high. At one time all the amber found here, even by the peasants in ploughing, belong to the German Government, the finder, however, receiving one-tenth of its value. For a peace in the Berlin Museum weighing 18lbs., the finder is said to have received a thousand dollars. During stormy weather, when the wind and waves beat violently against this coast, a great quantity of amber is washed up. The total yearly product is, however, apparently on the decrease, and so the price of amber is on the increase. Professor Zaddech, of Konigsburg, concludes that the trees yielding the amber resin must have grown upon the green sand beds of the cretaceous formation, which at this time formed the shores of estuaries where the lower division of the tertiary accumulated. Immediately over the amber producing strata rest the brown coal beds, the fossil plants found in which differ entirely from the amber bed flora. Many insects and plants are found embalmed in the amber. Over 800 species of the former have been named, and over 160 of the latter. When collected, it is, for the purposes of trade divided into classes, the best pieces being generally sent in the rough to Constantinople, where they are in great demand for the mouth-pieces of pipes. The smaller sized pieces are used for beads, &c., and the impure morsels for the manufacture of succinic acid or in the preparation of amber varnish. From other resins amber is distinguished by its hardness, its lesser brittleness, the much higher temperature required to reduce it, and its greater electric action. At a certain temperature it is also extremely flexible. The imitations of amber are numerous, but all are detected by the use of the electrometer. While the colour of true amber is generally yellow, it occurs in all shades, from pure white to black. Amber was intermingled with the myths and religion of the Greeks, their legends ascribing its origin to—

> . . . . the sweet tears shed
> By fair Heliades—Apollo's daughters,
> When their rash brother down the welkin sped,
> Lashing his father's sun team, and fell dead
> In Euxine waters.

Amber literature, indeed, has an interest of its own. Books in all languages refer to its many supposed qualities, and the insects contained in it have given rise to many a quaint metaphor.—*Times*.

LAC.

"LAC" (or as it is called in Hindustani, *lah*) is secreted by an insect (*Coccus lacca*) on the branches and twigs of certain jungle trees. The principal of these are the khusum (*Schleichera jujuga*) plas (*Butea frondosa*) and bier (*Zizyphus jujuba*). The lac from the first-mentioned, the khusum, is more highly esteemed than that from the others. To some extent the lac is found occurring, so to speak, spontaneously, and is collected by the forest tribes, and brought by them to the fairs and bazaars for sale. Where, however, there is a regular trade in stick lac, propagation of the insect is systematically carried on by those who wish for a certain and abundant crop. This propagation is effected by tying small twigs, on which are crowded the eggs or larvæ of the insect, to the branches of the above-named species of trees. The larvæ are technically called 'seed.' The larvæ, shortly after sowing, spread themselves over the branches, and, taking up positions, secrete round themselves a hard crust of lac which gradually spreads till it nearly completes the circle round the twig. At the proper season the twigs are broken off, and we must suppose them to have passed through several hands, or to have been purchased directly from the collectors by the agents of the manufacturer. On arrival at the factory, they are first placed between two powerful rollers, which by a simple arrangement, admit of any degree of approximation. The lac is then crushed off, and is separated from the woody portion by screening; it is next placed in large tubs half-full of water, and is washed by coolies, male or female, who, standing in the tubs, and holding a bar above with their hands, stamp and pivot about on their heels and toes until, after a succession of changes, the resulting liquor comes off clear. Of the disposal of the liquor drawn off at the successive washings, I shall speak presently. The lac having been dried is placed in long cylindrical bags of cotton cloth of medium texture, and which are about ten feet long and two inches in diameter. These bags when filled have somewhat the appearance of an enormous Bologna sausage. They are taken to an apartment where there are a number of open charcoal-furnaces. Before each of these there is one principal operator and two assistants. The former grasps one end of the long sausage in his left hand, and slowly revolves it in front of the fire; at the same time one of the assistants, seated as far off as the sausage is long, twists it in the opposite direction. The roasting before the glowing charcoal soon melts the lac in the portion of the bag nearest the operator's hand, and the twistings of the cloth causes it to exude and drop into a trough placed below. The troughs which I saw in use were simply leaves of the American aloe (*Agave americana*). When a sufficient quantity, in a molten condition, is ready in the trough, the operator takes it up in a wooden spoon, and places it on a wooden cylinder some eight or ten inches in diameter, the upper half of which is covered with sheet brass. The stand which supports this cylinder gives it a sloping direction away from the operator. The other assistant, generally a woman, now steps forward holding a strip of the agave of aloe between her hands, and, with a rapid and dexterous draw of this, the lac is spread at once into a sheet of uniform thickness which covers the upper portion of the cylinder. The operator now cuts off the upper edge with a pair of scissors, and the sheet is then lifted up by the assistant who waves it about for a moment or two in the air till it becomes quite crisp. It is then held up to the light, and any impurities, technically 'grit,' are simply punched out of the brittle sheet by the finger. The sheets are laid upon one another, and the tale, at the end of the day, is taken, and the chief operator paid accordingly—the assistants receiving fixed wages. The sheets are placed in packing-cases, and when subjected to pressure break into numbers of fragments. In this fresh state the finest quality is a very beautiful object, having a rich golden lustre. On seeing it thus, one cannot help feeling regret that it is not nice to eat—the best Everton toffee never looked more tempting. The above is the history of shell-lac, from its birth in the jungle to its appearance in the world as the commercial article. From the manufacturer it passes through the broker's hands to the merchant, and from him again to the manufacturers of varnishes, sealing wax, and other commodities of which it is an ingredient.

"The dark red liquor resulting from the washing above described, is strained, in order to remove all portions of woody fibre and other foreign materials. It is then passed into large vats, where it is allowed to settle; the sediment is subjected to various washings, and at last allowed to settle finally, the supernatant liquor being drawn off. The sediment, when it is of the proper consistency is placed in presses from which it is taken out in the form of hard dark purple cakes, with the manufacturer's trade-mark impressed upon them. This constitutes what is known as lac-dye. By the addition of mordants, this dark purple substance yields the most brilliant scarlet dyes, which are not inferior, I believe, to those produced by cochineal. The dye which is thus separated from the lac by washing is said to be the body of the insect, not a separate secretion."

One more extract we venture to make, which gives a description of the uses made of the flowers of the *Bassia latifolia* Roxb. Not only are the fruits of this tree used as an article of food, but "the fleshy deciduous corollas are likewise largely employed for the same purpose, and, in point of fact, constitute a staple and sometimes almost the only article of diet available to the poorer classes during several months of each year. Towards the end of February, or the beginning of March, as the crop of *mhowa* flowers approaches ripeness, the corollas, becoming fleshy and turgid with secreted juices, gradually loosen their adhesion to the calyx and fall to the ground in a snowy shower. The duty of collecting the fallen blossoms is chiefly performed by women and children; at dawn they may be seen leaving their villages with baskets and a supply of water for the day's use. Before the crop has begun to fall they take the precaution to burn away the grass and leaves at the foot of the trees, so that none of the blossoms may be hidden when they fall. The gleaners generally remain under trees all day, alternately sleeping and collecting the crop, and the male members of the family visit the trees once or twice during the day, in order to carry away what has been collected. At night, bears, deer, and other animals visit the trees to take their share of the crop. In the early mornings, and late in the evenings, the less frequented trees, on the borders

of the jungles, attract numbers of jungle and pea fowl. Cattle also are very fond of the flowers, and cow's milk has, in consequence, at this season, a strong flavour of mhowa.

"It often happens that the people who collect come from a considerable distance, in which case they erect with the branches of the sál a temporary encampment of huts, in which they live until the crop is all gathered in. In front of each of these huts a piece of ground is made quite smooth and hard, for the purpose of spreading out the flowers to dry in the sun. When perfectly dry they have a reddish-brown colour, and in size they have lost three-fourths of the original dimensions, and about half their original weight. It is the custom with some of the natives, before spreading them out to dry, to pull off the ring of minute foliaceous lobes which crowns the fleshy corolla. It is very difficult to obtain any trustworthy statements as to the yield of the mhowa trees. A first-class tree, I have been told, will continue to shed its blossoms for fifteen days at the rate of 120 pounds a day, but this estimate is, I believe, at least double what it ought to be. The rent of the trees varies with the abundance of them in the district, the quality of the previous rice harvest, and various other circumstances affecting the demand and supply. Two-pence to four shillings were the extremes of prices which in various places, had, I ascertained, been actually paid for permission to collect. As does the rent of the trees, so the saved crop varies much in price —the limits being from 120 to 480 pounds for the rupee, or two shillings, but when as is most frequently the case, the exchange is in kind, the merchants only give a small quantity of salt, and six or eight pounds of rice for a maund (80lbs) of mhowa. During the famine in Maubhoom the price of mhowa averaged about 24lbs. for the rupee.

"Two maunds of mhowa are stated by some to furnish a month's food to a family consisting of a father, mother, and three children. It is however, seldom eaten alone, being mixed with the seeds of the sál, or with the leaves of jungle plants; sometimes a small quantity of rice is added. It is the custom to cook but once a day and each member of the family helps himself whenever he feels hungry.

"When fresh the mhowa has a sweet taste, with an odour somewhat suggestive of mice; when dried, it presents some resemblance to the inferior kinds of figs. Cooking renders it vapid and utterly devoid of flavour. On distillation, the newly dried flowers yield a highly intoxicating spirit called *daru*; this is generally diluted with from five to ten times its bulk of water, and is then sold at about the rate of a penny for a quart. Its odour is most offensive to Europeans, but British soldiers have been known to secure for themselves the pleasures of intoxication by drinking it with held noses, as a child takes a nauseous draught. By careful distillation it is possible to get rid of the essential oil which causes the unpleasant flavour. From the seeds a sort of oil is expressed, which is used for cooking purposes and to adulterate ghee. Although the natives protect such mhowa trees as exist, I am not aware that they do anything to increase the number.—*Nature*.

PHOSPHATES AS MANURE.

A CORRESPONDENT of the *Madras Mail* writes from Scotland:—"The Highland and Agricultural Society have issued their usual annual volume, and it is more varied and readable than it generally is. Amongst other articles it contains an account of experiments of growing crops, with various manures, and particularly of trials between dissolved and undissolved phosphates. Phosphates are now generally derived from ridges of phosphatic rocks, and they are ground down into powder, and our custom hitherto has been to dissolve them, and convert the phosphate into superphospate by the addition of sulphuric acid—which dissolves the powdered rock. These phosphatic reefs of rock are found in various parts of the world, and they exist with you, and if the ground phosphates are found to have as good an effect on the growth of plants in Southern India as they have with us, they will ultimately prove of more value to the country than the gold-yielding quartz. With the machinery now in use, the expense of crushing the phosphatic rocks is not an expensive operation. Sulphuric acid is not dear with us; but still its use almost doubles the cost of the manure, and with you it would probably do a good deal more. For the growth of cereal crops nitrogenous manures are more profitable than those of mineral origin, because the return is greater and more immediate, still it is proved by experience that Liebig's theory of keeping up the fertility of the soil by returning to it the minerals extracted by the crops, has a basis of truth, and that they do add to the produce of the soil, and that more permanently than nitrogenous manures, which we apply in the form of sulphate of ammonia, nitrate of soda, and guano. Phosphates seem better adapted to the growth of green crops than of the cereals, and it is evident that they are very favourable to the growth of leguminous plants. Wherever they are applied to old pasture land, there is an immediate increase and luxuriant growth of all the natural legumens, such as wild peas and vetches, while, with a continued use of nitrogenous manures, these totally disappear from the pastures. Dr. Voelcker, one of our most eminent of agricultural chemists, a short time ago wrote that insoluble mineral phosphates, such as ground phosphatic rock whether contained in coprolites, apatite, or rock guano scarcely produce a visible effect on vegetation, even, when they are applied to the land in a finely powdered condition, and in large quantities. This statement was accepted as truth till the Aberdeenshire Farmers' Club determined to test it practically, and experiments have shown that the application of the undissolved ground rock gave 40 per cent. more barley, and 70 per cent. more turnips than when nothing was applied. The great point is fineness of division of the article used, and, if ground to an impalpable powder, there is no doubt but that the fertility of the land can be much improved by the use of undissolved phosphatic rock. Every soil has its own deficiencies, either natural, or from the previous course of cropping, and discrimination and observation are required to use manures to the most profit. Sir Joshua Reynolds replied to some one asking how he mixed his paints, that he did so 'with brains, sir,' and the farmer all the world over must mix his manures with the same not over plentiful, but very valuable ingredient if he wishes to derive the most profit from them."

THE CEDAR OF LEBANON.

IN the lately-published part of the journal of the Linnean Society, Sir J. D. Hooker publishes an account of the discovery of a variety of the cedar of Lebanon by Sir Samuel Baker on the mountains of Cyprus. It is interesting to note that, though the botany of his island has often been examined, this is the first record of such a discovery. The trees were described by the monks of Trooditissa Monastery as existing only on the mountains between the monastery of Kyker and the town of Khrysokus. This is a pathless and almost inaccessible region. The monks considered the wood to be the Scriptural "Shittim wood." Sir Joseph Hooker describes the specimens forwarded to him through the kind offices of the Marquis of Salisbury as differing from the known forms of *cedrus* in the shortness of their leaves and the smallness of the female cones. He thinks that the now far separated cedars of the Himalayas, Lebanon, the Taurus, and Algeria were races of formerly more generally distributed trees, and that their isolation was due to geographical and climatic changes in the area over which the species was distributed. Their isolation is now very great. The nearest point to the Lebanon at which cedars have been, up to this, found, is the Bulgardagh chain of the Taurus in Asia Minor, and from that point, forests of *C. Argentea* extend eastward to Pisidia and northwards to the Anti-Taurus. At a distance of some 1,400 miles from the cedar forests of Asia Minor, and separated from them by the whole breadth of the Mediterranean Sea, are those of Algeria, containing the Atlas cedar (*C. Atlantica*). Proceeding eastward from the Lebanon, we come after another 1,400 miles to the cedar forests of Afghanistan, which extend thence continuously eastward along the Himalayas almost to the confines of Nepaul. This cedar (*C. Deodara*) is perhaps the most distinct in habit of the three forms. As to the Cyprus cedar, Sir Joseph Hooker says that in size of cone, and size, form, and colour of leaf, it approaches the Algerian far more closely than it does any Taurian, Himalayan, or Lebanon cedar.—*The Times*.

THE USES OF THE POTATO.

IN France the farina is largely used for culinary purposes. The famous gravies, sauces, and soups of France are largely indebted for their excellence to that source, and the bread and pastry equally so, while a deal of the so-called cognac imparted into England from France is distilled from the potato. Throughout Germany the same uses are common. In Poland the manufacture of spirits from the potato is a most extensive trade. "Stettin brandy," well-known in commerce, is largely imported into England, and is sent from thence to many of our foreign possessions as the produce of the grape, and is placed on many a table of England as the same; while the fair ladies of America perfume themselves with the spirit of potato under the designation of *Eau de Cologne*. But there are other uses which this esculent is turned to, abroad. After extracting the farina, the pulp is manufactured into ornamental articles, such as picture frames, snuff-boxes, and several descriptions of toys, and the water that runs from it in the process of manufacture is a most valuable scourer.

For perfectly cleansing woollens, and such like articles, it is the housewife's panacea; and if the washerwoman happens to have chilblains she becomes cured by the operation.—*Sydney Mail*.

DISCOVERY OF KEROSINE IN NEW SOUTH WALES.

THE *Sydney Morning Herald* of 25th March says:—"For some ten months boring for coal has been going on at Moore Park, near Sydney. One day last week the rods were lowered, and when they were within eight inches of the bottom were set in motion, whereupon a quantity of oily matter came up outside the stand-pipe, and continued to flow for ten minutes. At first its appearance was dark brown, and on falling it became immediately covered with a thick foam or froth; afterwards it became milky white, and finally changed to water with an oily scum on it. Mr. Coghlan bottled some of the liquid, which showed oil on the top very freely, and ever since the gush of brown liquid there has been an oily scum on the water discharged from the bore. On Friday, just as boring was commenced, there was a gush of oily matter similar to the first, only that the force of this discharge was greater, and the flow lasted for half-an-hour before it was replaced by water. Mr. Coghlan is strongly of opinion that the liquid is crude kerosine, since it has the smell of that substance. During the day the spot was visited by Mr. Wilkinson—the Government Geologist; Mr. Pitt, Mr. Peate, Mr. Street, and several other gentlemen, whose interest had been stimulated by the supposition that Mr. Coghlan had struck

oil. The mysterious liquid was the subject of much attention from these gentlemen, one of whom confirmed Mr. Coghlan's opinion that it was crude kerosine. Others of the party would not venture to express a decided opinion as to its nature, although it was being washed out before them and had increased in volume very considerably during their stay. Mr. Wilkinson took a bottle full of the liquid away with him for analysis, but this analysis is not yet completed. There is no doubt, however, that its results will be watched with intense interest, because the discovery of a payable oil well in the vicinity of Moore Park would be of immense importance and value, not only to Sydney, but to the colony generally."

MADRAS AT THE MELBOURNE EXHIBITION.

DR. BIDIE has drawn up a very interesting catalogue of the specimens sent for display to the Melbourne Exhibition. The articles selected will give one a good idea of the products of this presidency, and it is hoped that by means of the Melbourne and Sydney exhibitions a trade will gradually spring up between the two countries. The Madras Presidency is capable of supplying the wants of Melbourne in respect to such articles as tea, coffee, tobacco, oil seeds, vegetable, fish oils, &c. The specimens of sugar and spices should attract attention there, but the produce of the Straits Settlements, Java, and the newly acquired Fiji islands will, we think, more than supply the demand. The Madras Government, the Nizam of Hyderabad, certain native merchants and the owners of the coffee and tea estates in the Wynaad, Nilgiris, and the Shevaroys have sent specimens, and in making the selections and cataloguing them, Dr. Bidie is likely to secure greater attention for the Madras exhibits at Melbourne than was paid them in Sydney at the recent exhibition. The specimens of mats and carpets came chiefly from Hyderabad; the specimens of metal work in brass and copper were from Tanjore and North Arcot. Some of the brassware were the product of the industry of Malabar, but we believe that the palm will always be borne by the Tanjore workmen whose designs are not only good, but the system they adopt of inlaying the one metal with the other such as brass with silver and copper with silver displays great mechanical and artistic skill. The Sandal and Ivory ware are exhibited by G. Chinna Veeranna, the manufacturer, whose exhibits at the last Fine Arts Exhibition here attracted much attention; fancy basket work made in Pulicat, and the rattan baskets from the Friend-in-Need Society are included in the Madras exhibits. The cotton fabrics are from the Cannanore Central Jail; the embroidery is exclusively a Madras manufacture, and it is to be regretted that there is every probability of the "art shortly dying out" owing to the little demand for articles. Embroidery is an industry introduced by the Mahomedans. Under the head "native costumes" we note that supplies of Madras palempores, handkerchiefs, and women's cloths are included. Fish oil which is largely available in Malabar is exported from the west coast, but the price seems to be rather high. There is a pretty large assortment of fibres for which this presidency is noted. "Fibrous plants abound in almost every hedgerow," says Dr Bidie, but "the great obstacle in the utilisation of this mine of mineral wealth has been the want of some simple and efficient machine for extracting the fibre, which would do its work without impairing the quality of the produce." Vegetable oils are, the groundnut, gingelly, castor, lamp, and cocoanut; the three first named are exported to France; the two last named are chiefly retained for local consumption. The tobacco specimens are chiefly those obtained from the Madura and Trichinopoly districts and from the Lunkahs in the Godavery delta. The trade in these staples is steadily on the increase, the shipments of cigars to the Straits Settlements, Mauritius, and other places, were never so large as they are now, and we have reason to believe that in Australia, good Trichinopoly and Dindigul cheroots will find a ready market. The specimens of dyes and drugs, indigo and cinchona, will take prominent position. The produce of the Government Cinchona estates on the Nilgiris, to say nothing of the large supplies grown and manufactured by private enterprise, will form a conspicuous feature in the Madras contributions. Specimens of Jalap and Senna have been included. Tanned and Dyed skins, pulses grain, and spices, are also among the exhibits; Madras tanned skins have been successfully introduced in Boston and in the United States of America, and we see no reason why they should not find a market in Australia. Madras exhibitors have been invariably commended for their exhibits of condiments, chutnies, and jellies, at exhibitions held in Europe and America, and we think there will be a market for these in the Australian colonies. The many samples of tea and coffee will, it is hoped, be appreciated by colonial merchants. It may be of interest to note that, according to the catalogue, there are in this presidency seventy-nine tea estates, with an area of 9,002 acres, and that tea cultivation is on the increase. The annual yield of the Nilghiri tea estates is 253 lb. per acre, the local average price of Nilghiri tea is Re. 1-4 to 1-8 per lb. The exports of tea to foreign ports from this presidency in 1878-79 were 204 630 lb., valued at a little more than two lakhs of rupees.—*Madras Standard.*

THE ROYAL BERKSHIRE SEED ESTABLISHMENT.

THE following is an account of the Royal Berkshire seed Establishment at Reading, near London, and is extracted from a Metropolitan Agricultural Journal :—

The Proprietors of this vast concern, which had now attained world-wide reputation,—Messrs. Sutton & Sons,—have long been among the foremost seed firms of the country, and can look back, as do almost all who have been commercially prosperous, upon a rapid growth from comparatively small beginnings. There are, however, a succession of generations in the business. The grandfather, with whom it began—growing out of the occupation of a corn-dealer and miller, half a century ago—has sons and grand sons now in the firm, and since the days of his earlier catalogues, which were shown me, it has grown up from very humble dimensions. Messrs. Sutton & Sons lay themselves avowedly open to cultivate a foreign and colonial trade. Nothing we can imagine is so trying to the temper of the agriculturist—or, for the matter of that, the amateur also—as to find, after he has taken great trouble and every reasonable precaution in sowing the seeds from the growth of which he anticipated profit, that they will not come up. In the frame of mind to which his disappointment gives rise, the enraged agriculturist is not disposed to discriminate with any degree of nicety between the parties he may be disposed to hold responsible for his disappointment. Sometimes, no doubt, as indeed recent trials have proved, he is the victim of an unscrupulous tradesman, and finds that he has had foisted upon him seeds which were never meant to grow; but more frequently the mischief may have been done unwittingly, and where the seeds have undergone transit, it is more frequently due to injudicious packing than to any other cause. Unsatisfactory results are sometimes experienced even when the seeds are packed by a competent man, to order. It is evident that safety cannot be insured unless the seeds are packed by the grower, at the right time, in such convenient parcels that they need not be opened until the ground shall be ready for the reception of the seeds. For the benefit of our distant readers we may mention that Messrs. Sutton & Sons have directed particular attention to this branch of their trade, and after a series of exhaustive experiments they have succeeded in hitting upon a system of packing, whereby grass seeds, farm seeds, vegetable seeds, and flower seeds may be transported, without deterioration, to any distance, to the varied climates from which their export orders come.

We were shown a room where some export orders where in course of being got ready, and we noticed that the packets for every order were placed in ingeniously constructed tin cases—of which we observed a large quantity in stock, specially manufactured for them—into which it is impossible for any damp to penetrate. These, of course, are for such seeds as are sent out in somewhat limited quantities; clover and grass seeds, which are exported in considerably greater bulk are packed as carefully in huge zinc-lined cases or casks, which the exigencies of trade allow of being rendered serviceable in the return journey for the carriage of tallow, &c. From the export department we were taken to the farm seed order room, which we believe is the largest of its character in the world, being no less than 180 ft. long by 60 ft. wide, one great peculiarity being that there are no pillars to obstruct operations, the roof being light and self-supporting. Numerous were the cleaning rooms through which we were taken, and most careful, it was evident, are the firm to keep up their prestige for supplying none but the best seeds. We were at first surprised at the quantity of apparently useful, if not first-class, seed which was thrown on one side by the employés but we could at once understand that it is this strict exclusion of inferior or damaged seed that has earned for the firm the reputation they enjoy.

The magnificent fabric upon which the reputation of the vast Reading enterprise is built, lies at the very foundation of the purity of stocks and freedom from adulteration. If the seeds are pure and the stocks have been kept true by constant selection from year to year for many years, they will produce plants of a fixed and constant type, which may be trusted to satisfy customers and do credit to the firm. Every year stock seed is provided for, in case it should be wanted; the best specimens are gathered from the fields and selected. If the character hinges upon leaf, or flesh, or shape, or all combined, a careful examination is made, so as to be absolutely true of its kind. At the proper time the selected specimens are planted out, far apart between the plots. But as, whenever a sufficient stock of first-rate merit has been obtained, it is used as long as it is alive, it thus comes to pass that only two or three kinds are every year required for the replenishment of the existing stocks. That mangel seed is perhaps five years old; it was the produce of a remarkably good year, and can be trusted more confidently than even that which was harvested last year to produce trustworthy plants. It is in this way that the seed bags of stock seed which I saw in one division of Messrs. Suttons' warehouses are from time to time replenished, and the apartment set apart for their security is kept fallen apartment which may be compared to the "deed room" of a mansion. It should be a 'safe, for the loss of it would be a very serious loss indeed.

Starting with the stock seed and seed fields in Essex, Kent, Cambridgeshire, Suffolk, Beds, Herts, Huntingdon, and Worcestershire, where the plants obtained from it are set out, we come at length to the second harvest time, when the seed from all these plants is threshed and cleaned, and despatched to Reading—every bag with its ticket inside as well as outside, to ensure its identity being known. These bags receive each a home label, indicating kind and date and grower, and they are warehoused until cleaned and ready for sale, when they are stacked each in its proper place until wanted for use.

On the several great warehouse floors—200 feet by 60 feet in area—we saw immense stores of Italian rye-grass, perennial rye-grass, various other grasses, clovers, &c. Italian rye-grass is principally produced in the fens of Cambridgeshire and Huntingdon, and the other rye-grasses, are grown chiefly in Scotland.

The varieties of farm seeds which are in most frequent requirement have, special stores devoted to them; thus, mangold, swede, turnip, &c., seeds have separate and capacious stores. Messrs. Sutton & Sons for many years have enjoyed a very high reputation for the quality of their grasses, and for these again they have two separate stores. The stock on hand is enormous; but large as was the supply at our visit, we were told that ere long it would all be gone. Each stock of natural grass is gathered by hand by women in Germany, especially for Messrs. Sutton, and is kept entirely distinct. A good deal of the higher class of seed is also hand-picked again on arrival in England—a tedious process but strictly carried out—and these varieties are afterwards mixed to suit the nature of the soils required to be sown. When we mention that there are some twenty-

three different kinds of natural grasses and clovers more or less fitted for permanent pastures, it may be imagined that considerable care has to be exercised in this department. Sufficient seed was sent out last year by this firm to cover no fewer than 28,000 acres with various kinds of grass.

The vegetable seed store is worthy of particular remark. It is a very hive of industry, and here it is that one comes first perhaps upon the admirable "system" which prevents the almost innumerable mistakes which would otherwise occur in an establishment of such extent. This room measures, we understand, 159 feet in length, by 30 feet in width, and 20 feet in height, and is fitted round with innumerable drawers, each "after its kind" distinctly labelled. The centre of this room is occupied by rows of small tables or counters upon which the attendants range the packets for each separate order, as they shall have fetched them from their proper drawer. An attendant of a somewhat higher standing next takes the order, and, comparing it with the packages which have been gathered together, sees that all is correct. We may here mention, perhaps, that throughout the whole of this extensive establishment everything that modern ingenuity can devise to facilitate and lessen labour has been done by Messrs. Sutton & Sons. The sub-division of work has been carried to a great pitch of perfection. The system devised for despatching goods not only greatly quickens the execution of orders, but greatly lessens the possibilities of mistakes. The flower seed store and the bulb-room are very much similar in their arrangements to the vegetable seed store, the most puzzling matter about them being the infinite number of varieties which are daily under manipulation. From the stores one passes to the packing-room, where the orders are put together, into secure packages for transit, and when it is considered that the orders sometimes amount to six or seven hundred in a day, it may be imagined what care is requisite that "system" shall everywhere be observed.

How large as well as various is the business of the firm, appears from some of the figures which were shown me—for Messrs. Sutton were good enough to let me see their books. The sales of grass seeds, mangel wurzel, swedes, and turnips, were last year enough for nearly 200,000 acres of land devoted to these kinds of crop alone. The business in grass seeds has increased a hundredfold during the last quarter of a century—that of flower and garden seeds, though originally proportionally larger than the other, has increased about as much.

So much then, briefly, of the business which brings grist to the employers' mill. But now, one word or two anent the interest employers manifest towards employed. Besides arrangements by means of which those who choose can remain in comfort during the intervals devoted to refreshment, there is a spacious library and reading-room provided, well supplied with books and periodicals, and which is open whenever business is not going on.

We cannot conclude our little sketch without a word or two about the handsome and instructive catalogues and guides which are annually published by this firm. As long ago as 1840 when nothing but bare unpriced broadsheets, specifying the kinds of seed in stock, were the order of the day, Mr. Sutton first issued a modest little compilation, which, originally only professing to offer a few hints as to how an amateur might keep his garden stocked without further assistance throughout the year, has gradually developed into an elaborate Annual, elegantly illustrated with charming chromo-lithographs, whilst the engravings, 500 in number, are all drawn from growing specimens. The articles are written especially for this work. Amongst the subjects treated upon in this year's edition, we notice "A Year's Work in the Kitchen Garden, January to December." "The Rotation of Crops in the Kitchen Garden." "The Cultivation of Vegetables," "The Cultivation of Flowers," "The Cultivation of Bulbous Flower Roots." "The Cultivation of the Potato," "The Eradication of Garden Pests" "The Laying Down and Improvement of Garden Lawns, Croquet Grounds," &c. Included in this Guide is a complete descriptive list of all the best varieties of vegetable seeds, flower seeds, and potatoes, so that every reader can have no difficulty in selecting the seeds best suited to his requirements.

In addition to this, the firm issue, for the information of those interested in the subject, a reprint of Mr. Sutton's "Permanent Pastures," alluded to above, and an extremely useful "Tropical Garden Guide," with notes on cultivation, which should prove very valuable to all interested in gardening, whether resident in Europe, Asia, Africa, or America. With a business energy and enterprise unequalled perhaps in the history of the seed trade, Messrs. Sutton have agents for the sale of their boxes of seeds in every part of the world, excepting the United Kingdom; and those abroad who would ensure success and prevent that vexatious disappointment which often happens, should not fail to find out by the papers where Sutton's Reading Seeds can be obtained.

AGRI-HORTICULTURAL SOCIETY.

WE take the following paragraphs from the report of the Committee of the Agri-Horticultural Society of Madras, for the year 1879:—

During the past year the Committee of this Society has, as usual, steadily persevered in its efforts to benefit and advance the Agriculture and Horticulture of the country, and has, with that object, made sundry experiments, with varied success. The year was very favourable to vegetation, the rainfall being well distributed and above the average, being from the published returns of the Government Observatory, 51·25 inches, as against an average of 48·94 inches. Fresh vegetation was slightly checked by unexpected hot landwinds, which blew so late even as 20th September, and ferns and roses suffered considerably in consequence, but happily no permanent damage was done.

Grasses, Fodder-plants, &c.—Further consignments of grass seeds have, from time to time, been received from Queensland, Australia, and distributed to correspondents in different parts of the country, and tried in the gardens, without any more satisfactory results than those detailed in the last Annual Report. The observations then made on the subject still hold good, none of these grasses appearing to be able to stand our long, continued dry weather, without constant watering and attention, which renders their useful cultivation impracticable. No further results have been obtained from the famous paper-making grasses *Esparto* and *Ligium spartium*, the few plants which germinated having dried out. Experiments with *Prickly comfrey* have failed, the plants which were in the gardens, though receiving rather more than their fair share of attention, having one by one perished. The gigantic fodder grass, *Euchlænas (Reana) luxurians*, may be stated to be a success. Several patches of ground in the experimental gardens have been sown and planted with it, and have produced most luxuriant crops, both when the plants were allowed to remain in the seed beds, and when transplanted. Self-sown plants also have grown well. It seeds freely and abundantly, but if allowed to seed, dies down. If cut while young, it reproduces itself repeatedly, even in the hot weather, but requires abundant water and manure. All animals seem to devour it voraciously, leaf and stalks, and it is difficult to save the seed from birds and squirrels. The Committee strongly recommend its cultivation. Efforts to distribute the "Rain Tree" (*Pithecolobium saman*), have not been relaxed, and many young trees, and some small parcels of seeds have been sent to different parts of Southern India, but unfortunately the seed was scarce, being produced only in very small quantity. There will probably be a more abundant crop this season, when requisitions which have been received from many distant parts, including South Africa, will if possible be complied with. Seed of *Cytisus prolifera* was received in August from Kew with a high character of the plant as forage. The seed was as usual sown in the garden and distributed to correspondents for experiment, but no satisfactory result can yet be reported almost every seed which germinated having speedily perished.

Liberian Coffee.—The introduction of Liberian Coffee into Madras and its neighbourhood may, the committee think, be declared a failure. The plants in the gardens have most of them perished in spite of every care, and those that survive still maintain the character of shrubs rather than of trees, though now upwards of three years from the seed, having been received in the gardens from Kew in July 1877. The healthiest plants the Society now possesses are from cuttings made from what the planters call expressively "Gormandising suckers." The plants in the ground amongst the shrubs in the ornamental garden, are still in better health than the survivors of those that were planted in the open in the experimental garden; but they grow very slowly, and though they have two or three times flowered, any fruit which has set hitherto has burned black and fallen

Cinchona.—Frequent and heavy demands continue to be made on the Society for cinchona seed, from various places, particularly Ceylon and the Wynaad, which are to as great an extent as possible complied with. *C. officinalis*, *C. succirubra*, and *C. Calisaya* are the sorts most frequently asked for. Requisitions for *C. Ledgeriana* continue to come in, and, to the Society's regret, remain unsatisfied.

Mahogany.—A considerable quantity of Mahogany seed has been received during the year from Dr. King, Calcutta, and Mr. Woodrow, Poona, and about two hundred young trees were raised. Many of these have been presented to the Robinson Park, the Gunpowder Factory, and other public institutions in Madras. A few have been sold, and others have been distributed to subscribers.

Grevillea robusta.— A large batch of young trees has been raised from seed procured from Mr. Cameron, Bangalore, and Dr Thwaites, Ceylon. The tree is exceedingly graceful, but does not flower in Madras; and the timber, though very beautifully marked, is, at least as grown in Madras, too light to be of great value.

Landolphia.—One of the most important plants recently introduced is *Landolphia sp.*, the source of the India-rubber obtained from East Africa. After several attempts, twenty-four plants reached Madras in good order in a Wardian case, sent by Dr. Kirk, H. B. M.'s Consul-General, Zanzibar, in May last. One plant was given to Mr. Cameron of the Lal Bagh, Bangalore, and the others, though growing very slowly, appear to be in excellent health, in the gardens.

Gardens.—No serious alteration has been made in the gardens during the past year. They continue to be maintained in very excellent order, and look well, as they have done throughout the last two seasons, which have been very favourable. The Committee hopes, very shortly, considerably to extend the area of the gardens by the purchase of parts of the cocoa, nut topes, to the south and west of the ornamental gardens, room being very much wanted for the many new and rare trees and other plants introduced within the last two or three years.

AGRI-HORTICULTURAL SOCIETY OF INDIA.

THE usual Monthly General Meeting was held on Thursday, the 25th June, 1880. W. H. Cogswell, Esq., V. P., *in the Chair*.

The following gentlemen were elected Members:—Baboos Jodoolaul Mullick, Bejoy Kissen Mookerjee, Kissorelal Gossain, Mohesh Chunder Chowdry, Bholanath Dhur, Messrs. Henry M. Lennox, and William Oldham, S.C.

The names of the following were submitted for Membership:—Mr. J. G. Macdonald, Calcutta,—proposed by the Secretary, seconded by Mr. G. L. Kemp.

Mr. A. Sprenger, Executive Engineer, Upper Assam Division,—proposed by Mr. F. St. C. Grinwood, seconded by the Secretary. Rajah Rajendro Narayan Roy, Joydebpore, *viâ* Dacca,—proposed by the Secretary, seconded by Baboo P. C. Mittra, Mr. W. F. Swan, Calcutta, —proposed by the Secretary, seconded by Rajah S. A. Ghosal. Mr. James Murray, Calcutta,—proposed by Mr. J. Martin, seconded by the Secretary. *Rejoined.*—Mr. D. G. Landale, Calcutta.

Contributions.—Seeds of *Cytisus proliferus* and *Hymenæa Courbaril*, From the Royal Gardens, Kew. The former yielding a good fodder; the latter is a fine timber tree, a native of South America, where it grows to an enormous size. A valuable resin, resembling the Anime of Africa, exudes from the trunk. These seeds are available to Members.

A few roots of Tydæas and some Begonias. From Dr. T. Beaumont.

Seeds and plants from the Nicobars. From E. H. Man, Esq. Letters were read—.

From Under-Secretary, Government of Bengal, inquiring if the Society can find room to provide for the necessary accommodation for models and drawings of agricultural appliances, &c, for the inspection of the public and persons interested. *Resolved*—that all available space be granted for this purpose.

From the Secretary, Bijnour Agricultural Institute, announcing the formation of the Institute and applying for assistance in the shape of plants, seeds, and publications.

Resolved—that this be granted to the best of the Society's ability.

From Lieut.-Col. M. Millett, Mussoorie, in reference to the allusion in Gardener's report at last meeting to *Clianthus Dampieri*. Col. Millett states that he succeeded very well a few years ago, when at Mooltan, in raising this plant "a very hot and dry climate, rain fell then 5·64, very cold winter, grown in pots, one seed in each pot, soil one part, best leaf mould, three parts well washed blue river-sand, a few lumps of charcoal for ventilation, water as required, but not excessive, flowers fine and perfect, much admired, seeded freely."

From Col. W. M. Lees, offering to obtain plants and seeds for the Society from his brother, the Governor of Lubaon. Accepted with best thanks.

From H. A. Firth, Esq., to the same effect in respect to Demerara. Also accepted with best thanks.

MINERALOGY.

RULES for the working of the coal deposits on the southern face of the Khasi and Jaintia Hills are under the consideration of the Government, " and the Chief Commissioner is ready to give every encouragement to the development of these resources," which, though difficult of access, may yet be made available for the purposes of tea manufacture.

IMPORTANT GOLD DISCOVERIES IN VICTORIA.

EARLY last month, according to the Melbourne *Argus*, a discovery was made in the Talbot district, Victoria, which promises to be of the greatest importance, with regard to the future of mining in that locality. The discovery was the finding of splendid gold on the bottom of the shaft of the Rip Van Winkle Company. The shaft is situate very near the centre of a stretch of the deep ground, about two miles in length, and the company is the first to have touched it, between the Sadowa Company's claim which yielded nearly a quarter of a million sterling in gold, and that of the Union Extended Company, higher up the lead. In two or three places during the past few years tunnelling has been carried on to some extent to catch the deep ground, but it has not been found till now. It appears certain, however, that several claims must all benefit by the recent discovery being right on the line of the deep ground. This discovery in the Rip claim is expected to open up about four miles in all of one of the richest alluvial leads in the colony. A tin dish full of the washdirt taken off the bottom of the shaft yielded a pennyweight of coarse gold. " Mining affairs on Ballarat have been very brisk for some months past, owing to the opening up of the Sebastopool lines of reef, and they have been further improved during the past few weeks by the discovery of what is supposed to be an extensive and rich run of wash dirt in the claim of the East Hurdsfield Company on Ballarat. The singular richness of this washdirt is still a source of surprise, and leads up to much speculation, because as no one ever expected that such a grand discovery would be made; so no one now knows where it is likely to terminate, and, although the general impression is that the washdirt is what is generally known as a reefwash, *i.e.*, a wash deposited on a flat or slightly shelving surface, much higher than the gutter—it is not definitely settled whether it is so or a missed main lead or gutter. If it turn out to be, as anticipated, a reefwash, there is no knowing to what extent it may be traced yet, as no evidence of its existence seems ever to have been revealed to the early diggers, whose sole object was to follow the deep gutters, which were supposed to contain the richest of the washdirt. The elevation at which it is found is very much in favour of the reefwash theory, and, that being the case, many people are of opinion that the Hurdsfield group of claims is not the only locality in which it will be found, but that it may be traced along the terraces of the Golden Point and Gravel Pits leads, right into, and possibly beyond, the centre of the City of Ballarat. That the progress of mining in the Ballarat district is substantial, is well shown by the returns for the last, and previous weeks. These show that the yields for the week before last exclusive of the Clunes mines and of co-operative parties, amounted to 3,599oz. 4dwt. 12gr., and the dividends £5,050, while for last week the yields—also exclusive of Clunes and co-operative parties—amounted to 4,620oz., and the dividends—with the same exclusion—to a trifle over £6,000.

SAPPHIRES IN SIAM.

THE following interesting memorandum is by Mr. W. H. Newman, Acting Consul-General at Bangkok :—

The year 1879 will long be memorable in the provinces of Battambong and Chantaboon for the discovery of valuable sapphire mines and for the great influx of foreigners, chiefly from British and Independent Burmah, to work the same. There have long been mines of inferior value in this neighbourhood, and about five years ago new mines were discovered by a native hunter. Being, however, in a very remote and secluded position, it was some time before the fame of the new mines spread to the Burman and Indian gem traders and miners. Some individual diggers, however, having found their way to the mines, and having returned to Rangoon and Calcutta with the proceeds of their work, realised very large sums, and a rush for the new mines commenced and continued throughout the last year, during which many thousands of British subjects passed through Bangkok from British Burmah on their way to the mines. The arrival of these large bands of armed strangers caused considerable alarm among the natives of Chantaboon and Battambong, who could scarcely be persuaded that the country was not invaded once more by the old hereditary enemies of Siam, the Burmans and Peguans. The miners, however, by their peaceable behaviour restored confidence, and the country people soon were glad to sell them all kinds of provisions at enhanced rates. The miners, in their haste to become rich, disregarded all considerations of health, and immense numbers died from jungle fever. The Governor of the province has hitherto levied 2¼ ticals (5s. 7½d.) from every man working at the mines, and this is cheerfully paid. Good order has hitherto been maintained, and the Governor has appointed a British subject named Kam Sai to act as headman and to collect the license duty. The Siamese authorities do not regard with entire complacency this conveyance from their soil of these valuable gems without the payment of any royalty. No definite proposition has, however, yet been made to impose any other than the license-tax above-mentioned. There would probably be found considerable difficulty in collecting any sort of *ad valorem* duty. As it is, the discovery of the most valuable stones is kept as secret as possible by the fortunate finders, and should any *ad valorem* duty be attempted to be imposed, the tax-gatherer would probably be defeated by craft or force. When Admiral Coote was here, I was anxious to show him some good specimens of these sapphires, and called for some of the miners who were in Bangkok on their return from the diggings. One of them, a poorly clad and miserable looking individual, produced a few small stones, and, after a great deal of coaxing, was induced with many precautions to give us a private view of his great prize, which was a very large sapphire in the rough, which he valued at Rs. 20,000. He would probably not have shown this stone at all had he not been on the point of leaving, in a steamer. Owing to the secrecy thus observed by the possessors of valuable gems, it is impossible to give any estimate of the total value of stones found, but that individuals have made very large profits is certain. There is a man now in Bangkok who dug out a stone which he offered for sale in Chantaboon at Rs. 1,000, but did not find a purchaser. He went with it to Rangoon, where he was offered Rs. 15,000 but, having then awoken to the value of the stone, he declined to sell, and took it to Calcutta, where he eventually obtained Rs. 30,000 (£3,000) for it. Now, however, there are many experienced gem merchants established in the neighbourhood of the mines, and something like the real value of the stones can be obtained by the miners on the spot. Many of the miners finding themselves in cash have invested in the luxury of wives taken from the Siamese population, and the value of marriageable young women, who are at all good looking, has in consequence gone up to a very high figure. The largest sapphire hitherto found, which I know of, weighed 370 carats in the rough, and when cut turned out 111 carats of the finest water. The ruby, onyx, and jade are also found in the district, but the quality of none of these is such as to make them very valuable.

FORESTRY.

THE Mysore Government is not behind-hand in its efforts in the direction of forest protection and extension. The Forest Department has of course been under the charge of sundry European officers of the department, and in view of the approaching restoration of the province to native rule, the progress report of Forest administration for 1878-79 is more than ordinarily complete in the matter of details. Extensive reductions have recently been effected in the *personnel* of the department, it being intended under native rule to throw the bulk of the work on the shoulders of the district revenue officers. The purely state forests extend to 454 square miles, which will be largely increased when certain surveys now in progress are completed. The subject of proper demarcation has been fully discussed in recent years, and for a time the plan of planting a thick belt of the quick-growing casuarina trees as a protecting boundary has been favorably entertained, but it having been ascertained that the casuarina readily takes fire and passes it on, this tree has been laid aside in favor of the fig, which, it is believed, will make a good boundary belt. Wood and bamboos for purely building and agricultural purposes are freely obtained and largely purchased by the villagers. Three hundred acres of teak and sandal wood were planted out in one division alone, and are doing well, while in others similar experiments proved unsuccessful, the best results having been obtained where close planting was tried. By close planting is meant 9 feet by 9 feet, thus giving 538 trees to the acre. When the branches touched, every alternate tree was removed, and this plan was found to give better results than the old one of planting out at first 25 feet by 25 feet or 70 trees to the acre. Doubtless the close planting had an influence in preventing the growth of brushwood and under jungle, which is often fatal to young saplings. Contrary to the experience of the Forest Department elsewhere, the financial results are eminently satisfactory. This is owing to the valuable nature of the timber sold, a large proportion consisting of sandal-wood. The receipts amounted to Rs. 4,52,575, which, after deducting expenses, left a net revenue of Rs. 2,51,555. Of the gross income no less than Rs. 3,65,188 are due to sales of sandal-wood. Now that the time of restoration of this province is so near at hand, it were well if all the other departments could show such a clean bill as can the Forest Department.

FOSSIL FORESTS IN AMERICA.

IN the valley of the East Fork of the river which flows through the wonderful Yellowstone National Park of the United States, the group of rocks known for want of a better designation as the "Volcanic Tertiary," is typically developed, and has a thickness of upwards of 5,000ft. Its prevailing materials are fragmentary volcanic products, which have been apparently redistributed by the agency of water, and now form breccias, conglomerates, and sandstones. These strata contain a great abundance of silicified wood; and in many places trunks of trees many feet in height and of gigantic proportions seem to stand in the identical strata in which they grew. Sometimes the crumbling conglomerates wither away from about these, leaving them to stand upright along the steep mountain sides. Mr. W. H. Holmes gives an account of these forests in the recently published number of the 5th volume of the "Bulletin of the United States Geological and Geographical Survey" (Washington, February 28, 1879). A section is given representing the north face of Amethyst Mountain. It includes 2,000ft. The summit of this mountain is 9,400ft., above the sea, and the river flowing at its base is 6,700ft., over sea level. Riding up the smooth river-bed, one has but to look right up the cliffs to discover multitudes of the bleached trunks of these ancient forest trees. In some of the steeper portions of the mountain's face rows of upright trunks stand out like the columns of some long since ruined temple. On the more gentle slopes lower down, but where it is still too steep to support vegetation, save here and there a few pines, the petrified trunks fairly covered the surface, and were at first taken to be the shattered remains of a quite recent forest. Sometimes the trunks were found in a fine state of preservation. Some, lying prostrate, measured 50ft. to 60 ft. in length, and not a few of these were 5 ft. or 6 ft. in diameter. One indeed was found on careful measurement to be 10ft. in diameter. The woody structure was so well preserved that it could be at once decided this giant tree was not a conifer. The strata also contain, as might be expected, many rootlets, leaves, and fruits, a collection of which have been submitted for determination to Professor Leo Lesquereux. They include an Aralia, a Magnolia, and new species of a lime, an ash, an elm, and a diospyros; also some new ferns. Some of the species are apparently identical with those described by Professor Whitney from the Elk Creek strata. But these strata are lower than the Yellowstone Park strata by fully 1,000ft., and are separated from them by 15 miles of broken country. These extraordinary fossil forests add one more to the noteworthy objects to be found in the National Park of the United States, already in respect of its natural phenomena without an equal in any part of the world.—*Times.*

THE USES OF FORESTS.

STRANGE as it may seem, there are people who still doubt, if they do not positively deny, the close connection between forests and the moisture of any particular region. For the benefit of these sceptics, we purpose to glean a few facts from a chapter on Forest Royalty in Mr. Baring Gould's instructive work on "Germany Past and Present." He points out that forests are to Germany what the ocean is to the British Isles. The tendency of forests is to lower the temperature by day, and raise it during the night. In treeless wastes, such as a large portion of Russia, the changes of temperature are rapid and excessive, a fierce summer heat following directly upon the intense cold of a long winter. The German vineyards exist only through the protection afforded by the woodlands which fence in the Rhine valley. The influence of trees upon the rainfall is still more remarkable. On an open surface the water pours down in a cataract, and runs away to waste, being unable to penetrate the hard sodden surface. Trees, however, intercept the downpour, and allow the moisture to trickle slowly and gradually into the vegetation beneath them, which holds the precious liquid, and shield the earth from over-hasty evaporation. The water thus gently percolates through the surface-soil, and feeds the springs. On the Tuniberg, a range of hills near Strasbourg, gifted with a peculiarly rich soil, the peasants cut down the trees which seemed to interfere with the cultivation of their little plots, and, in consequence of their folly, the springs have dried up, and during the summer much damage is done by drought. So also in the Island of Ascension, Some years ago copious showers refreshed the drooping vegetation, till the residents in their unwisdom, cut down all the trees. The rains at once ceased; but, now that fresh plantations have been made, a sea-drizzle has begun, and, as the trees grow up, the clouds will yield their moisture. A belt of trees is further efficacious in breaking the force of the wind, as is shown between Calais and St. Omer and a low sandy ridge, clothed with firs and oaks, about three miles from the sea and running parallel with the coast. On the one side is to be seen a dreary expanse covered with rank grass, and on the other luxuriant crops and trees bending with a rich weight of fruit. Again, along the shores of the Baltic, from Memel to Kiel, a thick forest once screened Poland, Silesia, and Prussia from the biting east winds, as injurious to vegetable as to animal life. The Jews purchased the estates of the needy Polish nobles, and felled the timber for which there was a great demand in England, the result being the reduction of large tracts of fertile land to a sandy desert, and on the Lower Ems the sand advanced some thirty feet every year. It is further related how Frederick William I. cut down a belt of pines between Dantzig and Pillau, and sold the timber for 200,000 thalers. The strip has lately been replanted, but as yet the partially restored barrier is powerless to arrest the billows of sand which are fast filling up a large, lake and impeding the water communication between Elbing and Pillau and Konigsberg. Similar effects were produced in Prussian Saxony near the town of Duben by the reckless clearing away of the forests fifty years ago. The sand waves immediately swept over the corn fields, submerged the gardens, and were fast turning the pastures into a desert, when the forester of the district stepped forward to the rescue, and upreared a barrier of acacias, pines, and birches.

In mountainous regions the peasants often fire a hill-side of forest to obtain pasturage for their flocks and herds, and for a few years the experiment appears to succeed. By degrees the tree-roots rot away, and loosen their hold of the soil, which slides off beneath the torrents of melting snow. As the rocks become bared, the cattle and sheep cease to find nourishment, and the latter end of their improvident owners is worse than the first. In Austria and in Switzerland this practice is still of common occurrence, but a wiser system prevails in the Bavarian Alps. In the middle ages kings and great barons forbade the cutting down of forest trees, but from purely selfish motives, and in order to preserve game. With the increase of the population, and the growing power and wealth of the towns to whom the impoverished nobles were glad to sell their forests, clearings were made without forethought or discretion, until the local prices were compelled to intervene, and restrain the arm of the woodman. Under the French Republic whole forests disappeared, the peasants paying off their debts, and making a little purse for themselves by felling both private and commercial woods. In the twelve years between 1791 and 1803, three million acres of woods had been devastated, and further destruction was only arrested by Napoleon issuing a prohibition against the rooting up of woods for 21 years. The recent destructive floods at Bordeaux have been clearly traced to the denudation of the high lands whence spring the rivers that water that country. The ancient forests held back in reserve the downfall of water, but since the hills were bared of trees, grass, and soil, the rain water has rushed off in raging torrents, causing rivers to overflow their channels, and spreading desolation for miles around. Of late years the Prussian Government have made great efforts to redeem their past negligence. Since 1857 ten thousand acres of moorland have been annually planted, and the science of forestry and arboriculture is nowhere carried to such a point of perfection as in Germany. So numerous are the foresters that they support thirteen newspapers and periodicals, two of which are illustrated. Three calendars are specially published for their benefit, and in the last three months of 1878, no fewer than twenty-three works were published in connection with forestry and the chase.—*Madras Mail.*

GARDEN.

THE ORANGE.

THE orange is the longest lived fruit tree known. It is reputed to have attained the age of three hundred years, and been known to flourish and bear fruit for more than a hundred years. No fruit-tree will sustain itself and produce fruit so well under neglect and rough treatment. It begins to bear about the third year after budding, and by the fifth year produces an abundant crop, though the yield is gradually increased by age and favourable circumstances. The early growth of the orange is rapid, and by its tenth year it has grown more than it will in the next fifty, so far as its breadth and height are concerned; but it is age that multiplies its fruit stems.

COFFEE.

MOZAMBIQUE COFFEE.

A RAMBLING correspondent of the *Madras Times* writing from the Malabar Coast, furnishes a few items of information in reference to cultivation in and around Cochin, which are not without nterest. He mentions amongst other things, that, though a general belief is entertained by professional planters in the difficulty or impossibility of growing coffee below a certain elevation, he saw growing on the plain north-west of Palghaut, trees large enough to admit of his conveniently walking under, and in full bearing of, what appeared to be a perfectly healthy crop. He mentions also having seen the same thing in the same neighbourhood at but a slightly increased elevation, and seems to think this attributable to the soil in those parts being alluvial. We are the more inclined to think these instances, no unusual exceptions, as, upon the island of Ibo in the Mozambique channel, where coffee grows *spontaneously* and in great abundance, it is found at but a trifling elevation; and though small and of very inferior appearance, it is probably superior in flavour to any other coffee grown. This wild coffee is regularly gathered, but the quantity serves only to meet the demands of Mozambique, Zanzibar, and some few other markets on the East Coast of Africa.—*Bombay Review.*

COFFEE PROSPECTS IN CEYLON.

THIS subject has the most intimate bearing on the question of estate valuations which we discussed on a former occasion. Will plantations in the older, and for that matter in the young, Kandy districts ever regain their former vigour? We believe many merchants and planters are considering this question at the present moment, and that some influential members of the community are inclined to answer it in the negative. Such a decision is, of course, injurious to the great planting enterprise, and, if promulgated without special qualifications, it can be shown, we believe, to be contrary to reason and experience. We leave out of view entirely, in our present remarks, the factor of "new products," although, as our readers are aware, there is now luckily no district in the country, if, indeed, there be many plantations, on which some attention has not been given to cinchona, cacao, tea, or cardamoms. This fact necessarily carries great influence in attempting any forecast of our planting enterprise. The contrast between the Dumbara valley of the present day and the same district ten years ago, we recently instanced as a case in point. Three thousand acres of cacao divided over the previously existing cultivated area have entirely changed the fortunes of most of the Dumbara properties, and the same result has been experienced in several other old districts. But, if we consider coffee alone, there are undeniable facts which serve to shew how rash and unfair might be a sweeping condemnation of old districts and plantations. The Dumbara valley itself includes some of the oldest coffee in the Island, and, we believe that last year the area cultivated—including all between the Hewaheta range on the one side and that of Rangala and Hunasgiriya on the other, up to an elevation of 2,000 and 2,500 feet,—gave a better crop than most other districts in the Island, and an outturn considerably above the average. It is quite evident that no "cut and dry" answer can be given to the question as to whether it is possible old estates should ever regain anything approaching their former condition. So far as we can judge from the history of agriculture and of the world, there is nothing to prevent their restoration to as much of their former vigour as is compatible with their increased age. To the sweeping question now locally propounded we might well reply with another and ask if our critics believe that farms in England will ever regain their former vigour, or that rust will exterminate cereals in Queensland and South Australia, or that the vines in Europe are doomed. We do not see why the enterprise in coffee should be any exception to the rule which applies to agriculture generally. It is impossible to venture on a safe opinion in respect of the future which is not, more or less, based on the experience of the past, and if we apply this rule to the case of several of our old districts and not a few plantations now under a ban in some quarters, we confess that we cannot see in them anything so exceptional as to doom them to a permanence of failure, or to distinguish them altogether from other depressed agricultural interests. If such interests are to recover in other lands, where depression has long prevailed, so ought judiciously cultivated coffee in Ceylon. The swing of the pendulum will undoubtedly come for those who may weather the present financial storm, and our fear may shortly be lest that swing of prosperity should once more carry the pendulum too far and revive extravagance, personal habits, careless management, over speculation, or neglect of prudent financial arrangements.—*Ceylon Observer.*

MYSORE PLANTERS' ASSOCIATION.

AT a General Meeting of the Mysore Planters' Association held at Sucklaspoie, on Monday, the 24th May 1880, the following circular was read:—

Circular.—The undersigned have the honor to invite the co-operation of all Mysore planters in endeavouring by practical experiment to arrive at some definite conclusion as to the most feasible method of mitigating the ravages and effects of leaf disease and "rot" in coffee.

Parasitic disease, its origin, development and cure, is doubtless a profound subject, but ruinously influencing as it does the enterprise in which all planters are so deeply interested, it is earnestly hoped that many may be induced to assist in collecting information in connection with well conducted field experiments.

It is suggested that an accurate record of all experiments should be forwarded to the head-quarters of the Association together with any information or suggestions which may appear likely to be of any practical utility.

A committee of planters will be subsequently formed to consider the subject generally; and draw up a report embodying the information obtained.

In addition to research in regard to cause and effects, the collection of reliable information on the following points appear to be highly desirable.

1. The effects of various measures for improving the mechanical condition of the soil.
2. The effect of various manures.
3. Experiments in connection with handling, pruning, &c.
4. Shade and its influence.
5. Observation regarding the physical and mechanical condition of soil.
6. The influence of rainfall and peculiarities of climate.
7. The management of nurseries, embracing the result of experiments with imported and acclimatized seed; the effect of irrigation shade, and forcing applications, together with remarks as to the possibility of spores being transmitted in the mucilage of badly prepared seed.
8. Analysis of soils—chemical and mechanical, including research in regard to any abnormal peculiarities either original or acquired.
9. The mitigating or curative powers of lime, sulphur, potash, magnesia, petroleum, salt, soot, Condy's fluid, &c.
10. Root pruning its effects and management.
11. The effect of stem cleaning and application of various washes such as:—
    - *a.* White wash.
    - *b.* Wash composed of lime, sulphur, and cowdung.
    - *c.* Petroleum.
    - *d.* Carbolic acid.
    - *e:* Permanganate of potash.
    - *f.* Chloride of lime.
12. The effects of deep cultivation and sub-soiling.

CINCHONA.

A RECENT *Gazette* contains a resolution on the annual report of the Cinchona plantations in Sikhim for the past official, year. The season appears to have been unusually favourable and about three-quarters of a million of young trees were planted out, of which 644,222 were *Succirubra*, against 353,415 planted in the previous year. The efforts made to propagate the *Calisaya* and hybrid varieties have at last begun to bear fruit. Of the latter, 76,080, and of *Calisaya* 12,782 were planted during the year. The entire produce of the year was 361,590lb. of dry bark against 261,659lb. in 1878-79; making the total produce of the plantations since their opening 1,496,491 lb. 14,240 lb. of the yellow or *Calisaya* bark were sent to England for sale towards the close of the year, but, as Mr. Gammie has now succeeded in making sulphate of quinine of excellent quality from this bark, it will probably not be desirable to send any more away. The total outturn of the febrifuge factory for the year was 9,434 lb. against 7,007 lb. in the previous year, and the sales to the public exceeded those of 1878-79 by 358lb., a circumstance which proves that the drug is rising in general estimation. The result of the operations, from a financial point of view, continues to be most satisfactory. Calculating the average price of quinine in Calcutta at Rs. 90, the total saving effected by the substitution of the febrifuge for the former drug in the Government hospitals and dispensaries since the factory commenced working, aggregates 11¾ lakhs, or more than the plantations have cost since they were opened. The proposal to erect a small factory for the manufacture of pure sulphate of quinine is now under the consideration of the Government of India.

RELATIVE MERITS OF CINCHONA ALKALOIDS (OTHER THAN QUININE) AND THE SIKHIM MIXED FEBRIFUGE.

PREVIOUS experiments made in the Indian hospitals having proved that cinchonidine and cinchonine were very little, if at all, inferior to quinine in the treatment of fevers, comparisons have now been instituted between those separate alkaloids and the Sikhim febrifuge which contains *all* the alkaloids of red bark in certain fixed proportions, quinine, if we remember rightly, constituting 16 per cent. of the whole. All attempts to obtain a mixed febrifuge in the Madras Presidency were abandoned because a Commission reported that Mr. Broughton's mixture cost far more than the price at which sulphate of quinine could be purchased. Mr. Broughton, therefore, in very indecorous terms, as is evident from the minutes recorded by the members of the Madras Government, resigned his appointment and disappeared in a manner so sudden and mysterious that he was long supposed to be dead. It is now certain, however, that he went first to England and then to New Zealand. In the case of the British Sikhim bark, there appears to be much less waste, although there is still a considerable percentage lost. The Bengal Government, with the sanction of that of India, no doubt, have consented to look, not at the price which the bark might fetch in the markets of the world, but at the cost at which it is produced. In this way the febrifuge can be sold to the public at about Rs. 2 per lb. Waving the question of real cost, the object of recent experiments has been to compare the effects of the mixed febrifuge, into which quinine, quinidine (very little), cinchonidine, and cinchonine are combined, with those of the two latter alkaloids in their separate state. The Surgeon-General of the India Medical Department has reported the results of the experiments in a paper which we quote as follows:—

The results of the trials are given and con trasted in the following table, but the comparison is not quite a fair one, as there were so many more cases of fever treated by Sikhim febrifuge than by either of the two other remedies:—

Preparations.		Average Dose.	Average quantity given in each case.	Average No. of days each case.	No cases treated.	Cured.	Died.
		grs.	grs.				
Sul. cinchonidine	...	6·24	87·93	5·86	970	849	...
" Cinchonine	...	9·52	109·57	6·55	917	805	3
Sikhim febrifuge	...	7·66	80·78	5·46	3,198	2,915	13

It appears that a less quantity of the Sikhim febrifuge was required than of either cinchonidine or cinchonine to cure an attack of fever. The actual average quantity used of each febrifuge was as follows:—

		Grains.
Sikhim febrifuge	...	80·78
Sulphate of cinchonidine	...	87·93
Do.	...	109·57

From these figures it appears that the Sikhim drug is the most active of the three, sulphate of cinchonidine the next active, and sulphate of cinchonine the least active as a febrifuge.

The Sikhim febrifuge had also the advantage as regards the time required to effect the cure of a paroxysm of fever—a point of great importance as regards the soldier, and also as regards some of the labouring classes. The following are the figures:—

		Days.
Sikhim febrifuge	...	5·46
Sulphate of cinchonidine	...	5·86
Do. of cinchonine	...	6·55

In this respect also, therefore, the three preparations hold the same relative positions.

The relative curative merits of the three drugs as shown by the figures given above in paragraph 5 may be illustrated as follows:—

Preparations.		Rate per cent. of. Cured to treated.	Not cured to treated.	Deaths to treated.
Sikhim febrifuge	...	91·15	8·44	·40
Sulphate of cinchonine	...	87·78	11·86	·32
Do. of cinchonidine	...	87·53	12·47	—

This places the Sikhim febrifuge first on the list as a febrifuge, cinchonine next, and cinchonidine lowest. These results are somewhat unexpected, and must not be regarded as final. Further experiments are in progress, and in due course the available data will be sufficiently numerous to indicate authoritatively the respective merits of the three preparations. The unpleasant effects caused by the Sikhim preparation were marked, and still form the chief obstacle to its more extended use. The superior position of the Sikhim febrifuge is possibly due to the proportion of quinine it contains, and Dr. King holds strongly that if the doctors gave up the idea that larger doses of the febrifuge are required, than of pure quinine, the symptoms of giddiness and nausea (with vomiting and purging) now complained of, would not occur so frequently. Even quinine occasions symptoms of giddiness and nausea in some cases. Giddiness is an unpleasant symptom, but not likely to do much harm, which nausea and its results in cases of fever may be positively curative. As this is the first report in which cinchonine has, *in any respect*, taken a place before cinchonidine, the Surgeon-General does quite right in asking that the result of further experiments should be waited for. At present the main alkaloids take rank thus:—

No. 1 ... ... Quinine.
" 2 (but closely approaching No. 1) ... Cinchonidine.
" 3 ... ... Cinchonine.

The mixed febrifuge stands by itself, and can, at present, be purchased at as low a price as even cinchonine could be laid down in India. For Government hospitals, coolies' lines, &c., therefore, nothing better could be used, specially if a solvent is employed, or the febrifuge made up in the form of pills. Before Mr. Wood was compelled to resign his appointment, the idea of separating the alkaloids was entertained in Bengal, and after all we suppose this will be ultimately done in view of the waste of at least 2 per cent. of alkaloids by the present process. The home manufacturers use apparatus and have secrets by which it is said every trace of alkaloid is extracted. The value of the Messrs. Howard's plant is valued at £100,000. All attempts to manufacture alkaloids in South America have failed. So with Mr. Broughton's experiment in the Madras Presidency. If the Bengal experiment, therefore, proves finally successful on every ground, commercial as benevolent, it will be unique in the history of the fever barks. In any case, it has provided a cheap febrifuge for a population who are specially liable to attacks of malarious fever.—*Ceylon Observer.*

MR. MOENS ON CINCHONA CULTURE IN JAVA.

THE *Ceylon Observer* gives Mr. Moens' replies to the circular it issued some time ago, and says, "from the interesting and valuable information afforded, our readers will gain fresh evidence of the effect of the rich soil of Java on the fever plants. The Nilgiris, British Sikhim, and Ceylon are left far behind when the best growths are compared with a *succirubra* tree of 14 years old, 63 feet high, and 3½ feet in girth; a *Calisaya* tree 17 years old, 60 feet in height, and 3 feet in girth; and a *Ledgeriana* 13 years old, 48 feet high, and 3 feet in girth. It is only the richest soils of Uva which can possibly give results to compare with these. From Mr. Moens' replies it would appear that no cinchonas, not even *succirubras*, are cultivated in Java (at least on Government plantations) below 4,000 feet, the range for *succirubra* being 4,000 to 5,000 feet; that for Ledgeriana from 4,000 to 5,000; while in the case of *officinalis* the lowest limit is 5,000 feet and the range up to 6,000. We suppose that in truth, 3,000 might be safely substituted for this latter figure, even if it should turn out to be true that the Java climate is so much colder than ours."

BANDONG, 1*st May*.—With this post I will send back the questions, answered as far as possible, without writing a book about them all. The question about harvesting is particularly difficult not only which is the best mode, but also how great the yield of the trees is. On 8½ bouw of Ledgeriana has given, within 13 years till now, 34,019 half kilograms, say 38,080 E. pounds, by thinning, coppicing, and scraping. And if you saw the gardens at present, you would ask where this bark had been taken? as the plantation is quite close and regular. We took only what was too much, and would hinder the growth of the finest trees. I have just had the pleasure to make the acquaintance of Messrs. Alexander and Kay Shuttleworth. They saw also the Ledgeriana plantation and agreed that it is not to be seen, where this quantity of bark, amounting to about 2,578 E. p. per acre, has been gathered. I am sure that the trees and shoots now left in these gardens, when uprooted, would give easily another 4,000 E. p. per acre.

But it is not always so good. I have just uprooted a piece of *C. officinalis* plantation, planted at 4,300 feet, *i.e.*, too low, and damaged since 4 years by the tea-bug (*Helopeltis Antonii*). From 80,000 trees, planted out in 1873 and 1874, I got about 1,000 kilograms of bark. This is a failure, but, if you get the tea-bug, such things may happen; and, as tea cultivation is spreading over Ceylon, I fear you will not escape this worst of all cinchona plagues. I often had caterpillars in the gardens, but do not care for them, as they do no serious harm, but these bugs make a fearful pest, and we could never get rid of them. In some plantations, in the dry season, when they appear to come in the greatest quantity, a young garden often looks as if boiling water had been poured over it, and it takes two or three months before the trees have recovered. These little creatures check our success, which would be too great without them, perhaps. It is a comfort that I may remember that it has been even in these 8½ bouw orig. Ledgeriana, the bug appeared first and that they have since often been severely damaged by them.

I saw from the last *Observer* that you had received the sad tidings of Scheffer's death. My lamented friend died from an inflammation of the liver. We thought he was on the way of recovery; he had been transported to the hills, but suddenly he collapsed and died quite unexpectedly. It is a heavy loss, not only for us and for our country, but for the science, botanical and agricultural, for the whole world, and it will be very difficult to fill his place. Scheffer was a young man, about 35 years old, and, with the zeal and science and active power he displayed, could have produced an immense deal of noble work. It is a great pity indeed.

As I am not directly connected with the Botanical Garden in Buitenzorg, this will not interfere with my going to British India and Ceylon. I intend to come in August next, leaving Batavia with the French mail of

the 18th of that month. I can then be in Ootacamund about the middle of September, when they are barking there, and in November in Br. Sikkim. I thought first of coming in March, but Mr. Money warned me not to go to Bengal between March and September, as the dreadful heat would be almost unbearable, and would prevent me from seeing Agra and Delhi, without danger to my health. I could perhaps have found a better time to come to Ceylon, but it is difficult to be everywhere in the best season. I hope to see you, and will be sure to call at Abbotsford.

The rains continue as fast as ever, and we have now a wet monsoon, lasting about 1½ year I hope it will soon change, for if we get no regular dry season, the Ledgeriana trees will never flower, and the seed crop fail again. You remember perhaps that Mr. Ledger—or rather Mr. Ledger's servant—said that the trees, from which the first seed was taken, had not flowered since four years, on account of frost killing the flowers. But I think the reason will have been that in these dense forests frost would be so severe as to destroy the flowers. And the cinchonas do not flower in the dry season when cold is most severe, but one or two months after the rains set in.

What Mr. Howard says about the British and Dutch Government refusing to Ledger the slightest compensation for his losses (*Pharm. Journ.* 18th March) is not quite right. Ledger has a very slight part in the whole business. The seeds have been gathered by an old servant of his, whilst he was on his travel back from Australia to Peru. The man brought the seed to the coast where Ledger was, and will have received a very small pay for it. It is a pity that this poor fellow has been killed for this reason (if it is true?) But I think that, for an Indian, he could have given his life for a worse cause, and without becoming an immortal hero in quinology. Who would know the name of Manuel Incra Mamani if he has not been so happy as to find the true Ledgeriana,—bringing it to Ledger?

I have a letter of Mr. G. Ledger (C. Ledger's brother) before me, copy of a letter of him to our Consul in London, Mr. May, dated 30th October 1865, in which he writes :—" As near as I can make out of 100 (about eight pounds st.) is just about the proportion of *cost* to the quantity of seed I have." When the seeds had germinated, Ledger received again 800f. (in all £50) and he then wrote (9th January 1861) :—" I also feel bound to express my sincere and hearty thanks for the prompt and generous manner in which your Government has responded to the condition suggested by me as to future reward," &c. In 1871 Ledger offered to procure seeds *on the same conditions as in* 1865, a further proof that he thought he was well paid for the part he took in the business. So when he, knowing the high value of C. Ledgeriana, came in 1876, with a claim for further payment to the Dutch Government, they could not find terms to reconsider the business, which had been concluded on fair terms and the greatest contentment of both parties, ten years before. Now Ledger complains very much (in his letter of Nov. 3. 1875) and says that " his brother G. Ledger received only 600 guilders, when he had expended more than as many pounds in its acquisition." If you consider this claim, in connection with the former letters, before L. knew that C. Ledgeriana was so good a kind, you may conceive what we had to think of his arguments and lamentation.

My government, though not being in a position to acquiesce to L.'s claim, was very willing to give him a reward in another form, and authorized me to enter into a proposition of Ledger's to procure us a new supply of seeds, and to pay it very liberally. I wrote to Ledger (though I doubt his faculty of getting true Ledgeriana seed, because he does not know where to find them), but never received an answer.

If cinchona growers would make a statue for the clever cascarillero, Manuel Incra Mamani, some reason could be found from that. But Ledger has indeed only a very small part in the history, and procured the seed without danger, and without trouble, and without knowing indeed that he had got hold of such a precious kind of seeds. And the *British* Government has nothing at all to do with it, for it was not the Government that bought the remainder of L.'s seeds, but our friend Mr. Money and he paid quite the same amount for it as we did.

Elevation ?—Mr. Moens : 4,000 to 6,000 feet. [Mr. Rawson : 6,000.]

What species and varieties grow best with you ?—Succirubra from 4,000 to 5,500, Ledgeriana from 4,000 to 5,000, Officinalis 5,000 to 6,000 feet. [Mr. R. : Succirubra and Officinalis.]

State age of trees, and extreme and average dimensions.—Trees from one to 24 years; tallest trees succirubra of 14 years : 65 ft. high, 3½ ft. girth ; Calisaya 17 years, 60 ft. 3 ft. girth ; Ledgeriana 13 years, 48 ft. to 3 ft. girth. [Mr. R. : 10 at 18 years, respectively (extreme), 30' × 1½ to 3 ft. average 20ft. × 1—extreme 40' X 37"—average 26 ft. X 24 inches.]

What is the yield of trees by any method of harvesting you have employed ?—The highest amount has been from an uprooted Hasskarliana of 17 years which gave 95 pounds of dry bark. Average two (officinalis) to four (Ledgeriana) or six (succirubra) pounds after eight years (uprooted) [Mr. R. : 14 years old trees coppiced averages 4½ lb., 17 years old stripped averages for 7th time 41-10th lb., good total 18½ lb. without branch.]

Do coppiced trees send up healthy shoots ? And state whether the stools were left under shade of surrounding trees, or thoroughly exposed ?—Yes, always thoroughly exposed, if succirubra. Officinalis and Ledgeriana may be coppiced in alternate rows if planted : officinalis at 5, and Ledgeriana at 6ft. [Mr. R. : Yes : thoroughly exposed.]

Have you found the bark renew freely after partial stripping ?—Yes but there are always failures, specially at the borders of the gardens : [Mr. R. : Yes.]

Has the operation affected the growth of the trees ?—Not till now, has been applied since three years. [Mr. R. : I think not.]

Have you tried covering the wound with any other material than moss; and with what results ?—Use often *indjoca*, a fibrous substance from the sugar palm (*Arenga saccharifar*), with excellent results. [Mr. R. with grass. Renewal, so far, as good as if moss have been used.]

Have you tried the system of shaving off the outer bark, leaving the liber intact ? And with what result ? Yes ; the bark regenerates very soon in all species. No deaths. Not yet known whether the quinine increases. [Mr. R. : Not yet.]

What diseases have effected your trees ? Our trees are effected by the *Helopelt Antonii*, a bug, which gives much trouble and damage. Canker very rare [Mr. R. : Canker to a small extent only.]

Have you any remedy to suggest for them ?—No [Mr. R. : Cover with moss.]

Have you found canker proving fatal the exception or the rule ?—Canker very seldom seen. Not fatal. [Mr. R. : No, with few exceptions, our canker as a rule affect only one side of the tree].

Have you tried manuring, and with what result—Have tried manure. Compost only (cow and horse dung, &c.) Trees grow luxuriant. Analysis about amelioration of bark cannot yet be relied upon. [Mr R. : Yes, with good results in expediting renewal and increase of thickness of bark ; also increased foliage of darker color.]

Have you reason to suppose that trees from cuttings are less healthy than those from seed ?—No. [Mr R. : No. I much prefer seedlings.]

Have you tried cinchona on patana land, or amongst old coffee, and with what results ? Yes ; grows well if the sub-soil is good ; requires high cultivation. [Mr. R. : On patana land largely with very good results : officinalis more successful than succirubra.]

Is sporting less common amongst plants from cuttings than from seeds ? If so, is the difference large or not ?—Cuttings do not sport. [Mr. R. : Cannot say, as our propagation is almost entirely from seed.]

Give any analysis of bark from the large leaves variety of officinalis ; stating, if possible, the yield of bark per tree and its age ?—Contained quinine 1·8, cinchonidine 4·82, cinchonine 0·79, amorph. alk. 2·00. Three of eight years. (This means a large, rapid growing kind, probably a hybrid.—Ed.) [Mr. R. : Quinine 8·53, Quinindine 0·08, Chinchon, 1·33, Chinchonine 0·20, Crystall, sulphate q. 4·75. Aged 16 years.]

SERICULTURE.

COLONEL COMBER, the Deputy Commissioner of Durrung, reports that imported cottons are rapidly driving the local silk manufacture out of the market. That this should be so is inevitable, though a matter for regret. If the indigenous silk ceases to be manufactured in the district, there is at least some prospect of its finding a profitable market in Europe where the wild silks of India (among which the *Eria* and *Muga* silks of Assam hold a high place) have recently been attracting much attention.

THE *Fiji Times* has received a sample of product called Kapok, for which it appears there is a remunerative market open in the colonies. The substance is of the texture of silk, but very short and weak in the staple. It is the product of a weed which grows abundantly in many parts of Fiji, and the fact that the substance has a recognized commercial value, may, it is said, serve to make the obnoxious presence of the parent stem the more readily tolerated.

THE INAUGURATION OF AN INDIAN SILK INDUSTRY.

BY invitation of Mr. Lepper, the Managing Director in India for Messrs. Lister & Co., of Bradford, in England, who have recently established a silk-growing business at Dehra and in the Gurdaspore district in the Punjab—our correspondent proceeded on the 22nd ultimo to Kaulagir, to witness the payment of the prices of cocoons reared this season by those to whom seed had been distributed, and the award of prizes for the season's results, and to hear the announcement of prizes to be given for the future. There were present the European managers of several tea plantations in the neighbourhood, who had interested themselves in the matter chiefly for the sake of setting an example to the natives, and also partly with the view of observing which species and varieties of the mulberry plant seemed to yield the best food for silkworms. One of these gentlemen said that his cocoons had yielded him cent. per cent. for his outlay ; but then he had not had to spend anything on rearing-sheds. All were, our correspondent believed, satisfied that they could make silk-rearing pay well. The principal native present was the Mahant,—a Hindu high priest,—of Dehra, who, as a landowner, had reared some good cocoons, and who seemed much interested in the proceedings. And there were some twenty or thirty native zemindars and rayats who had taken part in the season's work.

Mr. Lepper had prepared an address, a copy of which, in English, was given to the Europeans to read, and a translation in Urdu was read out. But, as Urdu is "not well understanded of the people," a Hindi translation of the address was, we understand, to be prepared and printed for circulation among them.

Mr. Lepper began by explaining to his audience that he had asked them to be present that day, not only that he might pay them the value of their cocoons, but also, and chiefly, in order fittingly to inaugurate and celebrate

an important step of progress which the district had now made. And he was further anxious that the cultivators should become thoroughly acquainted with the bright prospects before them, and with the plans he had formed for encouraging and assisting them in future.

Mr. Lepper then reminded the silk-growers what they owed to the perseverance and good will of the Superintendent of the Dun, Mr. Ross. Years ago that gentleman saw what a great advantage this climate offered to rearers of silk-worms, and, knowing well how profitable the industry had proved in other countries he saw how great a boon it would prove to the natives under his care. With this before him Mr. Ross had perseveringly followed ou this idea, in the midst of his many other important duties, and notwithstanding frequent disheartening results. He had to teach himself, before he could attempt to teach others. He had total ignorance on the part of others, and prejudice against a new pursuit, to contend against. He had yearly pecuniary failure to explain to Government, whilst at the same time he had to appeal for funds for further trials. Confident, however, of the merits of his object, nothing daunted, nothing stopped him. In order to attract European enterprise, he proved the suitability of the climate for mulberry cultivation by planting these trees all along the roads and canals of the district. He sent samples of cocoons, reared by himself, to different experts for their opinions, and in order to create an interest in the work. And at last he succeeded in attracting the attention of a firm fully capable of giving the Dun every chance of success as a silk-rearing locality. This is the history of this new industry, now in their own hands and their success in future should always recall to their grateful remembrance the name of Mr. Ross.

Mr. Lepper had felt some doubts as to attempting to induce anyone to try the new industry under the present disadvantages of the leaf supply. He knew that the chief item of cost in silk-rearing was that of carriage of leaf, and that if sufficient leaf was not procurable close to the rearing sheds, four or even eight men, according to distance, might be required to pluck and bring it in, for one man that would be required were the leaf as close at hand as it should be. If, therefore, they should find their leaf supply failing in their own neighbourhood, and have to send to a distance for it, the experiment would then not have a fair trial. Still, after all, he had thought it would be better to make a start at once, and trust to the intelligence of those experimenting, to understand that a moderate success under the present disadvantages would show how much better the cultivation would succeed if they could reduce their distance from their leaf-supply. His fears about the leaf-supply had, unhappily, been satisfied. The road-side trees became too dusty, and some of the cultivators had been compelled to send carts miles, for leaf, thus spending, he thought, four times what ought to have been necessary. He was sure they understood this, from the conversations he had had with all of them. But notwithstanding this disadvantage, and their want of previous experience, he was quite certain that none of them had lost money that year. Experience was as important in silk-rearing as in ploughing; they had tried a new thing, and he must say their produce had not been wonderfully good; but they had shown a desire to succeed, and that desire, combined with more experience, would very quickly improve their results. This year, being anxious to encourage them as pioneers, in every possible way, he would make only one price for their produce, and pay all alike the full value of first-class cocoons, though with two exceptions—theirs were of a very low class indeed. After they had acquired more experience, he would make it worth their while to try and turn out first-class cocoons by offering prizes for the best, and by paying for the cocoons according to quality.

Mr. Lepper then proceeded to explain another branch of the silk industry, viz., that of the castor-oil plant feeding eil kworm. If this worm could only be acclimatised in the Dun, it would be a great boon to the poorer men amongst them. As they all knew, the mulberry tree took some years to come into bearing. They also now know that only one crop of silk could be got in a year from the mulberry worm. These two circumstances must tell very much against a poor man attempting to make a profit from growing mulberry. True—the mulberry silk was more valuable than the castor-oil fed silk, but the poor man would look at the time the mulberry trees took to grow, and at the fact of his rearing shed being empty for eleven months out of the twelve, and would feel disheartened; whereas a rich man could afford to wait for his mulberry trees to grow. To the poor man sowing castor-oil seed the future would be nearer; in two or three months he would have leaves, and if the Eria worm succeeded well in the climate of the Dun, as Mr. Lepper hoped it would, he would get four or five crops of cocoons in a year instead of only one.

As an experiment, Mr. Lepper had sent to Bengal for a seer of eggs, and they ought to arrive shortly. He should distribute these eggs in small quantities to cultivators owning castor-oil plants of a pluckable age, and who might desire to make a trial. And before that crop should have produced eggs in its turn, he trusted that a considerable area of castor-oil plant would be available. To give poor men a chance, he should be glad to give a reward of one rupee for every beegah of land having castor-oil plants properly planted on it for silk-rearing purposes, which plants must be five feet high in nine weeks from that day,—no man, however, to receive more than ten rupees.

Mr. Lepper then proceeded to announce his awards of prizes for the past season's experiments, and explained that, as the cocoons produced this year were so poor,—owing to the difficulty there had been in getting leaf, and the late date at which the eggs had been hatched, and the inexperience of the growers,—he could not give a prize for *quality*, except to one man. And indeed they were not independent rearers, for he had provided Cashmiris to instruct them. The one exception was a man at Ambiwala, who had reared the cocoons of one shed there quite independently of Cashmiri attention, and whose cocoons were yet decidedly the best of the year. That man, however, had had the great advantage of mud walls to his shed; and from this year's experience, he (Mr. Lepper) would advise all who could afford it to put mud walls to their sheds, for that made a difference of five to seven rupees per maund in the value of the cocoons. The Ambiwala grower would receive a watch, as the only reward given this year for quality. Indur Singh of Rangawala, having by his attention to the instructions for careful feeding produced the earliest cocoons, should also receive a watch as a reward.

But, further, Mr. Lepper said he would present, to all who had this year acted as pioneers of the new industry, a silver medal. The fact that he was paying the growers about five annas in the rupee more than the market for their this year's crop, must also be considered as encouragement given. And Mr. Lepper intended also every year to set up a memorial stone, bearing a sculptured inscription, in the village which should have produced most silk during the year, on a site to be selected by the inhabitants, one stone for mulberry silk, and another for castor-oil silk.

Mr. Lepper then announced the prizes he intended giving for the future as follows:—

First competition.—*1st prize.*—A gold medal and Rs 200 for the best mulberry plantation according to his specification ready by 1st May 1883 *2nd prize*, a silver medal and Rs. 100.

Second competition.—*1st prize.*—Rs. 50, and a silver medal to the rayat who should on 1st May 1883 have on his land the most young mulberry trees of certain age and size; *2nd prize*, Rs. 25 and *3rd, prize*, Rs. 10.

Third competition.—*1st prize.*—A silver medal and Rs. 50 for the most land on castor-oil plant, really for silkworm rearing purposes, before the 28th November 1880; *2nd prize*, Rs. 40; *3rd prize*, Rs. 30; *4th prize*, Rs. 20; and *5th prize*, Rs. 10; no area under ten beeghas to compete.

Fourth competition.—*1st prize.*—A silver medal and Rs. 50 for the largest outturn by 30th November 1880 of castor-oil fed silk; *2nd prize*, Rs. 40; *3rd prize* Rs. 30; *4th prize*, Rs. 20; *5th prize*, Rs. 10; *6th prize*, Rs. 5.

Besides these, Mr. Lepper said that there would be prizes for next year's mulberry silk, the particulars of which he should publish later on. And he hoped that next year an exhibition of both kinds of silk would be held at Kauligir, at which the rearers should compete for prizes for quality. A list of the prizes he had now awarded and offered for future competition would be printed and circulated in the villages.

In conclusion, Mr. Lepper thanked all present for their attendance, and announced that rooted cuttings of the mulberry would be distributed *gratis* at the proper time, to approved intending growers.

We believe that the pruning of the existing mulberry trees on the Dun is now engaging Mr. Lepper's attention. This is an important point, for on judicious pruning depends the supply of good young leaf shoots next spring. The eggs produced this year are being kept, up at Mussoorie, till next spring.—*Civil & Military Gazette.*

TOBACCO.

THE PREPARATION OF TOBACCO.

In two recent articles (see July number, Ed., *I. A.*) we treated of the selection and of the planting of tobacco, it remains for us to describe the best method of preparing the leaf, before leaving the subject.

The leaf having matured, it is only necessary to cut down the whole plant with a long knife (wetta-catty) close to the ground. This can be done only in perfectly fine weather, and when the morning dew is upon the plant. A framework of posts and horizontals should be fixed up under any clump of shade-giving trees, and the plant tied together by plantain fibre in pairs, and gently placed, across the bamboos, which are in turn placed on the framework, so that the pendant plants do not touch the ground; in placing the plants on the bamboos, it is well to see that they are not pressed together; the frame-work should be large enough to accommodate one day's cutting; the plants should be left there until they are withered, which operation will probably take one day: care must be observed during the process that the leaves are not allowed to dry too quickly or they will become shrivelled and remain green. The withering being done and the leaves having acquired an old-rag-like feeling, the bamboos with the plants hanging upon them, are carried to the drying shed. Before we can state the drying process, it is necessary to describe the drying shed; we suppose that on each half acre plot of tobacco there should be built a shed 50 × 20 feet, but as the most temporary building will suffice, this need not prove a serious drawback. The walls of the shed should be 17 feet high, roofed with cadjan, and having shutters in three tiers, one above the other, and opposite each other, so as to regulate the current of air through the building; flush with the window heads of each tier should be erected frames to accommodate the bamboos upon which the withered plants hang. When there is a hot breeze blowing, the windows must be closed so as to avoid the danger of too rapidly drying. The plants should remain on the lower tier "close hung" until the leaves have turned yellow, which will be from six to ten days. They are next hung upon the upper tier, the windows opened and the plants "free hung," so that the air may circulate well around them

until the light yellow has deepened into golden or light brown. When at this stage, all windows may be thrown open, and the plants may be hung close together on the highest tier; the evaporation from the leaf will be very little now. The drying and changing colour of the leaf generally begins from the margin to the mid-rib, when the mid-rib is entirely dried up and pliable, the tobacco is ready for the next process—"stripping." As before said, for stripping, the leaf must be perfectly soft and elastic (a damp moist vault would make a good stripping-room). In the early mornings when the plants have absorbed some moisture, they should be first heaped to check evaporation, and stripped when the leaf can be best rolled and bent without breaking. The leaves, when stripped from the stem are at once "sorted." There should be four sorts thus, No. 1, large equal coloured and untorn; No. 2 large equal coloured and torn; No. 3, bottom leaves of inferior colour, and No. 4, refuse and shrivelled up leaves. Nos. 1 and 2 are used for wrappers. The leaves are next carefully smoothed down on a flat board, and tied up in "hands" from ten to twenty leaves each, according to the size of the leaf. Should the colour of these "hands" not be uniform, to give them a brown colour they may be "bulked" that is to say heaped, so as to encourage a slight fermentation, but in this operation great care must be taken to avoid over-heating and mouldiness. If the tobacco has been carefully dried, and is of a good variety, it may be smoked a week after curing. Many ingredients are used in the trade for improving colour, flavour, &c., but it is wiser, we think, to leave all this to the cigar manufacturer. It should be remembered that a good cigar depends much more upon the rolling and wrapping than is generally supposed, and many a good quality cigar is thrown away in disgust, although the tobacco is of the finest and the leaf has been carefully tended and cured.—*Ceylon Times.*

TOBACCO IN MYSORE.

LOVERS of the fragrant weed—and they form a large body—must be interested in everything that relates to the better development of the tobacco plant. There has from time to time been a good deal of talk about making improvements in the growth and after preparation of the plant, but very little has been done to carry out the suggestions that have been made. Tobacco is grown in most parts of India, but very little is imported to Europe, and the reason of this is not far to seek. The production of this country is considered inferior to that of other parts of the world, and hence it finds but few purchasers in the home market. But it is very remarkable that with every kind of soil and climate the growers should not be able to produce an article equal, if not superior, to that grown in America and other places; skill and capital alone are required, we should fancy, to bring about a change in this respect, and we believe that a good deal of money might be picked up if any one would set about the business in the proper way. Why should not this province grow the plant to a greater extent than it does at present? There must be plenty of places where the soil is propitious, and probably there is not a better climate for its growth in any other part of Southern India. Before the famine, tobacco was cultivated in large quantities about the village of Bettadhapura in the Mysore district, but we believe the cultivation has fallen off a good deal during the last few years The soil is rich and well suited to this peculiar cultivation, and years ago this was taken advantage of by the ryots in the neighbourhood. But even in its palmiest days this district did not produce so much tobacco as it might have done, either from the pressure of taxation, or from the want of a suitable market. The plant found its way, it is true, to other parts of the province. and perhaps beyond, but not in sufficiently large quantities, while in some cases the ryots only grow enough for their own wants. The late Mr. Broughton of Ootacamund examined the tobacco grown in the district, and pronounced it to be, in some respects, equal to that raised either in Manilla or the West Indies. Mr. Broughton analysed the tobacco in order to find out the amount of nicotine in it when dried, and the amount of potassic carbonate in the ash, and from the report that he gave, we find the following:—

Nicotine, per cent.	3·61
Ash, do.	15·35
Amount of potassic carbonate contained in the ash of the tobacco, per cent. ...	3·23

He discovered that the greatest fault in the tobacco was a deficiency of potash salt, and this he thought might be remedied by greater attention being paid to the cultivation of the plant. If this could be improved, the flavour of the tobacco would be better, and it might find a ready sale outside the province.

There must be many other parts of the province equally suitable to the growth of tobacco as the district we have mentioned, if only little trouble were taken to find them out. The plant is considered to be of hardy growth, though, of course the quality depends upon the kind of soil that the plant is placed in. Tobacco in order to be brought to perfection requires a good, red soil, such as is found in several parts of the Astagram district. The cultivation is not difficult; the land requires to be well manured before the planting takes place, and, only at the time of transplanting, irrigation is required; after that the plants may be left to the rains of heaven. The method of cultivation is known to every ryot, and need not be described here. There is plenty of land in the province waiting to be tilled, and tobacco, if good, finds a market all the world over, so that it is a pity that its cultivation should not be taken in hand on a large scale, and not be carried on with more care. There is, as we have said, money to be made, and it only requires a little capital and skill to make it.—*Bangalore Spectator.*

ADVERTISEMENTS.

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.
Proprietor.

Calcutta, 1st Feb. 1876.

CONTENTS.

NOTICES TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

CORRESPONDENCE.

CARDAMOMS.

TO THE EDITOR.

SIR,—Having seen an article on the cultivation of cardamoms in your paper of the 1st July, I shall feel obliged if you or any of your readers can inform me where I can procure a book on their cultivation.

August 1880. MALABAR.

NOTE.—We believe there is a work by Dr. Pereira on the subject of spices, which would probably give our correspondent all the information he requires. We have not seen the book ourselves, and cannot therefore speak positively.—ED., *I. A.*

SILK.

TO THE EDITOR.

SIR,—Can you inform me, through the columns of your paper, whether or not the Eria cocoon has a marketable value in Calcutta, and if it has, what is its value per maund ?

Assam, 7th August 1880. W. S. YOUNG LESLIE.

NOTE.—The "Eria" like all the wild cocoons of India will always find a market in Calcutta. A reference to a silk broker will get you the present value.—ED., *I. A.*

INFORMATION WANTED.

TO THE EDITOR.

SIR,—If A.B. has succeeded in domesticating the silk-worm *Antheræa Paphia*, will he kindly send particulars and say if he has any eggs to spare ? If any of your readers can give information regarding the winding off of the Eria cocoon, I shall feel extremely obliged. Can they be reeled in the same way as the mulberry feeders?

ONE INTERESTED IN SILK.

Ghatal, 28th August 1880.

PAPER FIBRES.

TO THE EDITOR.

SIR,—Having read in your paper several articles on the matter of obtaining cheap materials for manufacturing paper, I have the pleasure to inform you that I have posted this day to your address a packet which contains two samples of fibrés, No. 1 taken from the Lady-finger plant, and No. 2 from branches of Jainti. Both of these plants grow very rapidly, and without any particular care being paid, except to extract the fibres. No other materials could be obtained more cheap than this kind, provided it answer the purposes.

August 1880. B. L. FRIZONI.

NOTE.—We are obliged to our correspondent for the samples which came duly to hand : we shall be happy to show them to any one desirous of inspecting the same.—ED., *I. A.*

PRESENT STATE OF JAMAICA.

TO THE EDITOR.

SIR,—This island is a very fertile one, with rich woodlands and scanty sugarcane fields interspersed everywhere. Its rise depends much on the su[illegible]op, and, as that plantation has failed, the island looks gloomy, not because a [illegible] cloud overhangs her, or because the sun does not shine, but because there is not much work, no demand for labour, and consequently the place has in three hundred and sixty-five days only ninety brisk ones. The land, notwithstanding the several fictions (that it will not yield after two or three years' plough) is highly fruitful, and to add to its fruitfulness, running streams, springs and ponds are to be met with wherever one turns, so that when much rain does not fall : there is very little of the cry "everything is scorched."

The disadvantage from which the island is now suffering is not merely from the want of labourers (as is the general rumour) but on account of planters not having sufficient capital to continue on the working of the cane fields. All the old planters have quitted the planting field, and those who have succeeded are inert on account of the prior reason—*viz.*, insufficiency of capital, there fore there is an end to general employment and occupation.

This island which once carried the name of the "great sugar country," is not so now ; other places have arisen and she has sunk several steps lower than the rest of the "sugar manufacturing world."

And now the question arises—When shall Jamaica again reach her former zenith? The question may be fairly answered thus :—

1. When planters think again of cultivating those sugarcane fields which have grown with noxious weed and unwieldly wood.

2. When planters know again the value of the products of Jamaica.

3. And when they will plan not only to cultivate sugar and rum, but other products of commerce which will serve to be profitable to them, and of use to those demanding.

Of the many acres of land, not half can be said to be in thorough cultivation, and according to a late report, it is still decreasing on.

Many who have tried to relate of the advantages and disadvantages of this island, say that labourers are required. When this was said before, it conveyed a right meaning ; but we may now safely assert that the island is in need of men withstanding, capital, —persevering men, and men who have an adscititious brain than the common majority.

Another cause of this island's failure is party prejudice, but as this exists among the lower classes and the vulgar, who are uneducated, I will not then lay it as a general source of grievance.

Montego Bay, Jamaica, April 25, 1880. CRITIC.

DISEASES OF THE TEA PLANT.

TO THE EDITOR.

SIR,—We read, hear, and see a great deal about the different diseases to which the tea plant is more or less a victim in the various districts where this cultivation has been undertaken, but up to this time no writer has been found to show us clearly the means by which we may be able to keep our plants free from diseases, which in some instances prove fatal.

Some attribute the cause to bad soil, others to pruning, &c. ; doubtless the former being one of the chief causes, cannot be disputed. Nevertheless climate too, I dare say, has a share. For instance one may observe that plants on a tea estate at a high elevation are not so much attacked by bug as those lower down. The rapidity with which these little creatures increase in number is marvellous. From the time when first a bush is attacked, the number are so few, that one may almost count them, but note the difference two months later, and you will be surprised, most likely the whole plant is one mass. A little later you may find your plant is no more : it begins with shedding its leaves, and gradually the tree dies out.

Hints from the pen of some scientific man, I dare say, will be of great worth to some who have failed to hit upon means of getting rid of this pest. I have tried lime, tobacco-water, and other things which I thought would be disagreeable to the insect class, but all to no purpose.

A proof of soil being poor, may be somewhat arrived at by the appearance of plants put out on it, which will in the one case show vigour and the other, appear sickly and sluggish in growth, but this may easily be rectified by the attention of the planter being drawn to supplying what is necessary. Much is said regarding chemical or artificial manure, but very few will dispute that ordinary earth manure is as good as any, and, if applied proportionally, will produce the desired results.

I wish here to say a word regarding a disease (I can call it nothing else) which may yet be a stranger in some districts, and as "prevention is better than cure," [illegible] very far some may, through hints fr[illegible] scientific writer, be able to check the evil while yet in the bud.

The estate where I first observed, what I am about to point out, is barely four years old.

The soil though not of the very best kind, is to all appearance one that could nourish tea plants for the next twelve years to come without application of manure of any description. I observed till May last the plants looked quite healthy. Since then several have as though commended to fall back, and a great number seem dying. These appear to commence dying at the branches, beginning at the upper end, till they reach the main stem, and gradually the tree perishes. The space of time I calculate from the first signs of dying to the complete dying out of a plant does not exceed three months. On digging up one of the bushes which perished in this manner, I observed that the roots were slightly covered with a white substance, much like fungus in appearance, or as may be seen on trunks of decayed trees.

It would be a great favour conferred if any of the contributors to your valuable journal would be good enough to give us an insight as to cause and remedy, by which we may be saved a further loss of our tea plants by this disease which is quite a new thing to me, though to men of long experience it may be quite familiar. We can but look to men of sound practical experience to help and enlighten the ignorant and

Neilgherries, 21st July 1880. "IGNORAMUS."

THE FOOD OF CATTLE.

TO THE EDITOR.

SIR,—With respect to several letters that have appeared in the *Agriculturist* on the subject of feeding cattle, I would offer a few remarks, leaving it to those interested to think and act for themselves. In the matter of feeding cattle with either raw or boiled grain, I have seen horned cattle fed with raw gram, a bean called "Moochacotay" in Tamil, in Bengal called "same." This when well soaked, they pounded into a thick pulp in a mortar and gave to the cattle. In this way the cattle must derive more benefit than by simply soaking and giving the grain entire, because, as one of the writers has acknowledged, the grain is sometimes passed out entire. This method of giving the grain in pulp can only remove one objection, *i.e.*, there can be no loss of food from indigestion. But who that has seen grain in its various conditions, will be satisfied with that? If the grain is simply to be soaked, then what becomes of all the worms, and such like, as well as their eggs which both horses and bullocks have to swallow, breed, and in some instances develop into other stages of existence, and which meantime go on drawing all the nourishment required for their existence at the expense of the health as well as the life of the animal they are breeding in and living on? If boiling is really objectionable, then *broil* well ; the gram may then be given in that state or soaked. By this means, about one-half, or less, fuel will be required, and all vermin will be destroyed, the grain meantime becoming more palatable and easier of digestion. Your Seringapatam correspondent's letter contains those words :—"But it is the belief amongst the native that this would produce colic, inflammation of the bowels," &c. I will just give one instance from my own observation to prove the soundness of the native views. During the late famine in Madras, as horse gram (*coolty*) had become very scarce, residents in those parts bought the Bengal gram (*chenna*), soaked it and gave it to their horses. A friend complained that "not only were people of all classes suffering in various ways, but horses too ; and I was assured that both the horses of the house in question had been totally unfit for work for some time, as shortly after their feed their belly would swell, and they would lie and roll and groan as if in great pain. I learned during the day that these horses had the Bengal gram *soaked* and given them, and I at once advised the boiling of the gram, when to the astonishment of all, the horses became perfectly well, and fit for work : there was *no more soaked gram*. The cause in this case no doubt lay in the germ which heat neutralized. Not a particle of the strength of boiled gram need be lost to cattle. Cool the water that is strained from the boiling, and give it to the horse to drink. If the horse won't drink it that way, pour it into a tub to ferment, then with the addition of his usual allowance of water give it to him. He will certainly drink with a relish in its sub-acid state. To this add the water that rice is washed with in the first instance, before boiling, as well as the water strained from the rice after it is boiled—this in hot weather will be drunk with great relish by all cattle. In the days of yore, say sixty years ago, ship captains in Madras paid *one double fanam* (2¼ of an anna) for the full of a quart-pot, a couple of green chillies being cut up in it as a zest. But there is another item of diet for the horse that must not be lost sight of, *viz.*, grass. How is this got? A woman or man digs it up, roots and all, with a kind of hoe, consequently it has to be washed, to free it from the clay, &c. During the rains there may be plenty of clean water handy, but in the dry season water is not only scarce, but what little there may be is often in the filthiest condition, and quite alive with animalcu'æ, &c. Into these sinks the grass is thrown to get rid of the earth, and there it is often allowed to lie, to enable it to get a fresh appearance. Is it not likely that in those stinking cesspools the grass gets filled with animalcu'æ, worms, &c., and is it not from this that the horse gets all the ringworm, sores, and itch he may be attacked with? Let your readers think on this and insist on grass being brought to them without being washed outside in the fields or villages ; let it be washed at the house or stable with well water. I recollect seeing a buffaloe killed as an offering to "Mariatha" during cholera time ; the stomach was full of the grass it had eaten, and in it there

was an immense amount of small leeches, which were all of a pale pink colour and alive. If the animal had the power of digesting these, well and good, but if *they* had the power of adhering to its intestines, then what wonder at the great mortality that often carries our cattle off by scores, while all directly interested, wonder why, and never know.

Now if it is a fact that gram becomes " heaty" if boiled, the remedy is within the easy reach of all. To a measure of wheat or fine rice bran, add one desert spoon of nitre (saltpetre), finely powdered, and about a tumbler of treacle that has been well boiled, give this once a week during the hot season, to your horse; it will cool his blood: I know this to be given, and with good result.

Give your horse, occasionally, some ripe plantains of the large coarse kind, slices of ripe pumpkin and water-melon, all of which are cheap and plentiful in most parts of India.

Take a real interest in your cattle, look at all that is given to them, see that all is clean and wholesome, and put a proper quantity of salt in their food. Sometimes give good, clean treacle; let this be well boiled and kept corked in bottles; it will do more good than the bare insipid gram and other grain, without the least particle of anything to make it palatable.

The health of our cattle depends often on the care bestowed on them, let us do our duty to them, as they minister not only to our wants, but to our comfort: and let us always bear in mind that the righteous man is merciful to his beast.

Those who give cotton-seed to milch cows, should make sure that the seed is fresh and sweet; old and rancid seed is only fit for manure.

12th August 1880. OBSERVER.

TEOSINTE A MEXICAN FODDER GRASS.

(*To the Editor of the Ceylon Times.*)

SIR,—I am surprised that no one has recorded their experience of the Teosinte fodder grass. The prickly comfrey was decidedly a failure —not to say a swindle. Of course it is a fodder for cattle and so are turnips and cabbages. It can be made to grow luxuriantly by garden cultivation, but it "won't pay." The Mexican grass is certainly a paying thing to grow, for while in guinea grass the thick stalks are unpalatable to cattle, the Teosinte has an advantage, *viz.*, that the thick stalks no matter how thick, are devoured by horses, cattle, and pigs, owing to the saccharine matter they contain, the manure would not only be superior, but the beasts themselves must fatten. There are certain places where Guinea or any grass won't grow. It is not expected that Teosinte can flourish on such soils. As a rule instead of a bad piece of ground being turned into a grass field, I would advise a small portion of really good ground to be selected for any kind of fodder grass. A little trouble in loosening the soil occasionally and replanting after breaking up the old clumps and clods, a little expenditure on artificial manure to be applied at the rate of 10 per acre including labour, will go far to give an immense quantity of substantial fodder making rich manure. The proportion in weight is as nearly three of Teosinte to one of Guinea grass, judging from the result obtained from a small plot of each grass treated equally. The quantity remaining in stalls of Guinea grass after feeding cattle when weighed, shewed 27 per cent. unconsumed, of the Teosinte only 11 per cent. To those who take an interest in a fair number of cattle and look to improvement in the stock, and to a good supply of rich manure, with but a small porportion of troublesome long stalks to impede the turning over and heaping or removing the manure. I strongly advise the planting of the Teosinte. It grows well on banks of roads and drains, and luxuriates in ravines. Its habit is not unlike the Indian corn these are the male and female flowers. The grass should not as a rule be allowed to run to seed. The rapidity with which it grows after each cropping is simply extraordinary, and from a single stool raised from one seed, as many as 17 perfect stems have been got by mere cropping. Length of average blade is 3 feet 9 inches, but many a foot more; general width in centre 2 to $2\frac{1}{2}$ inches. Mind I speak of grass well attended to. I had read and heard of the grass, but never cared to experiment until in Galle a ship captain who had been to Mexico and knew the grass, confirmed the accounts given of it. He spoke also of two other good prarie grasses which he thought would suit the low-country marshes.

L. T.

FORESTS AND RAINFALL.

(*To the Editor of the Bombay Gazette.*)

SIR,—Anent the subject of forests and rainfall, I would remark that the pretentions of forest conservators remind me of nothing more vividly than the claims of the African priest and medicine man. To quote a popular work:—

"The African priest and the medicine man is one and the same, and his chief function is to make the clouds give out rain. The prepartions for this purpose are various—charcoal made of burned bats; internal parts of animals, as lion's hearts and hairy calculi from the bowels of old cows; serpents' skins, and vertebræ, and every kind of tuber, bulb, root, and plant to be found in the country;" In short, all "forest produce." Although you disbelieve their efficacy in charming the clouds to pour out their refreshing treasures yet, conscious that civility is useful everywhere, you kindly state that you think they are mistaken as to their power; the rain doctor selects a particular bulbous root, pounds it, and administers a cold infusion to a sheep, which in five minutes afterwards expires in convulsions. Part of the same bulb is converted into smoke, and ascends towards the sky; rain falls in a day or two! The inference is obvious!"

So also is it with the forests and rainfall! The thing is quite plain. The rain tree must induce rain, and the Jovian functions of forests conservators and their assistants are beyond all proof and question. Some things are above reason?

July 23.

JUPITER PLUVIUS.

THE COFFEE BORER.

(*To the Editor South of India Observer.*)

SIR,—In your issue of the 31st July, there is a local para. referring to the ravages of the "borer' in the Nellacotta to the district. It has been very generally remarked here, by all who have seen the para. in question that it is calculated to convey the impression that some of the estates in the district are suffering from exceptionally severe attacks of this insect. This is by no means the case. The facts are rather that there is less "borer" this season, on the whole, than there has been for years past. Every season we have borer, more or less, but during my six years' experience in the district, I have never known any estate to have suffered from an expectionally severe attack. As is the rule in the Ouchterlony Valley, so here, the trees attacked are regularly and systematically cut down and burnt at this season of the year. If the insect does make an invidious distinction in the trees it selects to attack, I should certainly say from my experience that weak and indifferent trees very generally appear to bear the honor of the distinction, and not so much the best trees, as stated in your para.

NELLACOTTA PLANTER.

Nellacotta, August 4, 1880.

A NEW VEGETABLE.

(*To the Editor of the Ceylon Times.*)

SIR,—As you are paying a good deal of attention to new products, perhaps you will allow me to call your attention to the following account of what is termed in home papers "a new vegetable," and to ask if it has been grown in this island. It is the *Soja hispida*, a species of leguminous plant, somewhat resembling in habit and appearance the well-known pea. Unlike the latter, however, it has two distinct uses—industrial as well as alimentary. It is highly prized in China and Japan, and is said, indeed, to take its scientific title from the Japanese name of a sauce-sooja—which is made from its seeds. The seeds are very similar to a "marrow-fat" pea, but contain a large quantity of oil, which is either pressed out of them or boiled out in process of cooking the seeds for the table which is effected by simply throwing them into boiling water, when the outer skin bursts and floats to the surface, together with a quantity of oil, both the oil and the husks being skimmed off together. These may be either used as cattle food, or the oil may be separated and employed for various purposes, while the husks are still valuable as a feeding stuff or as a manure. The peas are boiled for about twenty minutes, and furnish a dish which is highly relished, not only by the Celestials, but by many Europeans who have tasted it. It is said to resemble in flavour the green pea, but lacks its sweet taste. The boiled sofa is also prepared as a cake and as a sauce, being fermented for the latter purpose, and salt, pepper, &c, being added. The sauce has a high reputation among the Chinese and Japanese, not only as a condiment, but as a medical agent.

The plant is described as thriving in very poor thin soil, and as adapting itself to a variety of climates. In Ceylon we are most deficient in the matter of vegetables for culinary purposes, and this would, from the account given of it, appear to be well suited for us and easily grown.

July 16.

B. R. D.

THE WILD VINE OF CALIFORNIA.

(*To the Editor of the Englishman.*)

SIR,—I have just brought from San Francisco a small parcel of seeds of the wild vine of California (*Vitis Californica*), which I shall gladly distribute to persons desirous of having them, and who may be able to put them out in suitable localities.

The California vine is now very much valued in Europe, and if these seeds should be successfully grown in India, they might be the initiation of an important and valuable industry, either for making wines or raisins.

Will you please make this known in your paper and oblige—

JOHN MARTIN.

5, Garstin's-place, August 14, 1880.

WHITE ANTS.

(*To the Editor of the Times of India.*)

SIR,—Your Ahmedabad correspondent "Hortus" calls for a cure for a disease which does not exist. It has been proved scientifically that white ants will not eat any vegetable with vitality. I would, therefore, suggest that HORTUS should look to his *malee's* method of planting or weeding, for I find if a rose-tree gets a knock with a *khurpee* or other tool injuring the bark, it admits water and causes death, when the white ants immediately seize it, the top remaining fresh and green for some days. Probably the *malee* detects, or you yourself notice, that the tree is looking sickly, and the roots are then examined for the first time, but the white ants may have found it out long before.

Baroda, August 8. GUZERAT.

The Indian Agriculturist.

CALCUTTA, SEPTEMBER 1, 1880.

THE BENGAL RENT LAW COMMISSION.

WE expected a good deal from the Commission appointed to draft a revised rent law. The experience of Mr. Dampier, the industry and legal lore of Mr. Field, the talent of Mr. Mackenzie, and the critical acumen of Mr. Harrison, with Mr. O'Kinealy's zeal for the improvement of the condition of the cultivators, could scarcely have failed to produce much when applied to a subject so important as the reform of our land system. And the report which the Commission has sent in fully justifies the hopes which had been entertained. Taken as a piece of literary and legislative work it is the best of its kind, as far as our experience of such productions in India extends. The Digest, which is its basis, gives a complete statement of the law as it stands, incorporating all changes, additions, and explanations by which the decisions of the High Court have supplemented the regulations and laws passed in Council. Sir Richard Garth has pronounced this work excellent, so that there is the best authority for assuming that the labours of the Commission rested on the only solid foundation,—a thorough knowledge of the laws which it is desirable to amend. The draft Bill now submitted goes over the whole ground to be covered; it is clear, logical, and exhaustive. The report by which it is prefaced gives in forcible language the reason for every change which it is proposed to make. We may say that the light of day has for the first time been let in upon the subject, that it has been treated in such a manner that any statesman or student, whether in another province or in England, can master it without the aid of local knowledge. On the question itself it is vain to look for any general agreement; in India, as in every other country, there is a landlord's party and a tenants party, and theetwo can never agree when the measure under discussion is really important; but we believe that all will be glad to acknowledge the utility of a work which ensures that the legislature, in whatever direction it moves, will have the guidance of light and reason.

The Commission has made several proposals most favourable to tenant-right, and which certainly should meet with our approval, as we have long advocated them. It is a defect in the present law that, while careful of the rights of privileged ryots, it has no provisions whatever for the protection of the ordinary tenants who form a moiety of the whole, and are becoming a majority. The landlord may rack-rent them or eject them at pleasure, or may appropriate without payment such improvements as they have made, such as the trees planted and reared, the wells sunk, the enclosures formed. It has even been decided in a recent case that a landlord thus evicting may take the standing crop, however valuable, and however near maturity. With regard to these unprivileged ryots, the Commissioners have remembered that, as a Trinity man at Cambridge is said to have charitably remarked of the undergraduates of the smaller colleges, "these, too, are our fellow-creatures." Ryots who have been in possession for three years are declared to be entitled, on ejectment for some cause other than an arrear of rent, to compensation for improvements effected by them. They can also get one year's rent as compensation for disturbance. In Ireland, from which the phrase and the thing is borrowed, compensation for disturbance may amount to five years' rent, so that it appears that the Commissioners can move in the direction of tenant-right only at one-fifth the pace of Mr. Gladstone's mighty strides. The compensation for improvements, too, is not assigned as freely as in the Act of 1870. Moreover, it is not clear why a tenant so unfortunate as to be ejected before he has been three years in possession, is to got no compensation for the improvements from which he cannot have as yet derived benefit. It would have been better had the proposal of Mr. Mackenzie, supported by Mr. O'Kinealy and Baboo Rajendro Kumar Seal, been adopted, and the three years' ryots raised at once to the privileged class, in which case their proposed status might have been inherited by the residuum, the unfortunate tenants left unprotected because they have not held for three years. But we must say that, voting in January, before the recent change of Government, the Commissioners went as far as could, at that time, have been expected. It is of little use to propose measures which, with reference to the known views of those who from above control our policy, are sure to be rejected. The Commissioners did as much for the ryot as was possible at the time; when Sir Ashley Eden meets his Legislature next season, he will be in a position to go much further, and really to settle the question.

On the occupancy or privileged ryots it is proposed to bestow this further right, that their holdings shall be alienable. At present such holdings may be sold or not according to custom, and it is always difficult to find out what the custom is in a particular place. There are some who believe that if ryots are given the right to sell, they will dispose of at once their tenures to the money-lenders; but this view, though plausible, is not borne out by experience. At present there are at least a hundred thousand alienable tenures in Bengal, from those of the peasant taluqdars of Chittagong on the south-eastern frontier, to the Surbarahars and privileged ryots of Orissa on the south, and the Gurjashtadars of Shahabad on the west. These are bought by money-lenders only occasionally, and the class connected with them shows no tendency to die out. The idea of declaring all occupancy right saleable is, as far as we know, Sir Ashley Eden's own, and it strikes us as being what *Punch* calls a happy thought. Nothing gives the proprietory feeling but the power to sell, and it is to the pride of proprietorship that we must look to to urge the ryot to improve. In fact it may be said, as a general rule, that all ryots with alienable tenures are now well off, and no others, except where population is thin. If the bulk of the ryots are given this privilege, there is room for a reasonable hope that they may become prosperous.

Since Sir Ashley Eden took the reins we have heard less of the wild schemes for unlimited enhancement of rent on new principles, which Sir Richard Temple declared that he would have invented. Baboo Kristo Das Pal heads a party which openly aims at depriving the occupancy ryots as a body of the statutory privileges they at present enjoy as to fixed rent rates, giving them in exchange other privileges of less value. He nearly succeeded in carrying out his purpose in Sir Richard Temple's time, procuring the introduction of a Bill which, if passed, and maintained, would have led first to an agrarian insurrection, and then to the general impoverishment of the cultivators. We are glad to see that the Commissioners have given no encouragement to these wild and pernicious views, and that even the native members who represented the landlords' interests, did not put them forward. The occupancy ryots under the draft Bill retain their right to hold at the old rates, subject to enhancement only on the old grounds. They are further protected against rack-renting by some new precautions. Enhancement can take place only once in ten

years, and in certain cases it cannot be carried to so great an extent that the rent shall be more than doubled, and in no case shall the new rate be more than equal to the value of one-fourth of the staple crop. It may, moreover, be made by instalments.

The equivalent given to zemindars for the curtailment of their powers involved in the extension of tenant right, is the power to put in motion the revenue machinery of Government for the purpose of raising rent rates, as far as the law permits that they should be raised. The landlords complain that they cannot enhance their rents through the Civil Courts, the process being too clumsy and expensive. They are to be given the use of the agency with which Government effects its own settlements, and which may be supposed to be the most suitable which experience can suggest. This is undoubtedly a great boon to the landlords, and a great injury to the tenants. We, however, doubt whether it will please the shrieking brotherhoods of the Associations, which have got up the agitation for new means of enhancement. These are formed by the more powerful, active, and pushing landlords, who have already enhanced by what they are pleased to call the consent of their ryots to rates beyond those to which they are entitled under the substantive law, and no change which merely gives increased facilities for enforcing existing powers will be of any use to them. What they want is either that the ryots shall be deprived of their present substantive rights, as by Sir Richard Temple's Bill, or that their own hands may be strengthened for the purpose of extorting further "voluntary" enhancements, as by the late Bill, to enable Judges to refuse to hear witnesses for the defence in rent cases. The concession now given will be of use only to the quiet and moderate landlords, who remain in the background, and have no influence in the press or at public meetings, the organs of public opinion.

We may, therefore, expect, indeed we have already witnessed, a strong opposition to the Bill from the party headed by Baboo Kristo Das Pal, the only native influence which is a real power in the country. Sir Ashley Eden's personal connection with many of the leaders of this combination may do something to soften their hostility, but, as we apprehend, not much, their disappointment at the result of the agitation which, since the movement of the ryots of Pubna in 1874 to maintain and assert their position under the present law, has been carried on to change that law to the detriment of the ryots, will be too great. And the question arises, if the opposition of the zemindars must be encountered in any case, why make concessions to it which will not satisfy or mitigate it? If we are to have a tenant right measure, why not make it effectual, and therefore final? Why not dispose of the matter once and for all, as Stein did in Germany? The draft Bill, excellent as it is when compared with other measures recently introduced in the Indian and Bengal Legislative Councils, stops far short of this. For instance, it permits the landlord to contract himself out of all his obligations under the Bill. Now tenant right can never be permanently defended where such a breach for attack is left as this. It is the rift within the lute that maketh all the music mute. The Conservatives knew this, when, in passing a law to give compensation for improvements in England, without intending that the right to receive such should be effectual, they provided that the rule should not over-ride any contract. Mr. Gladstone knew it when, in 1870, he enacted that any contract between Irish landlords and tenants, purporting to exempt the former from obligations under the Act should be null and void. Under the Bill of the Commissioners, a zemindar may keep all his ryots tenants-at-will at rack-rent rates, if he only takes sufficient trouble. He can do this either by registered agreements, or by making them change their fields every three years, on the system which Sir Richard Garth states has been adopted for that purpose by landholders in the Central Provinces. The principle in Bengal should be that, as the revenue is moderate, so should the rent be also; and this rule should be made so strong and close, that the most powerful landlord should be unable to break through it or the most cunning to creep under it. If we do not adopt such a policy, Bengal must in the end be ruined by rack-renting, like Behar and Oudh. It would have been useless to have asked for a law of this kind a year ago, but now the hour has come, and we hope that Sir Ashley Eden will prove to be the man.

IRRIGATION IN SINDH.

IRRIGATION in Sindh is a subject of more than ordinary interest, as being attended by unique conditions. Elsewhere (except in some parts of the Punjab) irrigation is more or less of a luxury; in Sindh it is a necessity. The extension of civilisation in that region is commensurate with the water spread of the canals. These, of course, are all fed from the Indus; and indeed that river might claim honours not inferior to those of the Nile, if practical benefit were the test, apart from historical and traditional glories. Like the Nile, the river of Sindh flows through a rainless country, and swells mysteriously when the drought is greatest. Its floods are more widely used than those of Egypt; the cultivator does not merely scatter his seed as the waters retire, but tills fields far removed from the river by the help of long canals. The system of Indus Canals counts up no less than 5,643 miles, and waters more than two million acres, or about 3,200 square miles. To this area must be added the aggregate area of the tracts directly submerged by the annual floods; it is not shewn in the canal returns, but may be assumed at about half as much again, making a total of some 5,000 square miles redeemed from the desert by the bounty of the river. Sometimes the river fails in its ministrations: more frequently it overdoes them, sending down a volume of water that swoops away embankments and bursts the canals. Such was the case in 1878-79, when the Kusmore embankment above Shikarpore was breached, and the floods joining their waters with those hastily contributed by the hill streams from the west, the gift of a sudden shower, swept over the whole country from Kusmore down to Sehwan. Repaired and strengthened, the Kusmore dam stood against the inundation of 1879-80; but a few weeks ago, it was breached again. These floods do great damage to the autumn crops, which are destroyed by submersion; but some compensation is got in the spring, when wheat and oil-seeds can be sown over a larger area than usual. Wheat, indeed, depends almost wholly on direct flooding, as distinguished from canal irrigation. The latter suffices to water the autumn crops while the canals are full, but when the river shrinks into its normal dimensions, the canals run dry, and there is usually no water left for cultivation in the spring. Exceptions are found in some favoured places, where the canal supply, besides irrigating the autumn fields, yields a surplus which can be stored in reservoirs or water-holes for use several months later, so that a crop of wheat can succeed one of rice or millet. Generally, however, canal-watered lands produce only autumn crops, and lands watered by floods give only the products of the cold months—wheat, oil-seeds, and pulses for the most part. Great uncertainty attends cultivation of this kind. If the floods come in short measure, the area sown is deficient; if they are excessive, it is an advantage to have a large area for sowing, on the condition that it can be sown in time; but often the waters refuse to recede till the season is past. The ideal floods, so far as wheat cultivation is concerned, would be those which should submerge the greatest possible area, and recede with the greatest possible rapidity. The character and extent of the inundation vary greatly from year to year; but on the whole years of flood are commoner and less harmful than years of drought. The year 1878-79 produced the highest inundation, yet recorded, and as a consequence, floods of a magnitude unknown since 1826; nevertheless, irrigation prospered, and the official report on Sindh Canals has little to chronicle but success.

Capital accounts are not kept up for all the canals, but the returns given show that a capital expenditure of 84¾ lakhs on certain lines brought in a net return of 2,40,000 rupees; that is to say, about 3 per cent. This return, however, ought to have been about 5 per cent., had revenue been fully levied from the canals in the frontier districts and Khelat territory. These are two works bearing the ominous names of the Desert and the Forced Labour (Begari) canal; and the assessing dues on the lands they water seem to be the same

as those which prevailed generally throughout Sindh until recent years, but never worked satisfactorily. The desert landholder is assessed to water at 10 annas 8 pie per acre, on the entire area of his holding; and he is supposed to cultivate one-third of this area annually, so as to effect a proper rotation of fallows; thus the rate per acre of cultivation would be two rupees. What he actually does, is to water the entire holding whenever he can get water enough, and then to cultivate it all, whether with autumn crops, or, if the water lasts, with wheat and other spring grains. In this way he gets off with one-third of the proper assessment per cultivated acre. Of course he loses his chance of fallowing the land, but that gives him little concern, for waste land is plenty, and he has only to throw up his whole holding when the year is out, and take up another of equal size. In Sindh Proper, this plan of cheating the revenue has been stopped by requiring the landholder to pay at full rates for the whole of his holding, whether cultivated or not; while the areas of holdings are at the same time restricted to what can fairly be brought under the plough in an average season, and fallowing is provided for by allowing the holder to relinquish fields successively, retaining a lien on them for two years after relinquishment. Some such arrangement will probably be introduced into the frontier districts sooner or later. Meanwhile, if the revenue returns for 1878-79 be examined, the productions of irrigation in Sindh will be found such as to satisfy the most exacting critic. The expenditure on maintenance and collection was 16½ lakhs; the revenue realised on account of canals was 29½ lakhs. But in truth, from the revenue officer's point of view, the virtue of the canals is inestimable; for without them there would be no revenue from these lands at all. The whole area of Sindh is about 34,000 square miles, only 13,000 of which are recorded as culturable, and about one-fourth of this latter area is, as we have seen, under canals. These figures convey a graphic idea of the desert and sterile character of the region; yet the lands recorded as unculturable owe their unenviable distinction simply to the fact that they lie above, the level of the canals; and it may be found possible, in the long course of years, as the canals extend and trees are planted, to bring even these high levels under cultivation, by attracting rainfall as a consequence of afforestation. At present along a single canal (that of Forced Labour) the Canal Department can point to nine thousand trees planted by the waterside, eight thousand of which are *babul*, a tree very suitable to a country which has been called Little Arabia, for the *babul* is the very acacia which in the greater Arabia waves her yellow hair

> Lonely and sweet: nor loved the less
> For flow'ring in the wilderness.

But the yellow hair of the Indian *babul* waves unnoticed, save haply by some solitary Englishman riding home through the thorny jungle in a golden afternoon of March, when the air is heavy with faint perfume.

Sindh is in several respects one of the most remarkable provinces of India, and not least so with regard to irrigation. Nowhere else do we find an entire province dependent upon a periodical water-supply, and nowhere else are canals so emphatically productive works. The annual Canal Report for Sindh furnishes the most striking testimony to the benefits of a strong and upright Government, however far removed, by alien blood and creed, from sympathy with the people, under its rule. Native governors designed some of the most important works, but it is only British supremacy that can guarantee their continuance. Persia, Mesopotamia, parts of Arabia can offer examples of the fate of embankments and canals under the vicissitudes of Oriental despotism. A great monarch accomplishes a gigantic work; and his successors allow it to go to ruin; while the people, disheartened and pillaged, have neither the energy nor the means to do the repairs themselves. Even in Sindh, the annual clearances, so necessary to the efficiency of the canals, are not managed without some trouble. An inundation canal differs from a permanent canal in the circumstance that it receives flood water only, which cannot be turned on and shut off at pleasure. Stones and silt come down with the flood; the volume of water cannot be regulated at discretion, and often breaks away from control altogether, striking out new channels and leaving the old one almost undistinguishable. Another tendency of flood irrigation is to convert the canal into a river, and thereby destroy its utility as a channel for the economical distribution of water. Even in the best years, the work of clearance is no light one, and but for the steady pressure of the canal officers, it would be very imperfectly done. Here it is that the regularity and persistence of a civilised administration prove so useful. Much depends, too, upon the careful collation of statistics, shewing how irrigation stands from year to year. Greater accuracy in these returns of areas is expected as the revised land-revenue settlements are gradually introduced. At present, the estimates of irrigated area are to a certain extent approximate. In the settled taluqas, the data of calculation are the known areas of the 'survey fields' into which the land has been divided for settlement purposes. These fields, however, are often very large (some of them, in the earlier settlements, were as large as 60 acres), and the whole of a field may not be watered; so that in fact the irrigated area has to be estimated by a rough comparison between the known area of the field and the apparent proportion borne to that area by the portion irrigated. In the unsettled taluqas, which are found chiefly in the Hyderabad district, where irrigation is by the Persian wheel, the area is calculated by allowing an average number of acres to each wheel actually in work; while the area of flow irrigation is roughly measured each year. With the revised settlements, more manageable 'survey fields' will come into use, and the cases will be rare where any part of a field has to be left unwatered; thus the area of irrigation will be known with much more precision than at present. There is every reason to believe that it will go on steadily increasing. Sindh is a province which has a future before it. The opening of the Suez Canal has invested the Sindh canals with a new importance; and the wheat growers of Kurrachee now enjoy the advantage of greater proximity to the European market than their rivals in the broad valley of the Ganges or the rich uplands of Chuttisgarh. Nor is Kurrachee alone in this favoured position. Thanks to the railway, which now traverses the length of the province, the remotest taluqas of Shikarpore are but little behind-hand; and Sindh officers may well be excused for the peculiar pride with which they profess their belief in the development of a province which has been redeemed from the desert not less laboriously than Holland from the sea.

UNANIMITY AMONGST TEA PLANTERS.

THE recent meeting of planters in Cachar has illustrated an important phase in connection with the tea industry, and that is—the utter want of unanimity that exists among the planters, as to their wants from a legislative point of view. We remember—several years ago, the Government asked the tea interest to meet and help in compiling such regulations as should be calculated to give the greatest satisfaction in working, and an influential commission of officials was deputed to meet with these delegates. What was the result, why nothing, no two of them agreed on any point, and the only conclusion the Government could possibly arrive at was, that it would be time enough to redress grievances when the aggrieved should decide on what constituted their grievances. For years the friends of the planters have urged union among them, but it has all been in vain. Petty jealousies and local interests have interfered; for it is absurd to say that indifference is the cause, the planter is sufficiently active in airing his own personal grievances. The real cause is that what suits one planter, does not perhaps suit another, and, as each clings pertinaciously to his own idea of what is wanted in the way of legislation, nothing can be done. It is absurd to blame the local Government, which doubtless would so legislate that all parties would be satisfied, if that were possibility. But as there seems no chance of unanimity, what can the Government do? The new society at home, the *Indian Tea Districts Association*, has petitioned the Government for sundry alterations in the existing law, reforms the memorial calls them, and among these that urgently wanted improvement, the propriety of substituting a five years' agreement for the present three years' engagement, occupies a prominent place. Recently a meeting was held in the sudder station of Cachar for the purpose of emphasis

ing this memorial, with the result of as usual agreeing to nothing. The motion for supporting the movement for a five years' engagement as against one for three, was lost, and that by the casting vote of the Chairman.

This must tend materially to weaken the hands of the Association at home, and make them ridiculous in the eyes of the Government. Here they have been most earnestly urging a reform for the planters, which a large section of those planters have just declared they do not want. If the tea industry is to be relieved from oppressive legislation, the first step towards this enfranchisement will be the formulating of the objections to the present Act (VII. of 1873, B.C.,) and submitting a list of such amendments as are calculated to put matters on a fair and just footing. There is no one who knows anything of the tendency and working of that Act, but knows that it bears with undue severity on the planter; we shall simply indicate one or two points in proof of this. In the early days of tea-planting in India, when coolies were imported from their homes and set down in the midst of dense jungles, there existed room for such a regulation as that regarding the maximum price of rice, which was often only obtainable at famine rates. Gardens were frequently situated in isolated spots, far away from bazaars or centres of supply, and were often separated from these centres by long stretches of almost impassable roads, not unfrequently by immense distances without any trace of a road at all. Under these circumstances it was but fair to throw the onus of providing food for these ignorant strangers on the planter, and the fixing of a maximum rate, although not exactly in accord with the principles of free trade, was unavoidable. Now, however, everything is changed, the coolie can always command a supply of grain at ordinary bazaar rates, and if it be considered necessary to keep to the rule of making the planter supply rice at a fixed maximum rate, it would only be fair to make that rate fixed, whatever the price of rice. As matters stand at present, whenever rice goes above the maximum price, the coolie demands his thirty seers per month at the Government fixed price, but should prices fall below that limit, the coolie goes to the bazaar and buys in open market. This we hold to be unfair in principle. The planter loses heavily on rice, and he should be allowed the opportunity of squaring his account, when the price of rice is in his favour. If it be considered advisable to adhere to this idea, it should be so modified that the coolie should be bound to purchase from his employer all the year round at the maximum rate. A much fairer plan would be to assess the average loss to the coolie on this article of consumption, and add that, in monthly increments, to his wages, leaving him all the year round to make his own arrangements as to purchasing. The bazaar is usually close at hand, and there is now no difficulty in procuring supplies within easy distance of each factory. For his own benefit the planter might be depended on to see that the local bazaar was sufficiently close to be convenient to his labourers. This has long been a steady grievance, and one upon whose merits no difference of opinion exists. Another hardship is the ease with which a coolie can break his agreement; although the planter feels this sore to be a severe and costly one, his sense of fair play impels him to do justice to the labourer. He knows for instance, that the coolie may have cost him one hundred rupees to land on the garden, but he also knows that this sum did not go to the coolie's pocket. The whole system of recruiting wants remodelling, but it might perhaps be the quietest plan were the planter to allow this grievance to right itself, which it is doing steadily and surely by the help of improved communication between the recruiting districts and the gardens. The planter must, however, lay it to heart—and this brings us back to the subject we started with—that no satisfactory redress of this grievance or of any other, will ever be attainable until a network of associations is spread over the tea districts, each one independent locally, but all affiliated to some centre, and all bent on carrying out the same rules, which shall have for their object the general good of the industry and not the furthering of private interests. Then a coolie who breaks his agreement without just cause, will have his descriptive roll sent to each garden, and will find it utterly impossible to obtain employment. He will thus be compelled to go back to the planter who imported him at [illegible] with whom he entered into an agreement for a [illegible] of this sort will put a stop to deserting voluntarily, or with the help of the sections of Act VII. We need not enlarge on this subject, as we imagine we have said enough to point the moral of unanimity and union.

THE SALARU FARM.

THE report on the Government Farm of Salaru for the half-year ending 30th April 1880, has recently been issued, and if nothing else has been effected, a clear proof of the benefit of deep ploughing has been adduced. But we do not get all the information we should like, and which is necessary to enable us to form a clear opinion on the point. For instance, we are not told how the ordinary country cattle managed to drag the English ploughs, nor is a word said as to the relative depths of the furrows as compared with those of the ordinary country *hal.* The experiment referred to was made with *bajri* and cotton. The field selected for the *bajri* experiment, was one overrun with a perennial grass crop, and while this was naturally against a good yield of grain under ordinary circumstances, it served the more clearly to prove the value of the work done by the English plough. The great difference between the English and native ploughs is that the former gives a deeper furrow, and besides it does what is never attempted by the native implement—it completely inverts the mould. Two advantages accrue from this—a new stratum is exposed to atmospheric influences, and the roots of perennial grasses and weeds are exposed to the action of the sun. Thorough exposure to the atmosphere constitutes the best manure the farmer has at his command, and it is one which after all does not cost much. Instead of ploughing so many beegahs per day, according to the cattle power at his command, if the rayat would only do, say two-thirds as much, and do it deeper, he would be astonished at the result. The country plough scratches the soil, and exposes the roots of the weeds to atmospheric influences thus fostering their growth in a remarkable degrees, while the stratum of soil which he actually loosens and leaves to a certain extent to be acted on by the air, is the same stratum which has done duty in this way for centuries, and which has as little humus in it as a handful of sand. With regard to the grass and weeds, the mould board of ploughs on the English system completely inverts the soil and exposes the roots inverted to the influence of the sun, which speedily deprives them of their germinating power. The plough used at the Salaru Farm was a Howard's English, and must of course have been of very light draught, turning over the soil to the depth of perhaps 3½ to 4 inches. We should have liked definite information on these points, and also as to whether the draught was within the reach of the ordinary country bullocks, without having to increase the number of cattle yoked to the plough. In the case of the crop of *bajri*, the result was so satisfactory as to be decisive.

The following table will give at a glance the results :—

	Scinde plough.	English plough.	Excess of English plough over Scinde plough.	
	lbs.	lbs.	lbs.	Percentage.
Grain ...	1,059	1,578	519	49
Straw ...	3,215	4,139	1,224	38

Otherwise than in the matter of ploughing, both plots were treated exactly alike, both having received two artificial waterings.

Now we turn to the cotton. Two acres were ploughed with the English plough, and five acres with the ordinary village implement. In other respects the plots were treated exactly alike, and the results obtained were as follows (in lb. of uncleaned cotton per acre.)

	Scinde plough.	English plough.	Excess of English plough over Scinde plough.	
	lbs	lbs.	lbs.	Percentage.
Uncleaned ...	1,164	1,561	400	34¼
Equal to cleaned	388	521	138	31⅓

The value of the excess 133lbs., was Rs. 28-10-4, it having actually sold for this sum, while the cost of the extra deep ploughing was Rs. 5-5-7, leaving a clear gain of Rs. 22-4-9 per acre. And this is not all. The improvement resulting from the deep ploughing will be found to be permanent, and future crops will derive benefit from it. In this way the value of the land will be improved.

During the half-year under notice, sundry other experiments were entered on, but as they do not seem to have been followed up carefully, they were bare of useful results. For instance, in one case, village cattle were permitted to destroy a crop, and surely where the exact results of experiments are aimed at, such a contretemps should have been prevented. The experiments with different manures gave much less of a valuable residue of results than did the deep ploughing trial, and we would strongly urge on cultivators, both of cereals and perennial crops, such as teas, coffee, &c., to give a large amount of attention to deep cultivation, where of course the soil is suitable. Where the subsoil is cold and sour, it would be ruinous to bring it up to the surface, but where there is a fairly good subsoil, as is the case in most cereal soils and in almost all tea soils, the advantages of deep ploughing and hoeing cannot be overrated.

EDITORIAL NOTES.

With the view of promoting agricultural improvement in Bengal, and encouraging the study of scientific agriculture, the Lieutenant-Governor has determined to create annually two special scholarships of £200 a year each, to be held by science graduates of the Calcutta University at the Royal Agricultural College, Cirencester. The first two scholarships will be tenable for two and-a-half years from the commencement of the January term in 1881. Only natives of Bengal, Behar, or Orissa, who have passed the B.A. examination on the Physical side, will be eligible. An allowance of Rs. 1,000 will be made to defray the expenses of each scholarship-holder in proceeding to England, and a similar allowance will be made for the return journey on the completion of the course. Applications will be received by the Director of Public Instruction, and will be submitted to Government with a report from a Committee consisting of the following gentlemen: The Director of Public Instruction, Mr. C. H. Tawney, Baboo Bhudev Mukerji, C.I.E., and Mr. A. W. Garrett.

With reference to the Indian Famine Report, just issued, it is stated that the questions of tenure irrigation, railways, &c., will be dealt with exhaustively in the second part of the report, which will, it is hoped, be ready for presentation to Parliament, before the close of the session. The first part of the report relates to famine relief; the second deals with the measures by which Government, through its action, may place the people in a better condition to withstand the effect of droughts.

We have before us the last General Administration Report of the Patna division, from which we learn some of the excellent results that have attended an increased cultivation of the sugarcane. Canal irrigation has done much by reclaiming and fertilising waste and barren lands, to develop the area under sugarcane, especially in the Gya district and in the Jehanabad sub-division. In the latter district the canal water, by means of the great facilities it afforded to the cultivators, has given a great impetus to the sugarcane industry. The results of last year's operations, we are told, paid very well, and there is no reason to doubt that the cultivation of sugarcane will continue to extend in the immediate future. Some remarks of the Sub-divisional Officer of Jehanabad are especially noteworthy, and we shall reproduce them here in the shape of a brief extract. He says that:—

"A ryot has made a clear profit of Rs. 80 per beegah by sugarcane. Comparing this with the sum of Rs. 8, which is considered to be a good profit in a beegah of *rubbee* or *khureef*, and that of Rs. 20 which poppy yields, there can be no doubt that sugarcane is the most valuable crop, and that an extensive cultivation of it is more likely than anything else to raise the condition of the ryots. There are no doubt certain drawbacks, namely, that the crops remain longer on the ground than any other, and that the work of preparing the land and irrigating the crops is extremely arduous. Still, the cultivators say that it does not require the same unvarying and engrossing attention that poppy cultivation does. It has been found that the sugarcane has in some places superseded poppy cultivation."

It will be seen that some most important statements are contained in the above paragraph, and we shall be glad to hear of further attention being paid to the subject. Many improvements have been made of late in connection with the sugarcane industry in Bengal. Experiments in agriculture have been carried out by European and native gentlemen, of practical knowledge, and new machinery has been invented and introduced in some parts. Conspicuous among these have been the gentlemen in charge of the Beheea estate—Messrs. Burrows, Mylne, and Thompson—whose new sugar-crushing machine, by reason of the great saving it effects in the outturn, is destined apparently, soon to be universally adopted. According to the Lieutenant-Governor these gentlemen, by their experiments, are "rapidly revolutionizing the whole (cane) sugar industry of Bengal."

Perhaps the most marked instance of success in the way of improvements that do not interfere with the rayat's prejudices is Messrs. Thomson and Mylne's Beheea mill. An improved cane-crushing mill was called for, and these gentlemen responded to the call, with the most gratifying results to all concerned. Their mill has many points to recommend it: first, it is simply the old native mill improved upon, and this is a strong point in its favour. It does not look like an English mill, but has all the characteristics of the old country mill the *kolhu*. Then it takes no more power to drive it, no more bullock power we mean. It would doubtles be easy to construct a mill which should do its work in a very complete manner, if no limit were placed on the power necessary to drive it, but with the average rayat, this is all important. He has a certain amount of bullock power at his disposal, and if you make a demand on him beyond this amount, you at once call on him to make an extra outlay to which he objects. The Beheea mill is worked with the same bullocks which worked the *kolhu*. That is another strong point gained. The patentees claim for it the advantage that half the number of bullocks suffice as are necessary for the other, but to be safe we will say that no more power is required. Then the *kolhu* being a fixture, necessitates all the cane being conveyed to it, whereas the Beheea mill can be moved by four men from field to field, a great saving in cartage being thereby effected. It does not require so many attendants to work it. For the old mill the cane has to be cut into short lengths, and as at the ends of each length fermentation is apt to supervene, it is easily understood that the quality of the juice is prejudicially affected thereby. The Beheea mill takes the cane whole, thus saving the labour of cutting and obviating the chance of fermentation. The juice from the latter sells therefore at 25 per cent. higher price than the other. Besides this, the rollers having more grip, the percentage of juice is larger than from the *kolhu*. Against all these advantages, there is only the drawback of increased cost. The prices are from Rs. 80 to Rs. 95, according to size, a sum considerably higher we presume than the cost of the other, but this does not weigh as a feather in the balance with the rayat, when he sees that this extra cost will be more than recovered in the course of a single season. Consequently we are not surprised to find that over nine thousand of these mills have been purchased in the Shahabad district alone.

We have repeatedly pointed out the absurdity of India purchasing sugar from other countries, when she can grow it so well herself, and we have also made the same remark regarding other articles. A few such successes like that of the Beheea cane crushing mill, and we shall have no cause for complaint left.

A Circular has been addressed by the Director of Agriculture and Commerce in the North-Western Provinces to all persons interested in the improvement of agriculture. The circular makes some very important suggestions, which we make no apology to place before the reader. In the first place the liberal use of bone dust as a manure is recommended. The circular says:—"The great increase in produce which results from the use of crushed bones as manure seems quite unknown to the people of this country, although in England bone dust is extensively

used and paid a high price for (Rs. 3 a maund). On the Cawnpore Farm, during the last *rabi* season, bone dust applied at the rate of 3½ maunds to the acre, gave a wheat crop of nearly 24 maunds of grain and 35 maunds of *bhoosa* to the acre which was 8¾ maunds of grain and 15 maunds of *bhoosa* more than was gained from unmanured land."

The crops for which bone dust will be found most useful are, maize, sugarcane, wheat, and barley. Then we learn that the urine of cattle is a far more potent manure than their dung. The circular says :—" In Europe it is carefully collected by keeping bedding of grass or straw under the cattle in their sheds, which absorbs all the urine as it falls, and which when rotted is applied to the land as manure. In this country it is inadvisable to use bedding since in the hot weather and rains it harbours insects and rots the feet of the bullocks, but I recommend that an attempt be made to collect cattle urine in the following manner. Have the floor of the bullock shed sloped off to a pit in one corner, and well rammed with clay, so as to let the urine drain off it into the pit. Keep the pit half filled with loose earth, taking out as much of it as is saturated with urine, say, once a week, and replacing it with dry earth. The earth saturated with urine should be kept for 3 or 4 months, and then applied to one-half of a field, and its effect in increasing the produce judged of by comparison with the other half."

Deep cultivation is highly recommended. The chief difference between the Indian and European methods of tilling the soil lies not so much in the *depth* to which the soil is cultivated, but in the fact that the European plough *turns the soil right over* while the Indian plough merely stirs it. Most European ploughs are meant to be drawn by horses, and are too heavy for bullocks, unless two or three pairs are yoked. But a plough on an American model has, we learn, been adopted by this department which is very light, cheap, and simple and which with an ordinary pair of bullocks will plough to a depth of 5 inches and turn the soil completely over to that depth. Many district officers and native gentlemen have used this plough, and given very favourable accounts of it. The Agricultural Department, we learn, is willing to lend ploughs of this kind for trial on application.

The Bengal Government has granted a sum of Rs. 2,000 for the importation of good potato seed from England and Australia, which on arrival is to be planted at Kalimpoong. Some years ago Darjeeling used to be famous for the excellence of its potatoes, and a very considerable trade in this produce with Calcutta and other places existed. Of late years the Darjeeling potato has been steadily deteriorating in quality, and the export trade which formerly existed has in consequence become almost extinct; Calcutta being now almost exclusively supplied with Bombay potatoes. The deterioration of the Darjeeling potatoes is apparently due to the native *jhooming* system of cultivation having become impossible in this district of late years, to the use of inferior seed year after year, and to the native cultivators knowing nothing about the rotation of crops, and never manuring the ground before sowing. The usual practice with the native cultivators is to sell the largest and best potatoes and to reserve only the smallest and worst as seed for the next season's crop, with the inevitable result of yearly deterioration both in quantity and quality. The introduction of a new and improved strain of seed in this district is calculated in time to restore a trade which has, owing to the causes above enumerated, almost ceased to exist, and it may safely be predicted that Government will in a very short time recoup itself for the Rs. 2,000 sunk in the very laudable effort to encourage the cultivation of a better class of potato by the hill people. That really splendid potatoes can be grown in the Darjeeling district is very well known, and the fact has been proved by a local gentleman, who imported some seed from Messrs. Sutton at the beginning of the year, and who planted it out on carefully prepared land. The crop is now being dug, and the results are more satisfactory, the potatoes being fully equal, both in quantity and quality, to English grown potatoes.

The *Pioneer* says that " the Government of India has ordered the extension of poppy cultivation to the Agra, Muttra, Aligarh, and Moradabad districts of the N.-W. Provinces, in addition to an increase in the area in districts where the cultivation at present exists. A considerable increase in the staff of the department, European and native has also been sanctioned. Mr. H. Rivett-Carnac, C.I.E., the Opium Agent, to whom the necessary measures have been entrusted, is now on tour, arranging in communication with local officers, the details of the new scheme."

The Lahore paper publishes a long letter on the Hissar Cattle Farm, and the vast improvements it has undergone under the able management of General Angelo. Beneath his fostering care, the writer tells us, jungles have given place to luxuriant and neatly kept fields, order has ousted disorder, neatness taken the place of untidiness, and economy that of lavish expenditure. He has initiated a new of system of ploughing and cultivation, to see which the zemindars not only flock in crowds to Hissar, but of which they have expressed their approval by adopting it themselves.

The news from the Berars is very bad, we are sorry to say; the clouds are carried over the country by strong westerly winds and no rain falls. A six-anna cotton crop is the utmost that is now hoped for.

A *Daily News* telegram from Alexandria states that the cotton and other crops in Egypt are looking splendid, and that the Nile promises to be equal to last year. Land is increasing in value.

When we are hearing such an outcry from most quarters regarding what is called " the deplorable state" of Indian trade, says the *British Mercantile Gazette*, it is well to look into the facts as represented by recent statistics. As for the financial blunder, that belongs to a totally different aspect of the question, but looking at the returns regarding India's foreign trade, there is no evidence of retrogression, but of steady progress, only temporarily interrupted by the universal depression. During the last ten years the imports of merchandise into India have increased 25 per cent., and transactions in cotton manufactures have gone up 50 per cent. The exports during the same period have increased over 20 per cent. Jute, hides, and skins, opium, grain, seeds, particularly represent a fair increase; but the most remarkable figures are in regard to tea, which has improved 200 per cent. during the last ten years.

The weekly report of the Bombay Chamber of Commerce just issued, gives the details of the trade for the first seven months of the year :—

		1879.	1880.
Cotton	... bales	551,978	816,036
Wool	... „	40,228	59,506
Linseed	... cwt.	421,931	1,400,318
Wheat	... „	8,590	1,075,509
Coffee	... „	90,969	106,895

It will be seen that cotton has increased 48 per cent., wool 47 per cent., linseed 230 per cent., wheat 12,304 per cent. (!) and coffee 18 per cent. No little part of the enormous increase in wheat shipment is owing to the opening of the short distance of the Rajpootana railway. The *Bombay Gazette* says there is still a good deal of wheat and seeds to go forward, and the stock of cotton in Bombay is much larger than for many monsoons, so that prospects for the rest of the year are encouraging.

Ceylon promises to make a good show at the forthcoming Melbourne Exhibition. Tea, coffee, cinchona, cacao, and cinnamon will be among the chief agricultural products, while in the ranks of manufactures the cabinet work of the Kalutara and Galle carpenters will stand well to the fore. Mr. A. M. Ferguson, senior editor of the *Observer*, who goes as the Ceylon Commissioner, carries with him the confidence of all classes, and there is no doubt but that he will do full justice to all Ceylon interests committed to his charge. The Madras specimens have been sent to Melbourne, and, according to the catalogue published, they ought to attract some notice.

Prof. Baeyer has, says the *Athenæum*, discovered and patented a method of obtaing artificial indigo, which is to be worked on a commercial scale by the Baden Aniline Company. The indigo is obtained from chloride isatin which is produced from benzole.

The Rangoon trade in salt shows considerable improvement annually. During the past official year, says the *Gazette*, 1,430,208 maunds of this article were passed through the Custom House for consumption on payment of a duty of

Rs. 1,71,816, while in the year previous, 1878-79, only 905,712 maunds nett, yielding a duty of Rs. 87,697, were consumed. Of the first mentioned quality, 894,323 maunds were consumed locally on payment of a duty of Rs. 1,67,686, at the usual rate of 3 annas per maund, and 535,885 maunds were exported to Upper Burmah and charged with duty at one per cent. of the market value of the commodity under the provisions of the Treaty of 1862. The latter quantity then paid the nominal tax of Rs. 4,130 only, whereas if charged with duty at the usual rate the amount collected thereon would have been Rs. 1,00,479.

NEW rice mills are still the order of the day in Rangoon, amongst both European and native firms. Three new ones are being put up now, and are expected to be ready for working by the next rice season; and we believe one additional rice mill is to be started in both Bassein and Moulmein. Improvements in rice machinery are yearly effected, and with the rapidly extending demand for cleaned Burmah rice in China and South America, there will doubtless be profitable trade for all the new erections in a few years. It is to be regretted, however, that the mercantile community do not interest themselves more in the land question, and move the Government to make more liberal grants of waste land, for the purposes of cultivation. There is no doubt a more liberal system would attract to these waste lands the population and capital which are now confined to the large towns, and if new rice mills continue to be erected in the numbers that they have been of late years, the difficult question for their owners to decide will be where to get sufficient supplies of grain to keep them constantly working. It would, therefore, be advisable for the merchants to look a little ahead, and to do all they can to encourage an increased cultivation of rice, or they may find in a few years that they have gone so far ahead of the present capabilities of the province, that their mills will be forced to remain idle for a great part of the year owing to the inability of the present population to supply them with paddy or unhusked grain in sufficiently large quantities. The capability of the soil may be boundless, but with the slow rate of increase amongst the agriculturists, which may be put down to the restrictions, red tape, and routine which has to be gone through to acquire land for cultivation, we may shortly find that the milling power in Rangoon is enough to convert the whole produce of the province into rice in a very few months of the year.

OUR Rangoon correspondent writes to us:—Government recently despatched a model of a Burmese kyoung or monastery to the Melbourne Exhibition. Had specimens of our lacquered-ware, silver workmanship, rice and tobacco been sent, I think it would have given the colonists a better idea of the province, and possibly induced some orders from Australia to our merchants and traders. Tea from Arakan and coffee from Tonghoo might also have been exhibited. Both are of the finest quality, and it is greatly to be regretted that unwise land legislation keeps the cultivation of both products backward. Surely to encourage the cultivation of such valuable articles for export, Government might offer land, of which there is such abundance here, free to any company or private person who could shew they possessed adequate means for cultivation, and on such terms that if the land was not used for the purpose it was applied for, or a certain proportion not brought under cultivation within a certain number of years, the land would be liable to be resumed. It can only be by some such liberal terms offered to the first in the field that we can hope to attact capital and population to this province. This has been pointed out over and over again, but still the Government made no move, and only offer leases where they should gladly make a present of the free hold to induce capitalists to come forward.

THE experiments of jute cultivation that have been carried on lately in Brazil are likely, it is said, to turn out a success. Both the soil and climate of the Brazilian lowlands are well fitted for growing jute; in some places two crops a year are obtained. The fibre of the Brazil jute is said to be of a superior quality; and the Brazilians are prepared not only to grow the raw material, but also to start manufactories.

THE *Lucknow Times* gives the following interesting account of the growth and manufacture of Chinese white wax:—

The white wax of Sze-chuen, China, is most peculiar in its growth. We observe that Baron Richthofen estimates the value of the annual crop, on the average at about £650,000. In 1879, upwards of £81,000 worth of this curious entomological secretion was exported from the one port of Hankow alone. White wax is the mere exudation of an insect in a state of disease, aggravated probably by the operation of an uncongenial climate, and favoured by the presence of a tree for which the creature has an affinity. In the Keenchang district, an evergreen, known as the *ligustrum lucidum*, thrives in abundance, and on its twigs in the spring of the year countless flies swarm like a brown film. The branches soon become covered with a white, soapy incrustation that increases in volume until the commencement of the fall of the year, when the sprays are cut off and immersed in water, which is kept boiling. The viscid substance rises to the surface, and is skimmed off, melted, and allowed to cool in deep pans. It was accidentally discovered that by transporting the insects from their native district to the more vigorous one of Keating Fu, in the north of the province, their capability of discharging wax was largely augmented, a property which was promptly and extensively availed of by the Sze-chuen traders. The period between morning and evening is chosen for conveyance, because many hours of sunlight would percipitate the hatching. This should take place only after the females have been attached to the trees. Arrived at their destination, six or more of the mothers—which are enormously prolific—are tied, wrapped in a palm leaf, to a member of the *ligustrum*. A few days later the young flies are swarming on the twigs, where they fulfil their mission by the month of August. Then they perish in the caldrons, where the results of their brief existence are collected. It is said that this peculiar industry requires the exercise of great care, forethought, and experience.

A DUBLIN paper, the *Farmer's Gazette*, says that the durability of wooden posts planted in the ground depends in a great degree on whether they are planted in the position in which they grew or *vice versa*. Owing, it is supposed, to the moisture not being able to ascend against the grain, posts planted top downwards remain sound many years longer than those not so reversed.

SELECTIONS.

THE MUDDAR PLANT.

A MEMORANDUM on materials suited for paper-making that we have received from the Agricultural Department, contains a most interesting monograph on the above weed.

We use the term "weed" advisedly, for though gifted with almost every quality that can make it useful to man, the Muddar still continues a useless jungle plant, that can be viewed in almost every part of India from the windows of a railway carriage—a standing example of how much yet remains to be done before the much-talked of development of the resources that lie at our feet, becomes an accomplished fact. The whole of Rajpootana so far as we have seen it, may be called a Muddar preserve; the plant abounds all over the Punjab and the N.-W. P., is found in moist and marshy Bengal (we have seen a splendid specimen of it in a compound in Calcutta), occurs again in Madras and Mysore, everywhere in fact where there is soil on which to grow, and where no care is required for its growth. In the words of the Report before us, it will grow where nothing else will grow—on beds of sand for instance. But it is equally at home on rich soil; a perfect cosmopolitan in short, that presents itself everywhere whether it is wanted or not, and always with a kind of mute reproach expressive of—"Why do you not make use of me? You could easily do so if you would only take the trouble, in place of frittering away your time on other plants that have not half the good qualities which I possess."

We must confess the Muddar is a perfect pariah amongst plants. Nobody takes care of it, for it takes such good care of itself that it is looked upon rather as a nuisance by those who have an eye for the picturesque. Its tough sea-green leaves are suggestive of leather, and it is only, while the pods are bursting and the silky contents floating about upon the wind that the plant can lay any claims to beauty. But that is a matter of opinion. The homely useful qualities of the weed we shall attempt to describe as briefly as possible in the following lines.

So far back as 1852 Dr. Riddell, Officiating Superintending Surgeon of his Highness the Nizam's Army, came to the conclusion that the milky juice of the Muddar, was not unlike guttapercha. After drying, he tried experiments with it in acids, alcohol, liquor potassæ, and spirits of turpentine, and the tests corresponded exactly with the established results of the real guttapercha. Captain Meadows Taylor of the Hyderabad contingent on hearing of these experiments tried another test. A piece of the real guttapercha of commerce and a piece of the new substance, both of the same size, were softened in hot water and united readily. He then submitted the mixed substance to a test by acids, and the results did not differ from those on either of the two original separate substances. In May 1853, Captain Hollings, Deputy Commissioner of

Shahpur in the Punjab, obtained precisely similar results with the juice of the plant grown in that province. He also used the Muddar guttapercha, instead of silk, for isolating wires used for the conveyance of electricity, and he found it to answer very well He placed a wire covered with the substance in a brass vessel filled with water, and found that the electric spark was carried along the inner wire without interruption. Dr. Riddell sent some specimens of the new guttapercha to be examined by a chemist in London, who put it into the hand of a scientific gentleman, Professor Redwood, who said :—" The substance resembling guttapercha, obtained from the Muddar, I find possesses several properties in common with guttapercha, while in other respects it differs." He tried to vulcanise it (i.e., to combine it with sulphur) but did not succeed, and he did not think it could be deprived of its property of being a conductor of electricity.

No further attempt has been made to solve this problem for more than a quarter of a century !

The next good point about the Muddar is the toughness of the fibre yielded by its stems. Ropes of surprising strength can be made of it, and it is also suitable for weaving as it blends readily with silk. Fishermen in Sind use it for their nets, and the hillmen in the Rajmahal Hills use it for their bowstrings, which are said to last five years in constant use and exposed to all kinds of weather. Some twine made from this (the Rajmahal variety) bore 248lbs. and 343lbs. in the dry and wetted conditions, when hempen twine of the same thickness bore only158lbs. and 190lbs. in the same conditions. Some experiments on the Madras variety again showed that it bore 532lbs, when the *sunn* of Coimbatore bore 407lbs., the *agave* (aloe) 362lbs., cotton 346lbs., and coir 224lbs. only.

The extraction of the fibre is the difficulty. It has to be picked off the inside of the bark, *not* from the stem itself. Captain Hollings says :—

" The workmen bite through the bark about the centre of its length ; they then hold the tissue of threads in one hand and separate the bars with the other. I have tried hot and cold water, and all the arrangements known for the separation of hemp, or rather the preparation of *sunn* jute, &c., without success ; as yet human teeth and nails are the manipulators, but it is not unreasonable to suppose that some chemical process will be discovered by which the bark will be easily separated from the fibre."

In 1855, practical men in England pronounced the fibre to be well calculated for supplying the place of good flax for making prime yarns, and it was considered at that time to be well worth from £30 to £40 per ton. Here too nothing has been done to improve the methods of extracting the fibre for the last quarter of a century.

The third product of the Muddar is the smooth glossy cotton, yielded by the bursting of the pods, and which resembles short lengths of pale yellowish-white floss silk. In France and Germany this has been worked up into articles of dress, and Messrs. Thresher and Glenny also succeeded in manufacturing a texture composed of equal parts of Muddar floss and cotton, and also a flannel from Muddar in one part and wool two parts. In October 1849, Mr. Mounckton, c.s., of Etawah, sent to the Agricultural and Horticultural Society of Bengal some specimens of cloth manufactured from the Muddar cotton. In one of those the warp or longitudinal thread was of common cotton, and the weft or cross ways of pure Muddar. In other specimens the warp was half common cotton and half Muddar, and the weft three parts Muddar to one of common cotton. At the International Exhibition of 1862 the Shahpur Jail gained a medal for its manufacture of Muddar cotton stuffs. And in the Punjab Exhibition some table napkins were exhibited made of Muddar cotton in Dehra Ismail Khan, also towels made of Muddar and ordinary cotton mixed, also a rug made of Muddar (coloured) from Rawul Pindi.

We have now said enough about the products of this valuable plant. It only remains to add that its cotton is supposed to be peculiarly well adapted for paper-making, and that it is probably in this direction that the Muddar will first be utilised. As his Highness the Maharajah of Gwalior has set an example of enterprise in starting paper mills, he may as well follow up his venture by bringing into use a material which can be had for the picking over a great part of India.—*Delhi Gazette.*

THE RAINFALL OF INDIA.

THE rainfall in India varies greatly. Cherapunji, on the Khasia Hills, north-east of Bengal, has the heaviest known rainfall in the world. Rain is estimated in inches. Every inch multiplied by 14½, represents the number of millions of gallons which fall per square mile ; each gallon weighing 10lbs. At Cherapunji the rainfall averages 521 inches a year. This means that if all the rain which falls there during a year remained on the ground, it would form a lake 43¼ feet in depth—sufficient to cover a large house of two stories. On the other hand, in Upper Sindh the average rainfall is only about two inches a year, while sometimes a twelve-month passes without a single shower. Between those two extremes, there is every intermediate gradation.

The rainfall in India is greatly influenced by the monsoons, or periodical winds which blow alternately from the south-west and the north-east. The South-West Monsoon, lasting from May to September, causes two belts of excessive rainfall. One extends from the mouth of the Irrawaddi along the east coast of the Bay of Bengal, up to the valley of the Brahmaputra, and along the skirts of the Himalayas. The other streches along the west coast of the Peninsula, from the seashore to the summits of the ghâts. In both cases, wind from the Indian Ocean, highly charged with vapour, drives against the face of a mountain range. The air in rising expands and is cooled, precipitating therefore a considerable part of its vapour. The rainfall increases with nearness to the hills in the direction of the wind. Thus at Lahore, 100 miles from the nearest hills, the annual rainfall is 15 inches a year ; at Rawul Pindi, near the foot of the hills, 29 inches, and at Hazara, on the hills, 44 inches.

On the *lee* side of a range, that is, on the side opposite that on which the wind blows, the rainfall is comparatively small, the air losing its vapour in crossing the mountains. At Bombay the annual rainfall is 71 inches ; at Mahableshwar, one of the highest points of the Western Ghâts, it is 260 inches, while at Poona it is only 27 inches.

Madras draws its chief supply of rain from the North-East Monsoon. The wind in its comparatively short passage over the Bay of Bengal, does not collect the same amount of moisture as the South-West Monsoon. The avarage rainfall at Madras is about 49 inches a year.

On the west coast most rain falls from May to August ; in the Carnatic October and November are the wettest months.

In the north-west corner of India there is an arid region, including all Sindh and half the Punjab, where the average annual rainfall is less than ten inches. Next, there are two zones of dry country, with an annual rainfall between 15 and 30 inches. One, named the Northern Dry Zone, surrounds the arid region in the north and east, in a belt from 100 to 200 miles wide. It includes Delhi and Agra. The Southern Dry Zone is in the peninsula, extending from Nasik to Cape Comorin at a distance between the two seas. The next region has a rainfall between 30 and 60 inches, and includes the upper part of the valley of the Ganges, Central India, and the eastern coast of the Madras Presidency. The deltas of the Mahanadi and Ganges, and the lower part of the Ganges Valley have a rainfall between 60 and 75 inches a year. The coast of Burmah and part of the west coast of India have a rainfall of above a hundred inches a year.

The rainfall of a few other places may be mentioned.

The highest known rainfall at Calcutta for 3[illegible] years was 93 inches ; the lowest but one, 44 inches. The average is 66 inches. According to Parkes, Benares has, on an average, 37·4 inches annually ; Agra, 28 inches ; Delhi, 25 ; Meerut, 18 ; Nusserabad, 15·8 ; Peshawur, 13·7.

At Madras* the highest known rainfall for 67 years was 88·41 inches ; the least was 18·45 ; the average 48·56. The rainfall at Moulmein is said to be about 180 inches a year.

Colombo, Galle, and Kandy, in Ceylon, have nearly the same annual rainfall,—about 80 inches a year. The rainfall in the north of the Island is only about half that on the south-west coast. At Ambagamuwa, the average is about 200 inches a year.

THE GROWTH OF BARLEY.

I WAS much struck with two letters which appeared in your valuable journal some weeks ago, the first from INQUIRER, asking for information from some of your numerous readers, respecting the barley crop of 1879 ; the other letter, signed BOTHERLY HELP, quoting an extract from a speech of Mr. Gladstone's, in which he rebuked farmers for the want of mutual interchange and communication of successes and failures in their business. As a proof how well we farmers deserved the rebuke, we find but two of our *profession* troubling themselves to give the asked for information. If the details of the different experiments made by many of us were given in our agricultural papers (of which we consider yours one of the best) much time and expense would be saved to many beginners, as they then would have simply to refer to their extracts from your Journal, and find whether or not their idea was worth trying. With your permission I will set an example by giving you a few of the wrinkles I have learned during the last thirty years in preparing the land for growing the best quality of malting barley, which is, from all accounts, to be one of the principal mainstays of the British farmer for years to come, the area where it can be grown being so small, and the demand likely to be large as soon as trade revives and our mechanics have plenty of spending money.

On no single subject connected with farming have I found such a diversity of opinion as on the preparation of land for the barley crop. If we take the Norfolk farmers for example, you will find one who will follow with his plough immediately after the sheep fold, just turning over the land with a furrow two inches deep, his neighbour will break his land up six or eight inches deep, with a plough without a breast. This will leave the dro[illegible] near the surface as his neighbour has done, and besides, will, by breaking up the [illegible] rendered it less likely to suffer from heavy rain or drought. The[illegible] both will follow with

* The following statistics may interest some of our readers. Average monthly rainfall at Madras ; January, 0·95 ; February, 0·28 ; March, 0·44 ; April, 0·68 ; May, 2·37 ; June, 1·99 ; July, 3·79 ; August, 4·53 ; September, 4·74 ; October, 10·84 ; November, 13·97 ; December, 4·98. *From Madras Observatory.*

The *Madras Administration Report*, for 1877-78, gives the average rainfall of the districts for ten years previous to 1876-77 :—Bellary, 22·34 inches ; Coimbatore, 23·71 ; Tinnevelly, 25·91 ; Kurnool, 27·33 ; Cuddapah, 28·01 ; Madura, 28·81 ; Kistna, 30·41 ; Nellore, 33·47 ; North Arcot, 33·83 ; Salem, 34·66 ; Godavari, 36·49 ; Trichinopoly, 37·06 ; Tanjore, 37·87 ; South Arcot, 38·29 ; Ganjam, 40·48 ; Vizagapatam, 41·01 ; Nilgiri, 44·68 ; Chingleput, 50·64 ; Madras, 53·33 ; Malabar, 107·95 ; South Canara 136·60.

another ploughing just previous to drilling the barley. The second is the system from which I have seen the best results. Again, you hear another light land farmer as strongly recommend ploughing but once after the sheep fold. This may answer in a favourable season, when your land suffers from neither heavy rains nor droughts, but it is not one that I would recommend. Then, with respect to the mixed soils and so-called heavy lands of Norfolk, you find just the same variety of opinion. My experience, and what I could learn from successful barley growers, convinced me that it was necessary to get the major part of the land folded and ploughed up before Christmas, giving it one fair earth of some five or six inches deep, then letting it lie until the latter part of March. Then scarify it across the furrows, harrow, and drill from six to eight pecks of the best barley you could obtain, and hope for the success you deserve. By the coast you find still another plan in operation. They grow heavy crops of swedes and white turnips, all of which are carted either on to the wheat stubbles, and there thrown about for the bullock to blow themselves out with, or are carted home and given without stint to the bullocks in the boxes. The land is then ploughed once, and sometimes twice, about three inches deep. Then in April they drill from three to four bushels of barley per acre, and, as any one out of the district would suppose, they grow a heavy crop of weak soft straw, with an equally light crop of inferior barley. One or two outsiders adopted the plan of feeding a third of the roots on the land, then first ploughing it six inches deep without the breast, and afterwards about four inches in the usual way; drilling in March from eight to ten pecks per acre, with a marked improvement both in quantity and quality.

The system of growing barley after wheat has very much increased of late years, neither the crops of straw nor corn are so heavy as after roots, but the quality of the barley is generally much superior and more suited for malting purposes. The cultivation found to answer best is ploughing the wheat stubble in, soon after harvest, then another earth in January or February, the manure being applied during the frosty weather. If any artificial manure is used, it might consist of two to three cwt. of superphosphate and one cwt. of nitrate of soda.

The growth of barley on heavy clay lands has also come more into favour since the price has increased, and that of wheat decreased. The usual cultivation is as above, if it is grown after wheat; and if after dead fallow, the land is summer-fallowed in the usual way, mucked in autumn or winter, and again ploughed during the winter. The best time for this last operation is when there is a frost, which will require to be very severe to prevent one's getting on with this work; the land will then fall down like lime, and take but little working when the barley is drilled. Two cwt. of superphosphate will improve the quality of the crop.—*Cor., L. S. Journal.*

ABOUT PAPER FIBRES.

Were we to ask any ordinary reader what paper is made of, the answer would probably be promptly "rags, of course." This is so nearly correct that if it be recollected as the leading idea in the subsequent remarks on materials for paper-making, they may prove interesting, if not, also useful. The Government have for some time been inquiring as to India's capabilities for producing such materials, and the results of those inquiries in all parts of the country have been curious and will probably be utilised by commercial people.

We associate the word "rags" chiefly with cotton and linen rags rather than with woollen. Woollen is unfitted for paper-making, but the other two materials well represent almost all others. The one, cotton, is a fibre derived from the "seed-vessels" of a plant: the other is fibre from the "stock" of a plant. Cotton is the commonest material, and India is the home of cotton. Then, say some, the question is settled, 'let India sell cotton to the paper-maker.' But this will by no means do. The paper-makers cannot afford new cotton; old rags easily collected are good enough for them, and the price is incalculably cheaper. It will not do even to send refuse waste home. The question is, is there no other cheaper source of fibre in the jungles or deserts of India, which will pay to collect and export.

Our first inquiry is, what are the exact requirements as regards such a fibre. This is answered by the curator of the Victoria and Albert Museum, Bombay. "To be successful, a raw material for paper-making should possess certain qualities. The first and most important is an abundant and lasting supply easily procured, and cheaply prepared for exportation, nor should its bulk be too gre[illegible] when in the hands of the paper-maker, it should work u[illegible]y, and at a moderate cost, and present no difficulties in bleaching: a fibre should have a certain amount of roughness to enable it to 'felt' or cohere in the massy, and lastly it ought to turn out at least 50 per cent. of good marketable paper."

First, as regards "an abundant and lasting supply," it is unlikely that it will ever pay to cultivate good land for this special produce, unless systematic paper manufactories were started in India itself. To this point we shall afterwards revert. But it appears from the various reports returned to Government that some of the best fibres are produced on land otherwise useless. Some grow in thick trackless jungles: some, such as the bamboo, in endless forests in difficult tracts; others, such as the *muddar* and certain grasses, in ground otherwise perfectly sterile and desert; and others in equally useless swamps and marshes.

This then, to start with, is very hopeful. It is said that the wise, good hearted Linnæus defined a *weed* as "a plant whose virtues and uses have not yet been discovered." If the weeds of our immense deserts are discovered to be useful articles of commerce as regards the important art of paper-making, weeds merely waiting to be gathered and sold, no doubt an impulse will be given to investigation in many other similar directions. The question of bulk in packing is of course an important one as regards cost of transport and freight, but, if the fibre is worth having, doubtless processes would soon be invented to eliminate the rubbish from the useful part and economise the bulk of the latter, just as in the wool-trade it is the most economical plan to clean it before despatching it to consignees, who do not wish, if they can help it, to pay freight for filth, mud, and refuse. The bleaching is more a question for the manufacturer than for the collector of the fibre, because if it is good for bleaching at all, the maker prefers to do it himself, from the beginning of the process. This therefore need not trouble the exporter: what he has to see to is that the fibre is what the maker will buy.

The question of "felting" of the fibre is a curious one to those who have never seen a paper mill. It is not a question of long or short fibre, or of fineness or coarseness. It is not whether it will make fine tough threads or close lasting fabrics. It is simply this: given a fibre which must be cut, torn, and minced and pounded into particles so minute that they cannot be distinguished except by a microscope; so minute that when boiled and mixed with water, they merely make it like milk or cream, so like butter-milk, indeed, that you could not tell the one from the other; yet, if that creamy fluid is poured out anywhere on a fine sieve or a flannel cloth, or some such surface, and pressed and dried, it will form a firm felted mass such as we can best describe by telling the reader to examine coarse blotting paper. One would think that any stuff that would thus make a pulp would make paper. For example, some juices make a pulp and turn out India-rubber and guttapercha. But paper pulp is quite different and its requirements special.

We come now to the consideration of certain substances that fulfil or partly fulfil these requirements. A number of them we are wholly unacquainted with, but there are some with which every one is more or less familiar. We have already set cotton aside as too valuable to be cultivated solely for paper. But flax deserves attention. In many parts of India the stem is wholly thrown aside as refuse, the seed alone being valued for making oil. A great industry seems possible in flax fibre, which at present is only used for string and rope. So also is *sunn* or tow, from which a good deal of native paper is made, but even that is often mixed for paper with a certain amount of cotton. The American aloe is counted a specially valuable fibre. When pains have been taken with it, it turns out first-rate, and is remarkable for the extraordinary strain it stands when made into rope. But at present no economical process has yet been invented to [illegible] the fibre from the refuse easily and cheaply. When this is done, it will attract more attention. The leaves of the wild date palm appear to be a very promising fibre. The palm grows in the most miserable sandy deserts and down the Indus Valley in great forests, only utilized by the natives for toddy making. As toddy-drawing spoils the fruit, but does not kill the leaves, there seems a hope that the licenses for toddy drawers may, some time or other, be printed on paper made from the leaves of the trees themselves.

Sugarcane refuse, which is now made into ropes for wells, &c., is also a substance that is now wasted in great profusion. In the United States, the home of economy and invention, the refuse is greatly made use of for the coarser kind of paper, and doubtless if we had local paper mills, we should also use up much of this for the same purpose.

From the above enumeration we have omitted all we did not think of much importance, and those also we thought of extra importance. One of the latter is the plantain. It cannot affect the Punjab much, so we may let it pass. The next is the bamboo. The bamboo grows freely in great forests all along the base of the hills. It already furnishes an important traffic, and it appears that its fibre is very valuable for paper. The Chinese have used it from time immemorial. It would scarcely pay to send home, but it grows just in the places where Indian paper mills would necessarily be started, that is about the clear streams of the lower hills, so that it is especially important to consider it always as a source of supply upon which a paper company could depend.

In the Government Report it seems to us that the river-side grasses have not received enough of attention. Perhaps it is our misfortune that we do not recognise the various *hibisci* under their scientific names, but if they were thought valuable, they would probably be better described. Yet the two most ancient papers in the world were swamp reeds—papyrus and rice. Moonj grass is barely mentioned, yet its fibre is incontestably very valuable. Rice straw is noted merely to be passed over. Wheat straw, which is here pounded up into bhoosa, if capable of making good useful paper. Wild bhung gives a very strong fibre and grows wild everywhere, especially in the hills; so common is it that its young leaves alone sell for about a rupee a maund as an intoxicating medium.

And lastly, we recur to a plant which we mentioned incidentally towards the beginning of our remarks. It is called in Punjabi *muddar*. Every one knows it. You have only to glance over the Anarkulli maidan to see it growing everywhere—a shrub about three or four feet high with thick greenish blue leaves and a thickish stem, generally considered an intrusive weed. As for the jungles, it grows everywhere over them and on the bare plains of Meean Meer just as it does at the back of your cook-

house, it is not particular. If you give it a flick with a whip, instantly milk springs out from the leaf. If that milk gets into your eye, it will blind you; if it is rubbed on your skin, it will raise a blister; if cows or sheep eat the plant, they will die; if goats eat it, it improves their digestion. If you collect the milk, it will form guttapercha, and can be worked in the same way and submitted to the same tests. It has, at the proper seasons, a large violet coloured flower which turns into a seed pod, which when it opens, displays a beautiful floss-silk down which the wind scatters every-where. This down makes up into a beautiful fabric, but it has not been much experimented on. It makes, we may remark confidentially, a most beautiful stuffing for pillows, rezais, and cushions. But its chief importance is that it has been found to be a splendid fibre plant. It bleaches beautifully, it is very strong, and it turns out an economical paper even when gathered in the jungles here and sent to England. In short, to recapitulate, it produces "a first class fibre, tenacious, elastic, and lustrous; and a cotton silk-like, smooth and glossy; and a juice with some of the properties of gutta percha," and certain medicinal qualities which have only partially been investigated, and it grows profusely as a weed in the worst and most desolate soils and regions of the Punjab. Its scientific name is *calatropis gigantia*, or C. Hamiltonii.

The above remarks have all had reference to the export of fibre for the English mills. But why is so little done in India? Whatever is done must be done in the pleasant little lower hill valleys, the land of clear streams and bright foliage. But, as yet, no railways approach these districts, and until feeders are thrown out to the foot of the hills, we shall see no such enterprise flourish. Beer seems to flourish apparently, because people will drink beer when they hate the very sight or mention of paper. Sugar in the Punjab has as yet scarcely had a fair trial, but, combined with rum, will probably make its own way. Whisky distilleries have not started yet, all the Scotchmen hereabouts being busy as yet in less congenial but more urgent labors. Wool mills are in a similar state of dubious popularity. But we prophesy that the next company will be a paper mill, and would indicate the localities of Kalka, Hooshiarpore or Pathankote as very suitable places for such a venture.—*Civil & Military Gazette*.

SUGAR-CANE IN AUSTRALIA.

THE different varieties of sugar-cane removed from the Botanical Gardens in 1878, to a portion set apart for them in the Oxley Reserve, have thriven exceedingly well, and answer in every respect my most sanguine expectations. The whole appear to be in a thoroughly healthy state, many of the canes having joints from 8 inches to 9 inches in length. I had intended this season to have each variety tested as to sugar-producing capabilities, but, considering the comparatively recent removal, and finding some difficulty in forwarding the cane to the mill, I have decided to allow the test to stand over until next season. Specimens of the principal varieties will be exhibited in stools at the forthcoming exhibitions. During the past year I have received the following:—From Hawaii—*Saccharum officinarum*, var. *Manulele*, Striped Bourbon or Black Striped; from Singapore, Saigon, and China—*Blanches du Cap*, Gingau, Chinese, Annamite Vamboir, Coki, and Diard; making in all a most valuable addition of 78 new and different varieties, all of which are now under successful cultivation. Promise has also been received from H. Murton, Esq., Director of the Botanic Gardens, Singapore, of varieties of cane from Pondicherry, which will be most acceptable as an addition to those already in our possession. This gentleman has always evinced a most lively interest in the progress of the sugar industry in this colony, and it is to him specially, and others in the southern islands of the Pacific, I am indebted for the most valuable specimens of cane we possess. From the period of my first entering into the duties of these gardens in 1854, I have endeavoured to collect as many varieties of sugar-cane as possible, not only up to the time of its cultivation in the colony as a commercial industry, but up to the present, and by closely observing them during their growth, and noting their peculiarities as to climatic and other natural requirements, have invested the collection with an amount of interest which will, I am persuaded, prove to be of considerable value in the future. Both individual experience and correspondence prove that the use of one class of cane, continued for successive seasons and extending over many years, materially deteriorates the quality; and the substitution of new varieties, to ensure successful growth and productive qualities, becomes imperative.

The applications for cuttings have not only become very numerous, far exceeding those of previous years, but have arrived from various parts of the world where the growth of sugar is an established industry. Different varieties suitable to the climate have been forwarded by request to the West Indies, South Carolina, and other States of America, the Sandwich Islands, Hawaii, and the Mauritius (no less than two tons weight of cuttings having been sent to the latter place), all of which were supplied from the plantation at Oxley previously referred to. I am glad to be able to report, also, that the demands for cuttings from the various districts of Queensland, from their large extent, shew in a marked degree the increasing popularity this important interest is gaining with our agriculturists. Rockhampton, has not hitherto been tried as a sugar-producing district, in a commercial point of view, although I have repeatedly called attention to it, as possessing a climate suitable for its cultivation. I am, however, glad to say that an experimental plantation is about being formed by a Mr. Hall, of Rockhampton, consisting of about fifty acres of selected ground, and I have arranged to supply him with sufficient cuttings (98,600) of suitable varieties to plant twenty acres of ground, in the hope that with proper skilful attention the venture may prove a success, and become the pioneer of more extensive operations conductive to the permanent establishment of the industry in the district. Instancing the large proportions to which sugar cultivation has attained in this colony in a comparatively few years, I find the following results, obtained from official sources, of the operations for the year ending December 31st, 1878:—

Areas under sugar-cane	16,584	acres.
Acres of sugar-cane crushed	11,005	"
Sugar produced	12,856	tons.
Raw sugar exported	3,380 1/8	"
Refined sugar exported	754	"

whilst the importations for the same period amounted to 250 tons of raw, and 54 tons of refined sugar. The quantity of molasses manufactured considerably exceeded half a million gallons, and the quantity of rum distilled, over 200,000 gallons—a vast and notable increase during the space of eleven years; the number of tons of sugar manufactured in 1858 being reported as 619. I am also credibly informed that the acreage under cultivation at the present season is considerably beyond that of last year, and the crushing has commenced under most favourable circumstances with every prospect of a most satisfactory yield.

The disease, or rust, which has made its appearance upon some of the plantations in this colony still occupies the attention of the growers and scientists, but, notwithstanding continual experiments both here and upon specimens specially sent to England for the microscopic examination of most eminent men, nothing definite or conclusive has yet been arrived at as to the actual cause of the disease, although the effect of it, so far as the rust is concerned, is generally conceded. Professor Liversedge, of the Sydney University, attributes the disease to *defective conditions of cultivation*, and I am still of my previously expressed opinion, which is corroborated by the majority of the planters with whom I have been in communication on the subject, that the true cause of the disease is the climatic changes to which some of the canes have been subjected, by being removed from their natural habitat, and being of too weak constitution to sustain the extraordinary claims upon their being placed under an uncongenial influence; and experience has shown that where diseased cane has been removed to a position where the temperature is assimilate with its original growth, the disease entirely disappears. I may also, with equal confidence, express my opinion that the disease is not contagious, for I have witnessed in plantations, where several varieties have been planted in close proximity to each other, some were to be found afflicted strongly with the disease, whilst others of a more robust nature in their immediate vicinity were entirely free from it. Another and most important question arising out of this vexed question is, how far the disease retards the growth of the cane or reduces the density of the juice? This is a matter not yet touched upon by those who have made this inquiry a speciality, but, so far as I can understand from those most interested, the damage is slight, if perceptible at all.—WALTER HILL, BRISBANE, in *Journal of Applied Science*.

SERVICES OF BIRDS IN AGRICULTURE.

PEOPLE often venture the statement that every object in Nature is of some use, directly or indirectly; but I fear if they were questioned as to the precise use and benefit we derive from certain members of the animal and vegetable kingdoms, they would find it rather difficult to prove the correctness of their assertion. Among the many natural enemies of the cultivator of the soil, slugs, snails, grubs under, and weeds on the surface, form a large and by no means contemptible part. That it were useless and unavailing for man himself to endeavour to exterminate these pests, is undeniable; and the only help he can expect must be from birds who, in their search after food, are unwittingly of immense use to him, some of them carrying destruction amongst the animal pests, and others against the vegetable ones. Some notes and facts on these services may not be out of place in this journal, and we will first take an insight into the way in which the former are kept under; of course the eventual extinction of these pests is not to be hoped for.

Amongst all our larger birds the *Corvidæ* or ravens are far and away the most aiding to the farmer, and of these the Starling shows to the fore in a useful aspect, its services being something, incredible; slugs, snails, worms, and beetles all form indiscriminate food for this most valuable bird. Statistics in such a case may seem odious, but I believe a German naturalist, with the extreme perseverance characteristic of his nation, once computed, and not incorrectly, that a single young Starling [illegible] snails in 14 hours out of the 24. Now, if we deduce further facts from this, we [illegible] see what a valuable aid to the cultivator the Starling is and how deserving of our protection. Nor is there, as far as I know, any set off against these good works; the Starling never attacks plants or grain of any kind, but will search with great diligence amongst new-sown wheat after noxious things, especially young slugs and worms.

Passing to our old and well-known friend the crow, we find that we are indebted to it also for services which, although rendered on behalf of itself, benefit us in no small degree. Not only grubs and their countless more or less distant relations fall victims to their accommodating and lasting hunger, but insects of all sorts and sizes, whose unwelcome pre-

sence is so detrimental to the soil on or in which they are, besides mice, which they destroy in great numbers and greedily devour.

The old discussion, whether the rook does more mischief than good, or *vice versa*, crops up continually from time to time, and the same old arguments are put forward by both sides to prove what is really a question more of locality and circumstance than a general one. Under certain conditions I consider the rook to be a nuisance, and under others a thing to be sought after, and therefore, without offering an opinion, I will state the facts of the case, and leave others to draw their conclusions. For the most part the food of the rook consists of cockchafers and their exceedingly destructive larvæ, besides slugs, worms, and grubs in lesser quantities: but it is also exceedingly partial to fruit, corn, and seeds of all kinds, not to mention young ducklings, chickens, young hares, rabbits, and game of all sorts. Then it must be allowed that the number of the former that they destroy is very considerable, especially the cockchafer larvæ, the liking for which they alone seem to have amongst birds.

Another exceedingly useful member of the *Corvidæ* is the jackdaw, but it is not nearly so plentiful as the crow and rook; consequently—for the same reason that white sheep eat more than black—they do not destroy so many hurtful insects as their less scarce relatives. Insects, snails, worms—*in short the whole category of the animals*, are devoured by the jackdaw, especially grubs in ploughed land. Mice also form a part of their food, and they eat a little corn as well, but not much; in fact, the loss could never be noticed.

One cannot help admiring the wonderful and surprising instinct of these three birds in discovering the whereabouts of the animals and insects on which they feed. They seem to be guided to the exact spot, and all they have to do is to thrust in their beak and draw out whatever may be the unlucky victim. It is curious that the ravens should include amongst their members really useful birds, thoroughly worth the farmer's protection, and birds so undeniably destructive as the magpie and jay, the former even more so than the latter. The mischievous and hurtful propensities of the magpie are only surpassed by its extreme daring while in search of its food. The first of these two birds eat a minimum of insects, and feed chiefly on fruit seeds, corn, in fact anything it can find to suit its by no means dainty palate; and does incredible harm in field and farm-yard. What is more the crow gets blamed for a great deal of the mischief the magpie perpetrates, I doubt if there is any, among all the birds we are proud to call British, whose mischievous propensities are so widespread.

Although the jay is not quite so unwelcome on farmed land as the magpie, still it is a bird whose room is always preferable to its company, for it is most impartial as to what it eats. Like the magpie, it will consume a few insects, but while it can get corn or seeds in plenty, coupled with an occasional duckling, or chicken, it will always prefer this comparatively easily collected food to the more scarce and less tasty and satisfying insects.—*Moorman, in L. S. Journal.*

THE CAWNPORE EXPERIMENTAL FARM.

THE experiments made in the Cawnpore Farm last year, as detailed in the report for the *rabi* season, 1879-80, seem to have been of a more practical kind than usual, and remind one of the doings at Sydapet in the Madras Presidency. The first series referred to in the report under notice are those made with different kinds of manuring. We are sorry to see that no attempt was made to introduce poudrette, which has, of late become so popular among the cultivators around Poona. The manures tried were—bone superphosphates, dissolved guano, and green manure consisting of a crop of indigo ploughed in. The table recording the result is so interesting that we make no excuse for transcribing a part of it:—

Manure applied per acre.	Outturn, grain.	Straw.	Total value.			Cost per acre.			Profit per acre.		
Mds.	lb.	lb.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
Bone Superphosphate, 2 mds.	1,627	2464	49	10	8	27	12	9	21	13	6
Ditto, 3½ mds. ...	1,894	2,927	59	0	11	31	4	5	26	12	0
Dissolved Guano, 1¾ mds. ...	1,427	2,196	43	11	2	34	6	5	9	4	6
Ditto, 2 mds. ...	1,778	2,881	55	0	8	39	9	7	15	7	1
Indigo crop ploughed in ...	1,430	2,994	47	0	8	30	8	3	16	8	0
No manure	1,171	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	15	8	4

It will be observed here that guano stands low in the matter of profit. This was brought about by the great cost of laying the guano down at Cawnpore, amounting to Rs. 9-14-8 per maund equal to Rs. 270 per ton, a price which practically placed it out of the competition. The bone superphosphate, obtained by crushing bones, and treating them with sulphuric acid and hot water, furnished a manure, which cost Rs. 8-7-8 per maund, and could, in fact, be made much cheaper were it not for the very high cost of, and frieght on, sulphuric acid. This solvent stands the cultivator in 3 annas per lbs. at Cawnpore. Three-and-a-half maunds per acre raised the produce from 19·5 bushels—the outturn of the standard and unmanured plot—to 27·1 bushels per acre. It must be remembered that the whole of this soil, having been more or less under experimental treatment during the past three or four years, was in better condition than the ordinary soil of the country, hence the high outturn of 19½ bushels per acre. We should mention that wheat was the crop experimented with Mr. F. N. Wright speaks of this rather as "a full average outturn for good lands, under the native system of cultivation." We must point out here that the general average all over India is 14 bushels, therefore 19½ is a high outturn, and 27 a striking illustration of what high cultivation can do. The cost of each experiment is very carefully debited—a matter not always attended to in these experiments. For instance, the land being on a Government farm, it is customary to ignore rent. This is unfair, and in this series of experiments, the cost has been made up as follows:—

	Rs.	A.	P.
Rent	6	4	0
Irrigation	3	12	0
Cultivation	8	8	8
Total, Rs.	18	8	8

The rent is based on the average rent of 12 fields adjoining the farm, and the outturn is valued at the rates current at Cawnpore when the grain was ready for the market. The experiments, therefore, have a value not always to be found in such trials, and they are conclusive as to the benefits of manuring. When will the ryot understand that he has just the same rent revenue, and canal dues to pay whether his crop is 14 or 27 bushels per acre; or, in other words, whether his profit is Rs 10 or Rs. 26, per acre per crop? It is worthy of note, too, that the amount of straw—the value of which was included in the above tabulated figures—was very much increased in amount, and when farmers use this for cattle-feeding, it must be of great value to them. The increase on the plot, with 3½ maunds bone manure, was 75½ per cent. Not the least interesting feature in this series of experiments is the result obtained from the so-called unmanured plot. It is true that no manure was applied with the crop, but in 1877-78, a mixture of blood and bones, to the extent of 5 maunds per acre, was applied, and it is well known that the effects of bone manure are lasting, as was clearly shown in this plot producing 19½ bushels per acre, which is 39 per cent. above the average of India. A second series of experiments was tried, in order to find the effect of carefully selecting seeds, instead of taking it at random from the *bunnia*. The result was a wheat crop of 23¼ bushels per acre from the selected seed plot against 18¾ from the other. The respective merits of thin and thick sowing were tested, and resulted in favor of close sowing.

We do not, however, consider the experiment to have been at all a fair one, as the amount of seed, used for thin sowing, was ridiculously small, being only 16lbs. per acre, as against 110lbs. This, we consider, to have been too extreme a test. Two plots were alike treated to 50 maunds farmyard manure, and in every other respect, except irrigation, they were treated in the same manner. The unwatered plot yielded 17 bushels grain, and 24 maunds straw, while the irrigated plot gave a return of 30½ bushels grain and 41 maunds straw, the extra cost of watering having only amounted to Rs. 3-12. Some experiments were made in the way of introducing wheat and barley from England, America, and Australia; and the general conclusion arrived at seemed to be in favor of improving the indigenous variety by careful selection. This, we believe, to be a thoroughly sound decision. Dr. Forbes Watson has told us that, in many districts in India the finest wheat in the world is grown; and there does not seem any reason why we should not indent on those districts for seed wheat to replace the more common varieties of other places. The Indian ryot has been for centuries engaged in cultivating the same grain on the same fields, and deterioration has invariably been the result of such a course all the word over.—*I. D. News.*

CITY REFUSE AS MANURE.

THE importance of having an adequate supply of manures in this country cannot be exaggerated. Mr. James Caird, the great authority in such matters, has, by carefully conducted experiments, proved to demonstration that the difference between the best and inferior agriculture on the same *soil* may be more than treble the produce. Wheat grown without manure yielded 730lbs., and wheat grown with special manure yielded 2,342lbs. The great difficulty in the way of the introduction of improved methods of tillage in India is the want of a sufficient supply of manures. The Indian cultivator must afford to manure his fields properly, and that is the main reason why the soil is becoming gradually exhausted. Such being the case, a peculiar interest attaches to the experiments now being made at Poona to utilise city refuse as manure. The use of poudrette as manure was unknown in the Bombay Presidency until recently; but the Poona Municipality has now been realising a considerable revenue from the sale of poudrette since the opening of the Mutha Canals. Some information about the manufacture and sale of poudrette in Poona will no doubt interest the reader. The population of the city is 90,436 souls. About forty-four cartloads of night-soil, equal to 575 cubic feet, are collected daily, and carted out to a depôt at the village of Dhanpodi, two and-a-half miles off from the extreme limits of the city. Then there are the street and house sweepings collected from the dust bins of the city. They amount to sixty-five to seventy-five cartloads, equal to 1,950 cubic feet, per day. These are carted out; and when burnt and sifted, the produce is 800 cubic feet of ashes. The process adopted in the preparation of the night-soil of

the city of Poona into poudrette is what is called the sun-drying process. The 575 cubic feet of night-soil shrinks in drying to 430 cubic feet of night-soil. Mixed with 300 cubic feet of ashes the produce is 730 cubic feet poudrette per day, or 226,450 cubic feet per annum. Experience has shown that to ensure thorough deodorisation, complete freedom from stink, and the best poudrette, the proportion of ashes to night-soil should be about equal; but as this is not now the case, the supply of night-soil being 430 cubic feet, and that of ashes 300 cubic feet per day —the Municipality are now trying to augment their collection of ashes to the required amount. The price realised is one rupee per cubic yard, or 27 cubic feet. The annual value of the poudrette prepared and sold by the Poona Municipality is Rs 9,870. The revenue realized by the Municipality from this source has been steadily increased. It has risen in five years from Rs. 766 to nearly Rs. 10,000. The cost of conveying night-soil and sweepings to the depôt comes up to Rs. 11,736; but as this cost has to be incurred in any case, it need not be taken into account. The manufacture of the poudrette costs Rs. 6,264. The annual revenue from the 266,450 cubic feet of poudrette prepared by the Poona Municipality is almost Rs. 5,000. The Secretary to the Municipality thinks that this revenue is susceptible of considerable development. The expenditure for removing the refuse of the city and the cost of preparing it into poudrette can be reduced by Rs. 3,000, while the sale proceeds of the manufactured article can be raised to Rs. 7,500 by increasing the price of the manure. The Secretary to the Poona Municipal Committee makes the following remarks on the value of the manure prepared by the Municipality:—"The manure prepared in this manner is much valued by cultivators, and is in great demand. Applications for the manure have been increasing since the opening of the Mutha Canals, and consequent extension of wet cultivation. Five years ago agriculturists would not touch the poudrette then prepared, and could not be induced to take away at even a nominal charge. At the present moment the outturn of manure is not enough to keep pace with the demand, and it has become necessary to take special precautions that the poudrette is not taken away in its raw state which the cultivators sometimes attempt to do. They frequently pay for manure from four to six months *in advance*, in order to ensure a timely supply. The poudrette manufactured by the Municipality is clean and free from brickbats, broken glass, and other rubbish or common earth. This is secured by the ashes being sifted before being mixed with the night-soil." Those who are never tired of speaking of the prejudices of native cultivators as an insuperable obstacle in the way of agricultural reform in India, should carefully note the facts recorded by Mr. Narso Ramchunder, Secretary to the Municipal Committee of Poona. That the cultivators did not touch the poudrette, when it was first prepared five years ago, was no more than what could have been expected. But as soon as they found that the use of the manure would prove remunerative, their prejudices at once vanished into thin air. They are now so anxious to have a supply of the manure that at the present moment the outturn of the article is not enough to keep pace with the demand, and that cultivators frequently pay for manure to the Municipality in advance, in order to ensure a timely supply. A fact like this is enough to overcome a thousand speculations. Show the Indian cultivator that he will be a gainer by the introduction of any new method, and he will be at once found ready to adopt it. It may be supposed that the manufacture of the refuse of the city of Poona into poudrette is carried on in such a way as may prove injurious to the public health. But we are glad to see that there is no ground for such a supposition. The Sanitary Commissioner of the Presidency has placed on record his opinion that the management of the depôt reflects the highest credit on all concerned. "I have," he says, "visited it often and unexpectedly, and remembering how rude are the means as they generally are in India, I can answer for it that every process is very carefully conducted." The example set by the Poona Municipality should induce other Municipalities in India to utilize the sewage of their town. —*Deccan Herald.*

CACAO PLANTING.

THE cultivation of cacao in this island has for some time past assumed proportions which promise to render it, at no distant date, a very important feature of our local industries and the increasing favor in which the article is held at home, added to the decline in its cultivation in other countries, seems to indicate a steady demand for it at remunerative prices.

There is no published account of the mode of cultivating the tree, and preparing the product, and the letters from the father of Ceylon planters on this subject, did not convey much that was new or of a practical character. There are accounts of the article by Simonds and other writers, but these are of a very general nature and chiefly statistical, and of little practical value therefore to the planter. We think it may be useful to many of our readers if we place before them our own experience, and such information as we have gathered on the subject.

To begin at the beginning, we may say to the cacao planter, choose well-sheltered land with a deep soil as cacoa is deep rooter: the more loamy the soil is the better, rocky or stony land should be avoided. As to shade we believe that it is necessary, and we cannot think of a better shade tree than the *Inge Saman*, which grows rapidly, and casts during the day a checkered acacia-like shade, and closes at night so as not to intercept the dew: until the trees are large enough to give shade, we should recommend the annual planting of castor-oil plants, which will grow to a height of 15 feet in six months, so that during the hot season the young cacao could be overshadowed by it, and at the return of the cool season, the castor oil tree be bodily cut down, and returned to the soil; if this method is adopted, the plants must be vigilantly watched, as a most destructive caterpillar sooner or late developes upon the castor oil plant, when it must at once be cut down, but as this pest never attacks very young trees, it is not a material difficulty. Another common plan is to clear the land, and quincunx the cacao with Liberian coffee, that is to say the cacao is planted 15 × 15 with a Liberian tree in the square: this no doubt adds quickly to the value of the clearing, but our opinion is that shade-grown clearing of cacao alone is in all respects more satisfactory, and in the end, more profitable. As regards the distance of the plants apart, it, in a measure, may depend upon the variety selected, and the altitude of the land, but supposing a rich low-lying flat be obtained, and Caraccas cacao be the kind selected, we think 12 × 12 as close as the clearing should be planted. On one fine cacao estate, near Kurunegalla, the proprietor has planted 9 × 9, with the idea of taking out alternate diagonal lines in about five years, after which the remaining trees will be in squares 18 × 18, with a centre tree to each square (or 13 4 × 13 4); in consideration of the value of seed-pods in Ceylon, this may prove to be good policy. It is considered a mistake unless in an exceptionally wet season, to plant *in situ*; the safest method is to put out young *plants*, under shade, in clay pots (the pots are merely long and narrow cylinders); while the young plants are growing in the pots, great care must be observed to keep them from the effects of damp, too much shade, and the attacks of insects, up to a certain stage the Cacao plant is extremely delicate, but once past this it may be considered a hardy tree. We have said that we think 12 × 12 to be the proper distance apart for planting; this will allow three hundred plants to the acre, the approximate cost of opening an acre may be estimated thus:—

Plants	Rs.	25	0
Felling and burning	„	15	0
Lining	„	1	50
Holing 2 × 2	„	6	0
Filling in	„	4	0
Planting	„	3	50
	Rs.	55	0

The growth of the plant, once having well started, is remarkable; plants put out at two months old, have grown to a height of four and five feet in the year. It will be necessary at about seven to eight months carefully to remove all suckers; regarding pruning, Simond's model is a "straight single stem up to three feet from the ground, and dividing into two or three as it grows higher: each of these again, divided into two or three branches make up the framework or principal branches which terminate numerously in the leafy branches, regularly disposed into a well-formed head;" practically this means that all matted and weak branchlets are to be removed as well as lateral branches growing at *right angles* to the stem, and a "chick-like" growth encouraged. Should the young trees as, often happens, lean to one side the top should be nipped off, and it will ultimately recover its shape again. The cacao tree, though it will bear at two years, is not fully matured until its seventh or eighth year, and the probability is that pods on trees younger than this contain immature and consequently unreliable seed. A gentleman on whom we place reliance, lately told us that in the London market it is said that we have not yet sent home the higher class of cacao, and we certainly think that more care should have been displayed in its selection. The Venezeula, or Caracca, Cacao, is the best, although it, according to Simonds, has deteriorated in Trinidad. The pods of this tree are small, but the seeds are more luscious, and globular in form, while the price is very much higher than the common West Indian variety, and we strongly advise intending cacao planters to take care to obtain this seed, especially as we consider that the Caraccas tree will soon become acclimatised here. We confidently prophecy a great future for cacao in Ceylon, and shall be glad fully to ventilate the subject of its cultivation in our columns: experience will no doubt teach us many things not now understood, and it will be well that the results of observation be brought together for the general good. —*Ceylon Times.*

VEGETABLE IVORY.

AS a substitute for ivory, in the manufacture of certain small articles such as buttons, rings, umbrella handles, &c., where hardness is not so much a desideratum as a fine white color, the use of the so-called "vegetable ivory" is largely increasing, and the trade in the nuts producing the material is becoming very extensive. The vegetable ivory nut is the produce of a species of palm which is met with in a wild state in South America and Africa. When imported into Europe the nut somewhat resembles a Brazil nut, only it is circular in shape, instead of triangular; and they are about the size of a large walnut or small orange. Inside the hard shell is the hard, white "kernel," resembling ivory in appearance. This solid matter, being softer than ivory, and easily carved, or turned in the lathe, and being easily dyed, and less brittle than bone, is largely employed in the manufacture of buttons and similar articles. When exposed for length of time to the air it assumes the granular appearance and the rich yellow, or rather creamy, tint of old ivory. This hard "kernel" is, in its natural formation, of the same nature as the kernel of the cocoanut. The unripe fruit consists of green shell, containing a watery fluid, which, as the nut matures, [illegible] becomes a pulpy mass, and eventually hardens into solid matter. The [illegible] though bitter to the taste is wholesome, and often renders invaluable service to travellers who cannot otherwise obtain water to drink. It becomes sweeter as it thickens, and in South America the pulpy mass is mixed with sugar and water, and largely consumed as a favourite beverage. The tree on which the fruit grows is unlike an ordinary palm, having little or no stem, and drooping downwards, especially when the weak branches are overweighted by the six or seven bunches of nuts—each bunch containing six or seven seeds enclosed in their thick and heavy shells and outer sheath, and weighing altogether from 20 to 24 lbs. Birmingham alone often uses as much as a ton weight in a day, of these nuts, and the annual import into this country (England) amounts to a value of at least £100,000, while equally large quantities are used in France and in other parts of the Continent.—*Hatters' Gazette.*

PAPER FROM BAMBOOS.

THE attention of Forest Officers in Burmah has lately been turned to the possibility of making paper from bamboos. Experiments were made last summer in Claxheugh, near Sunderland, with bamboos sent from Burmah, and the result, it is officially reported, "was an exceedingly strong and even paper, marred only by numerous yellow, scabby looking spots, which, under a magnifying glass, it was easy to see were pieces of hard silicate, the outermost skin of the bamboo, which had not been sufficiently affected by the boiling in the alkali solution." By a more effectual treatment in the caustic solution, it is conceived that these glassy scales would be destroyed; but in any case, if bamboo shoots are used while they are still young enough, there is no glassy skin to be afraid of. Well then, it will be said, cut the shoots young enough, and the difficulty is overcome; but this is not so. After they are out, they soon harden on the surface. To use them for paper making successfully, it is necessary to work them up while they are still freshly cut, and the inference from this, it will be seen, is that the manufacture can only be successfully carried out in the country where the bamboos are grown. The production of bamboo paper, in fact, is pointed out by Providence as a Burmese industry. The Pegu conservator, who has been employed by the Government to report on this subject, has made some interesting calculations as to the prospects of the undertaking. In order that a factory may be profitably worked, he says it is necessary that it should turn out 3,000 tons of stock annually. Now it would take 1,000 large green bamboos to yield one ton, or 3,000,000 shoots for each factory. A good bamboo forest can yield 150 young shoots per acre, and would therefore consume the outturn of nearly 32 square miles. But bamboo forests of this extent are available in many parts of the Pegu circle. Obviously it would not answer to depend permanently on the wild growth of Nature, but persons interested are clearly of opinion that it would answer to irrigate bamboo plantations with the view of producing a perennial supply of young shoots, and that meantime a factory could be profitably established at Pegu.—*Pioneer*.

THE PRODUCTION OF SUGAR.

THE production of sugar from the "Imphee" of Africa has engaged attention for some years past in several tropical countries. As closely allied to our "Jowar" or "Janera," it has naturally attracted notice in India, and under the name of *sorghum saccharatum*, its cultivation has been attempted in various districts, but, we believe, unsuccessfully as a sugar yielder. The idea of obtaining sugar from this plant and from maize, in sufficient quantity, or good enough, for public consumption, has been ridiculed by many, more especially in the West Indies. But our indefatigable trans-Atlantic brethren have nevertheless been persevering in their endeavors for some time past, and success is now crowning their efforts. The Indians, too, have taken kindly to the culture and to the extraction of the sugar. The result of trials, so far, has led to the conclusion that sugar of a first-rate quality is obtainable, and that it compares favourably with the best product from sugar-cane grown in the most favourable localities. The cultivation has, it appears, been tried far down in Texas and high up in Minnesota; and that plant has everywhere been successfully raised, and has proved prolific. One great point claimed in its favour is that its saccharine matter is entirely derived from the atmosphere, so that, even though cultivated year after year, there is no reason why it should not increase in fertility. This seems rather doubtful, but those who make the assertion have, they say, good authority for it. The crop of seed is very important for breadstuff. Moreover, good vinegar is obtainable from sorghum skimm'ngs and refuse. The best manures are phosphates, lime, wood ashes and plaster of Paris. An important authority, Professor Caldwell, of Cornell University, is in favour of beet sugar production, and thinks that sorghum stands little chance in competition with beet; but he agrees that there is one advantage in its favor, in the fact that it requires less machinery and less capital. In other words, "sugar can be obtained from the cane, in a small way, for home consumption better than from the beet." Be this as it may, this new industry is regarded as of the greatest importance to the country.—*Englishman*.

THE IMPROVEMENT OF THE POTATO.

WHILE commending the action of Government in its endeavour to introduce a good description of potato in these hills, and thanking Lieutenant-Governor for the liberal grant of money which he has made for the purpose, we would strongly deprecate any importation of potato seed from America. The desire is, we believe, to try various seeds with a view to ascertain and establish those descriptions that give the best results, and with this object seed will be imported from England, Australia, and probably America. We have nothing to say against importing from the two first countries, but we would warn those concerned against having anything to do with seed from America, as it is almost certain to be accompanied by that dreadful pest the Colorado beetle. The ravages of this prolific and almost indestructible insect have been fearful in America. At one time this beetle was an object of great dread on the other side of the Atlantic where the most careful measures were, and are still, taken to prevent its introduction. Nearly every mode of destroying it has been tried with very doubtful success, as the pest is still spreading. We read the other day that Colorado beetles have late been making themselves unpleasantly conspicuous by their proceedings in Westchester country, New York, where they have appeared in alarming numbers. The farmers and gardeners have pressed all their households and all the additional help they can muster into service to make war upon the pest in the potato fields; but it seems likely that in the end victory will rest with the Colorado beetles. The great specific is Paris green; but it requires such frequent application, and is, moreover, so dangerous to use where there are domestic animals that many farmers hesitate to resort to it, and prefer destroying the bugs by means of boiling water. Boys and girls and many other assistants are paid three cents a quart for picking bugs. One smart boy will pick from 15 to 20 quarts of bugs a day. The potato bug is, however, a cunning insect, or it thinks it is. It knows instantly when the vine is assailed, and drops on its back as though it were dead. When the intruder has passed on, it climbs up the stalk, and begins to feed on the leaves again. The effect of Paris green is most instantaneous. The bug drops rolls on its back, gives a few spasmodic kicks, and is dead. Whether it suffers much under these circumstances is a matter of doubt. The farmers generally hope it does but some of them are inclined to think that it does not.—*Darjeeling News*.

THE INDIAN WHEAT TRADE.

THE Indian wheat is a splended grain second to none, full of glutinous qualities which causes it to be in great demand, not only in England but also in France and Italy. It is grown most extensively in all that tract of country by the Nerbudda, spreading in the valleys to Cawnpore in the north, and the Raipore districts in the south, Jubbulpore being as near as possible the centre of the grain districts. The cultivation extends over hundreds of square miles, and although we are accustomed to read of the marvellous crops the virgin soil of the Western States of America and Canada will produce, yet here in India under our very eyes it is grown at a minimum cost, to which no other country can bear comparison. The almost nude native, with a pair of bullocks, and two rough pieces of timber made into a plough, constitute the sole farming stock, and a favourable monsoon the only fertilizer. With these advantages Indian wheat ought to be the largest item of export. The G. I. P. Railway runs through the heart of the wheat country from Sohagpore to Jubbulpore and Nagpore, is in direct through traffic with the East Indian Railway to Cawnpore; the distance is less from Jubbulpore to Bombay than to Calcutta by 168 miles. Yet it is cheaper to send it to Calcutta. The charges are as follows:—

			as	p.	
Nagpore to Bombay,	520	miles ...	11	9	per cental.
Jubbulpore to Bombay,	616	" ...	12	8	"
Jubbulpore to Calcutta,	784	" ...	10	3	"
Cawnpore to Calcutta,	684	" ...	11	0	"

This shows clearly how excessive the G. I. P. Railway chareges are, and although the old excuse will doubtless be urged, of the extra expense this railway incurs through having to traverse the Ghât, yet add 40 miles more to the distances of Nagpore and Jubbulpore for the extra expense of the ghât traffic, and it will still be seen the G. I. P. Railway rates are far in excess of the East Indian. Wheat is an article which has to enter into keen competition with other countries, and the slightest addition to railway charges takes away the small margin of the trader's profit. Our railways charge as much for a distance of a few hundred miles as the Americans do for thousands. For easy reference we quote at par exchange:—

Jubbulpore to Bombay ...	... 1*s*. 7*d*.	per cental.
Chicago to Liverpool ...	... 1*s*. 3½*d*.	"

With the splendid facilities of a new Prince's Dock and warehouses our grain trade ought to multiply tenfold, if the zeal which is exhibited in the United States were only imitated in India. It is a matter our Chamber of Commerce ought to take up warmly, for the interests of the Port Trust, and the port and trade of Bombay are most deeply concerned in seeing that the main trunk railway puts forth every energy to foster the wheat trade, instead of charging a prohibitive tariff, and if the object was to check and suppress it.—*Bombay Gazette*.

TREE PLANTING.

THE question of replanting many portions of tropical countries which have become denuded of forest trees, is one which is being taken up in India, and acted upon by the authorities. In the Madras Presidency, in some districts, the collectors call upon the cultivators to plant a certain number of trees during each rainy season, and the question has been seriously taken up, whether it may not be desirable to plant large districts of waste lands, and the roadsides with useful fruit-bearing trees, so that in seasons of food scarcity, if not in times of famine, the people may obtain relief from the produce of the trees. In some districts forest planting or renewing, is taking place in order to maintain the supply of firewood for the railways, in others, to ensure a supply of useful building timber which in many parts of India is becoming scarce.

In Ceylon, apart from the question of timber supply or effect upon the rainfall, there is the other question in reference to fruit bearing trees viewed either as producers of food for the people, or as a means of improving the public health, where, strange as it may appear, vegetable food is often very scarce; it is an admitted fact that in our towns and chief centres of population the supply of vegetable food is out of all proportion to the number of the inhabitants, and in a tropical country this is particularly to be deplored, as there can be no doubt that the absence of vegetable diet exercises a prejudicial influence on the health of the people.

It should be the effort of our Government to encourage, by all means in its power, the planting out of fruit-bearing trees by the

people, a course which could easily be adopted through the agency of the village Councils; the same rural organisation which takes account of the repairs of fences and ellas might readily be called upon to see to the planting and keeping in order of a certain number of jack, breadfruit, and other trees, the produce of which would be at the disposal of the population. As we have advocated the propagating and the distribution of useful economic plants by Government authorities, so we would wish to see a distribution of fruit trees through similar agency. This has been attempted in one or two districts, but unfortunately the climate of those localities were ill-suited to the growth of young plants, but there can be no reason why in a large number of districts the rearing and distribution of useful friut trees should not be a most complete success.—*Ceylon Times.*

MANGABEIRA RUBBER.

THE largest quantity and the best quality of rubber has hitherto been imported from the Province of Para, Brazil, and although it has long been known that other provinces of that vast empire contained forests of rubber-yielding trees, these have never been taken advantage of, owing to the ignorance or supineness of the natives. The inhabitants of the province of Hernambuco are now beginning to realise the vast stores of undeveloped wealth existing in their virgin forests, and rubber is being exported from that province, which may, soon rival Para in the extent of its exports of this article. This action is almost entirely due to the exertions of Sanhor Joao Fernandez Lopes, who has spared neither time nor money in his endeavours to improve the agriculture of the province, and to develop its vast stores of natural wealth. This gentleman has issued a circular (dated April 26th, 1880) calling attention to this important source of wealth, and giving practical instructions for the collection and preparation of the rubber, from which the following is extracted :—

"Mangabeira rubber is the most suitable for the springs of railway wagons, tramway cars, and different machines, and for an infinity of other purposes. The process of extracting the milk from the Mangabeira tree is very simple and easy. Each person must be provided with fifty or more small tin basins and a small axe. He should make eight oblique cuts, sloping downwards at a little distance from each other, all round the trunk of the Mangabeira, cutting only the bark, and placing immediately below each cut one of the basins, securing these either with adhesive clay or nails. These small basins will collect the milk that exudes from the cuts, and when full, they must be emptied into a larger vessel. This process should be continued during the whole day, and thus three or four bottles of milk may be collected, according to the fertility of the trees. The cuts should not be deep, as the milk is secreted just below the outside bark; and a great number of incisions should not be made on each tree, as these may weaken or kill the trees, which has been the case, in some instances with the seringueira, the tree from which the Para rubber is obtained.

"The Para rubber is made in the place where the milk is collected because, in the process of preparation by smoking, there is not time for the milk to be carried to the houses of the collectors; but here we do not prepare the rubber as they do in Para, but make use of the process introduced into the province of Para, in 1860, by Senhor Strauss, which being much simpler, gives admirable results.

"The process is as follows :—Put a little powdered alum into a teacup full of water, mixing it well, then put a few spoonsful of this solution into a vessel in which three bottles of the milk have been placed, properly strained, to clear it from any extraneous matter. Immediately the milk coagulates, which will be in two or three minutes, the rubber must be exposed to the air on sticks and allowed to drain for eight days. After thirty days, it is ready to send to market in cases or barrels. We have tens of leagues of Mangabeira trees, and long ago we might have made use of this wealth, according to the opinion of Senhor Joaquino d'Almeida Pinto, an intelligent botanist of this province. The seringueira planted here grows perfectly, and there is no lack of different milk-giving trees that might be made useful. The province of Para exported last year three million kilogrammes of rubber, valued at six thousand contos (£600,000.)—*Journal of the Society of Arts.*

THE PAPAYA.

A CORRESPONDENT supplies a Batavia paper with the following particulars of the properties of papaya juice :—

"I have again met with something new about the papaya tree. A short time ago, I reported that in the West Indies, meat is wrapped in papaya leaves to make it tender. Now I see that Frenchmen, on examining the white milky fluid present in the stem, stem fruit and leaves of the papaya, has found that this sap works like *pepsine.* Albuminous substances are consumed by it. It also attacks living tissues, so that the experimenter has tried it on living animals. He has thereupon injected it into hardened swellings which caused great pain accompanied by fever, but very soon made the hard swellings soft after which they were cut into and cure followed. Into a mixture of 4 parts water and 1 part papaya sap he also put a frog, of which after two days, nothing but the skeleton remained. All the flesh had been digested in the bottle just as it would have been in a stomach. After all this it is surprising that now that people know of so many plants which feed on flesh [that of insects, &c.], the papaya which possesses such a flesh consuming sap has no means of catching those insects it might so well feed upon."

OPIUM REVENUE.

Opium Revenue to date compared with the estimate for the year 1880-81.

THE following is the result of five sales of Bengal Opium and 4 months' pass duty on Opium exported from Bombay:—

PRESIDENCY.	Estimate.	Actual.	Better than estimate.	Worse than estimate.
	Rs.	Rs.	Rs.	Rs.
Bengal ...	2,52,62,500	3,19,77,995	67,15,495	...
Bombay ...	1,07,53,000	55,07,625	...	52,45,375
Total Rs. ...	3,60,15,500	3,74,85,620	14,70,120	...

CALCUTTA BOTANICAL GARDEN.

THE Annual Report of the Royal Botanical Garden, Calcutta, for 1879-80, was read on the 21st ultimo, and the résolution passed thereon was as follows :—

The work of remodelling the garden made considerable progress during the year. Additions were made to the ornamental water; land was levelled and raised; avenues were opened out and connected with the main roads; and swampy ground was reclaimed and prepared for planting. The avenue of *Albizzia Paludosa*, which was laid out some years ago, promises to become one of the principal ornaments of the garden. Dr. King hopes to complete the laying out of the garden in two years more. It will then be possible to devote more minute attention to neatness and general maintenance.

2. Experience appears to have shown that *Rhea* cannot be produced in Lower Bengal as cheaply or as plentifully as was supposed. The plant makes little progress in the cold season, and the stems produced at that period of the year are short and woody. To secure even a moderate yield of well-sized stems deep-hoeing, manuring and irrigation are necessary, and it is only on good land and at a considerable outlay that three cuttings in the year can be looked for. At present the practical importance of this inquiry depends in a great measure upon the result of the attempts to produce an efficient machine for cleaning the fibre.

3. The results of the trial in England of certain coarse grasses of Orissa, to test their suitability for paper-making, are not discouraging. It seems that the two varieties known as *Ranikharia* and *Tiansi* are little inferior to *Esparto* grass, which is so largely exported from Spain for this purpose. The *Sara* grass also appears to be of good quality. Dr. King's correspondent states, regarding *Ranikharia* and *Tiansi*, that "if they can be had in large quantities and at the price of *Esparto*, they might be worth trying on a large scale." Larger quantities will be sent to England for further trial at the close of the present rainy season, and the Lieutenant-Governor requests that the result may be specially reported as soon as it is known. Dr. King explains satisfactorily his failure to examine the long grasses on the banks of the Adjye and Damuda, rivers. The Lieutenant-Governor trusts that this work will be taken up during the ensuing cold season.

4. Among the economic plants of which trials have been made in the garden, the *Carob*, the *Eucalypti*, the *Pará* rubber, and the fodder-tree *Symphytum Peregrinum* must now be pronounced failures, and the Lieutenant-Governor sees no advantage in further attempts to induce them to grow in an uncongenial soil and climate. The *Ceará* rubber, on the other hand, promises very well. It is extremely hardy and is readily propagated. The Lieutenant-Governor hopes that it may be possible to tap the trees and test the produce during the current season. Dr. King anticipates that indigo and tea planters in the plains will find it to their advantage to cultivate this valuable and hardy tree. He has made a *Ceará* plantation "in expectation of large demands for young plants and seeds." Dr King makes the following observations regarding the Guango or Rain-tree (*Pithecolobium Saman*) :—"This wonderful tree grows faster than any hitherto introduced into Bengal, with the single exception of the *casuarina.* It gives a beautiful shade and yields a pod with a sweet pulp, which is greedily eaten by cattle. For avenues, cantonments, squares, and situations where dense shade is wanted, no tree is more suitable than this" The Lieutenant-Governor has already directed the attention of the District Road authorities to the advantage of planting fruit-bearing trees along the sides of the roads, and thus increasing the resources of the district, while promoting the comfort of travellers. The Rain-tree appears to be well adapted for this purpose, and also for the formation of fuel reserves near stations.

5. Altogether 46 Wardian cases of plants were received from different parts of [illegible] despatched, against 21 and 21 respectively in the previous year. Dr. King justly points to this increase as evidence of the growing usefulness of the garden in the distribution of exotics. The number of plants sent out in open boxes and pots was 19,447, and of plants so received, 6,055 in 1878-79. In the interchange of seeds there was a large increase, 6,457 packets having been distributed, against 3,972 in the previous year, and 2,448 received, against 1,307. There were also considerable additions to the herbarium. Among the chief donors of plants and seeds were Mr. Bull of Chelsea, M. LeBœuf of Argenteuil, Messrs. Haage and Smidt of Erfurt, and Mr. Van Houtte of Ghent. Those who made the most valuable contributions to the herbarium were Mr. Brandis, Inspector-General of Forests, Mr. Sykes Gamble, Conservator of Forests. Mr. Duthie, Superintendent of the Botanical Garden at Saharunpore, Mr. Fisher of the Assam Forest Department, Mr. Ford of the Hong-Kong Botanical Garden, Major Collett, M. Godefroy Le Bœuf, Archdeacon Hose, and Mr. H. O. Forbes.

Dr. King himself was able to add his own collection made during his visit to the Straits and Java. To all these gentlemen the thanks of Government are due.

6 The garden sustained a serious loss during the year by the death of Mr. Biermann, an officer of much experience and worth. Dr. King also refers to the departure of Mr. John Scott on sick furlough, and the Lieutenant-Governor has, since the submission of this report, heard with regret of Mr. Scott's death in Europe. Mr. Scott had been connected with the garden for seventeen years, and had held charge of the herbarium for a considerable period.

7. The progress of the *Lloyd Botanical Garden*, during the year reflects much credit on the Curator, Mr. Jaffery; several thousands of seedlings were raised and considerable quantities of plants and seeds were received and distributed.

8. The Lieutenant-Governor again tenders his acknowledgments to Dr. King for the thorough efficiency displayed by him in the management of the garden.

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday, the 22nd July 1880.

W. H. COGSWELL, ESQ., V. P., *in the Chair.*

THE proceedings of the last Meeting were read and confirmed.

The following were elected members :—

Mrs. J. G. Macdonald, Messrs A. Springer, W. F. Swan, James Murray, and Rajah Rajendro Narayan Roy.

The names of the following were submitted for Membership :—

Secretary, Patna Municipality,—proposed by Mr. R. Bignell, seconded by the Secretary.

W. Mackenzie, Esq., Huttowrie, Belsspore, Tirhoot,—proposed by Mr. G. Toomy, seconded by Mr. G. Swaine.

Mrs. A. J. Hughes, Mozufferpore,—proposed by Mr. H. Stanley Collier, seconded by the Secretary.

Newton E. Jennings, Esq., Engineer, Kimerdi Estate,—proposed by Mr. W. F. Grahame, seconded by Mr. H. J. Leitch.

Rejoined.—A. J. Farquharson, Esq., Tea Planter, Gowhatti.

CONTRIBUTIONS.

1. Proceedings of the Boston Society of Natural History, Vol. 19, Parts 3 and 4, and Vol. 20, Part 1, Memoirs of Ditto, Vol. 3, Part 1, Nos. 1 and 2. From the Society.

2. Notes on Tea and Coffee Fertilizer, prepared by David Waldie. From the Author.

3. Memoirs of the Geological Survey of India, Vol. 15, Part 2. Records of Ditto, Vol. 13, Part 2. Memoirs of Ditto, *Palæontologia Indica*, Vol. 1. Part 5. From the Superintendent.

4. Journal of the Asiatic Society of Bengal, Vol. 49, Part 2, No. 1, and Vol. 49, Part 1, No. 1, and extra No. to Part 1 for 1878. From the Society.

5. Plants and seeds from the Nicobars. From E. H. Man, Esq.

6. Seed of the yellow flower variety of the Dhak (*Butea frondosa.*) From J. V. Sturt, Esq., V.P., Municipal Committee of Mau, Ramporo. Mr. Sturt remarks that it is a rare variety, and very pretty seen in blossom alongside of the common or scarlet variety.

7. Seed of *Millettia ovalifolia*, from Rangoon. From R. Rowett, Esq. This is a handsome tree and supposed to furnish the "Moulmein Rosewood."

8. Seedlings of *Amherstia nobilis* and plantain shoots from Moulmein. From C. Ady, Esq.

9. A quantity of Mahogany seed. From Dr. G. King.

10. Bulbs of *Eurycles Cunninghamii* and seed of *Acronychia Baueri*. From L. Bernays, Esq., V.P., Acclimatization Society of Queensland.

REPORT ON NEW PLOUGHS.

A second report of a Sub-Committee of the Council (Dr. S. Lynch, Mr. W. H. Cogswell, and Baboo P. C. Mittra) in respect to trial of certain ploughs, was read as follows :—

Your Committee presented their preliminary report at the general Meeting in March last on a plough submitted by Mr. Martin of Etawah, when it was resolved that another trial be given to this and any other ploughs submitted for competition, when the rainy season had fairly set in.

Accordingly, on the 23rd June, your Committee met again at the Society's garden, when the following ploughs were arranged for trial :—

1. A combined plough from Mr. Martin, of Etawah, single handle, weighing about 12 seers, selling price, Rs. 3 at Etawah, in Calcutta, Rs. 4.

2. A plough from Mr. Crawley of the Cawnpore Model Farm, made of wrought iron, weighs 14 seers, said by the maker to plough 6 inches without any pressure whatever being used by the ploughman, the cost of making will not exceed Rs. 5, single handle.

3. A plough from the central prison, Benares, double handle, and no beam, cost Rs. 13.

The land on which the trial was made may be termed grass land. It had never before been prepared for any purpose, the grass was in most parts short and close, elsewhere long and jungly. Sufficient rain had fallen to render the ground soft and practicable for ploughing purposes.

The cattle employed were the ordinary village plough bullocks.

With respect to the Benares plough (European in all respects, except in the absence of the beam) it was found to be beyond the powers of bullocks of the above description owing probably to a defect in the shape, the soil clogged at the shoulder of the mould board, increasing the draught whilst the soil was not turned over; when it was attempted to increase the depth of the furrow, the heel of the plough was lifted off the ground. This is one of the results of the absence of the beam. Another is that the ploughman's command over the plough during heavy work is lost owing to the absence of leverage. The body of the plough is a heavy inert mass in the ploughman's hands. The width of the furrow with this plough is about six inches. The depth could not be fairly stated from the trial.

This plough might go through light soil previously worked without any difficulty.

The Cawnpore plough, in like manner, cutting a furrow of six inches in width by about four inches deep, was heavy in draught, and failed to invert the soil. The mould board was clogged all the time.

The plough from Etawah (Martin's) performed its worked efficiently. It showed a light draught well within the power of the little Bengali bullocks; it turned the slice completely over, making a furrow of a depth of three inches, with a width of 4½ inches. This plough, whilst it resembles most nearly the native type in construction and cost, makes a close approach to the European plough in the mode in which the work is turned out. But there is the radical fault in this and other ploughs with fixed beams, that at the moment when the work is heaviest, the heel of the plough will be drawn up and the point depressed to such an extent as to tax severely the strength of the ploughman.

Resolved that copies of the above report be sent to the parties interested.

RHEEA FIBRE.

Submitted certain papers on the above forwarded by the Secretary to the Government of Bengal, with a sample of Rheea fibre referred to therein. Mr. Mackenzie adds : "that the Lieutenant-Governor would be glad if he could be favoured with the opinion of the Society as to the commercial value of the fibre and its suitability to the Indian and home markets."

From Messrs. Burrows, Thomson, and Mylne of the Jugdispore Estate, Boheea, dated 8th April 1880.—"In reference to the recent competitive trials at Saharunpore of machinery for extracting the fibre of the Rheea plant, it may be interesting to his Honor, the Lieutenant-Governor, to know that the fibre has been prepared many years ago at Bhagulpore by some families of the Dhanook caste for the silk-weavers there.

We were aware of this, and at the time of the recent competition sent to the President of the Government Committee, sample of Rheea fibre prepared by the Bhagulpore method, with a description of the process.

It was also suggested that this process might be beneficially carried out by the female members of poor Rajpoot and Brahmin families who are not allowed to appear in public or engage in field work. There are great numbers of such families whose women have literally nothing to do.

Clean Rheea fibre brings high prices in Europe and is valuable as compared to its bulk.

The plant is perennial, and the cultivation similar to that of sugarcane without the labor and expense of yearly planting. The roots properly attended to will give three or four cuttings yearly in this part of the country. If left in the open field cattles don't graze it. These are desirable qualities in the estimation of Rajpoot and Brahmin cultivators.

We have procured roots from the Saharunpore and Calcutta Government gardens, with the intention of doing what may be possible, to introduce a valuable industry among the Rajpoot and Brahmin families, resident in the villages of the Jugdispore Estate.

A small sample of Rheea fibre from plant grown here and prepared by the Bhagulpore process, is herewith enclosed for the inspection of his Honor the Lieutenant-Governor."

From the same, dated 19th September 1879, *to the President of the Rheea Committee, Saharunpore.* RHEEA FIBRE.—The method for obtaining this fibre, practised by certain natives of Bhagulpore of the Dhanook caste some eight or ten years, or still further back, is generally as follows :—

The site of the little factory is chosen, if possible, near a stream of soft water, as the process is one of slow boiling or simmering, and beating in combination with washing.

The factory plant is an earthern or other pan or boiler, and two notched boards, such as *dhobies* use.

The work-people—two men, two women, two boys.

The boiler is charged with water sufficient to cover the shoots proposed to be dealt with, and to it is added about 10 chittacks *sujjee-muttee* for a maund of plant placed in the boiler, the whole is then allowed to simmer or boil slowly for half or two hours.

The shoots are then taken by or handed to the nearest man with a notched board before him (the boards being placed near by or partially in the water *dhobi* fashion) in such portions as can be held firmly between his two hands; he continues to dash it against the board, washing it at the same time, thus clearing each end alternately of the wood and portions of the bark and gum. The handful is then passed on to the second man with a similar board who beats and washes it in the same way to free the filaments still further from gum and bark.

After this it is taken by the boys back to the boiler to be again slowly boiled or simmered for about an hour. It is then again beaten and washed by the two men as before till the gum is removed and the filaments are free.

The two women now take charge of it to be dried, beaten, and drawn or carded till it is in the condition of the accompanying sample, but much whiter.

A maund of shoots per hour can thus be easily worked off, which, its filament is in the plant in the proportion of 2½ per cent., will be one seer

of fibre fit for spinning by the native hand-method or for the carding machinery sent to Europe. If the percentage of filament in the plant is over 2½ per cent., the outturn will be increased in proportion, while no addition is made to the cost.

By adding half the original quantity of *sujjee-muttee* to the water in the boiler, it may be used again, afterwards the water should be changed.

We propose introducing the domestic cultivation of the Rheea plant and preparation of fibre to the people of the villages on the Jugdispore Estate in the hope that it may make a considerable addition to the family earnings especially to high caste families, whose women are, as a rule *purda nashin*, and to whom it seems the preparation of the fibre would be a profitable means of passing time otherwise useless. The plant being perennial and handy, would require little care from the men beyond perhaps loosening the surface and weeding every two months and giving some manure twice yearly.

Should any simple machine be required or found to be beneficial, we have reason to believe that the want will be met by two small rollers on the principle of the native *chirkee* or cotton gin roughed on the surface and working at different degrees of speed ; this has been found to loosen and partially remove the bark, and to some extent freeing the filaments from the gum or gluten by the drawing or triturative motion of the rollers so adjusted to each other.

In addition to our memorandum on Rheea fibre, handed to you yesterday, we will be glad if an opportunity can be given during November and December next of testing on a reasonable large scale the Bhagulpore method of preparing Rheea fibre, at or near the Botanic Gardens, Calcutta, where, we believe, a considerable quantity of Rheea plant is grown.

Report by Mr. W. H. Cogswell.—I consider this sample of Rheea to be one of the best that has been submitted to me for a long time past, as regards its color, cleanliness, and soft silky fibre, and its comparative freedom from gum and mucilaginous matter. The fibre, has not been destroyed by chemicals, as is so frequently the case in many processes, and I think but very little injured or weakened in its strength under the simple method is said to have been adopted in its preparation. It is excessively short, owing, I think, to excessive hackling or combing, and a great waste must have been the consequence. Its value in consequence will be materially lessened. It is, however, admirably adapted for spinning, and I would recommend that in the absence of spinning and weaving steam machinery a sample of cloth be prepared by hand. It is beyond all doubt, of great commercial value in Europe, for blending with silk fabrics, and I advise that a good large sample be sent to England to be properly and carefully valued, which, I think, it is quite impossible to arrive at in this market.

Note by Mr. W. Stalkartt.—I quite agree with all Mr. Cogswell has written above.

Report by Mr. S. H. Robinson.—I agree with Mr. Cogswell's remarks: but before sending the sample to England for valuation in the home market, I think Messrs. Thomson, Burrows, and Mylne might be asked at what rate it is usually sold in the Bhagulpore district, and the rate quoted to the English dealers to whom it is proposed to send the sample.

HINGLI TOBACCO AND ALOE FIBRE.

Submitted certain specimens of the above, obligingly forwarded for the inspection of the Meeting, by Mr. H. H. Locke, Secretary to the Economic Museum, with the following note thereon :—

Here are the samples of—

1. Hingli tobacco.
2 and 3. Aloe fibre, combed and uncombed.
4. And matting made from the Aloe fibre,

which you thought your Society would like to see to-morrow.

I subjoin some short notes about these things :—

The Hingli tobacco was received from the Magistrate of Nuddea. It had been exhibited at the Ranaghat Exhibition in January last, and was sent to us at the end of April. On the 10th May it was thus reported on by a Calcutta expert :—

'A very good sample of Hingli tobacco. Sweet and well cured, comparatively free from stem, worth in Calcutta to-day (10th May) Rs. 9 to Rs. 9-8 per maund, or say Re 1 more than good ordinary Hingli.

'Owing to the weight of stem natural to this quality of tobacco, it is not suited for European markets.'

The Aloe fibre and Matting comes from the Hazareebagh Jail. Dr. Cobb the Superintendent, writes concerning the Matting that

'It is of very superior quality ; is everlasting in wear, and looks well to the last. Is especially suited for passages, or the aisles of churches or public buildings ; ship and steamer saloons, &c.'

Its price is Re. 1-4 a yard. Some excellent samples of lines and twines made from Aloe fibre, were also sent by Mr. Winter,' the Jailor of the Hazareebaugh Jail, for transmission to the Melbourne Exhibition. I am sorry I cannot send you samples of these, but the specimens I received were too small to admit of portions being retained for permanent deposit in this Museum, and the original samples have been despatched to Melbourne.

SEED POTATOES FROM MELBOURNE.

The Secretary drew attention to ten cases of seed potatoes just received from Melbourne, through the kind intervention of Messrs. Anderson Wright & Co. These potatoes are in excellent sprouting condition, but having arrived too early in the season for Bengal, it was agreed to distribute them to residents at Darjeeling and other hill stations, and ask them to send down a portion of the produce for trial in the plains in the cold weather.

The best acknowledgments of the Society were tendered to Messrs. Anderson, Wright & Co., for their kind assistance.

PROPOSALS FOR THE DESTRUCTION OF THE TEA BUG AND OTHER INSECT PESTS IN ASSAM AND CACHAR.

The Secretary next read a letter from the Under-Secretary, Government of India, Home, Revenue, and Agriculture Departments, forwarding, as requested, certain papers connected with the above important subjects. The papers consist first of a memorial from certain proprietors and agents of tea properties in Cachar, parts of Assam, and other districts, respecting, the serious extent to which the tea industry in India is being injured by blight, caused by an insect known as the tea bug, and requesting the services of certain Government officers, botanical and entomological, being granted towards an inquiry into the whole subject. Then follow—*secondly*, correspondence between the Governments of India and Bengal and the Trustees of the Indian Museum ; and *thirdly*, other communications resulting in the deputation of Mr. Wood-Mason to Assam for the purpose of investigating the injuries caused to tea plants by the tea bug, and the best means of destroying the pest.

In connection with the above, the Secretary drew attention to the great interest the Society had previously taken in the subject. For several years past, it would be in the recollection of most of the Members present, he Society had been receiving communications from the tea districts regarding the great and annually increasing damage caused not only by the tea bug but other insects. In view of these numerous notices, the Council suggested to the Society in 1876 the advisability of taking some steps towards endeavouring to remedy this annually increasing evil. The recommendation, it would be remembered, took the form of endeavouring to engage the services of a practical entomologist to travel over the tea districts of Assam, Cachar, and Darjeeling for two years, to study carefully the character and habit of the various kinds of blight in their several localities, and so be able, probably, to suggest some remedial measures of a practical nature for modifying if not entirely eradicating, their ravages. For this purpose it was estimated that a sum of Rs. 15,000 would suffice, which could be easily raised by agents of various gardens agreeing to subscribe Rs. 10 for every hundred acres under cultivation. The amount to each would thus have been trifling, even if the results were not successful. The Society, moreover, engaged to secure the services of a competent person and to publish, in due course, the result of his inquiries, supplementing it with a *resumé* of the papers already collected and published in their Proceedings and Journal during the past eight years. Notwithstanding the Circulars issued on the subject, combined with personal application, this proposal did not meet with sufficient encouragement to enable the Society to take necessary action. Several agents, largely interested were quite willing to support the scheme, provided all would join. As however, many, though apparently well inclined, would not come to any definite understanding, the Society, as intimated in the last annual report, were reluctantly compelled to abandon the scheme.

The Secretary added that he had afforded all the information in his power, in the early part of the year, to the originators of the above recent memorial to the Government of India.

Letters were also read—

From the Secretary, Royal Horticultural Society of London, returning thanks for donation of seeds.

From the Secretary, Bijnor Agricultural Society, offering the cordial thanks of the Committee "for the valuable support the Council of the Agri-Horticultural Society have given them by consenting to supply this Institute with copies of their publications and seeds of field crops free of cost."

MINERALOGY.

THE Board of Revenue draws the attention of all officers to the following orders regarding the right of Government to mines and minerals, as laid down by the Government of India and Secretary of State :—

Except in permanently settled estates, it is presumed throughout India that, in the absence of any distinct judicial precedent or proof of established usage, the State has a right to minerals. The [illegible] grantees of waste lands (whether or not the grants expressly comprise all produ[illegible] above and below the surface) are, in the absence of provision to the contrary, entitled to mines of gold and silver found thereupon, is limited to grantees of waste land "in fee simple," made in accordance with the rules framed upon the instructions given in Sir Charles Wood's despatch No. 14 of 1862. Grants of waste land in fee simple are, however, no longer made, and all leases of waste lands are now distinctly given subject to reservation of the full right of the State in mines and minerals, and of right of access and other reasonable conveniences for working them on behalf of Government or the assignees of Government.

ONE of the passengers from Bombay by the P. and O. steamer that leaves to-day will be Mr. Brough Smyth, who has been summoned by telegram to London to consult with the Directors of the Gold Mining Company to which Mr. Smyth has been appointed Managing Engineer. We believe that Mr. Brough Smyth's experiments on stone brought from the Comany's land have been highly satisfactory and encouraging to future operations.

IT is stated that a French Indian Gold Mining Company is in course of formation in Paris.

ACCORDING to the *Indian Railway Gazette* an important discovery of coal has been made by Mr. Mitchell, Supervisor of the Candahar State Railway at Sharagh. The coal is said to be in abundance on the hills about the station, and no trouble will be experienced in the getting of it, as it is said to be plentiful near the surface. It is now being used instead of wood in the railway workshops, and is said to contain a great deal of gas and to burn better than any other coal yet produced in India.

IT has been determined to add a series of specimens illustrating the geology and mineralogy of Ceylon to the Ceylon Court at the approaching Melbourne Exhibition. The cost of collection and despatch of the collection has been liberally undertaken by a private gentleman, Mr. A. C. Dixon of the Colombo Academy, who considers that the Australians are likely to take much interest in everything connected with geology.

WE understand that a Mining Company of San Francisco in California intend prospecting for minerals in Travancore and Cochin. They have deputed Mr. W. J. Dermies, who is said to be one who is well qualified for the task, to inspect and report on the geological condition of the two States, and this gentleman is already on his way to Travancore. There has been a general impression that the two States are not without their mineral products; and should the visit of Mr. Dermies prove conclusively that it is so, we expect to see the Company carrying on active operations in Travancore and Cochin before many months are over.

A CORRESPONDENT in Wynaad says:—"Our neighbours in the south-east seem to be in a perfect delirium of triumph over the continually increasing success of their discoveries. Some especially rich reefs have just been hit upon. Everybody is digging holes, and breaking up rocks. Coffee is nowhere, or rather it is anywhere ruthlessly dug up, wherever it in the very least interferes with the one absorbing object; and with the extraordinary finds daily come upon, all reasonable doubt on the subject of the existence of gold, and gold in very considerable quantities in Davala, must, I should imagine, be at an end. A new era in the history of Wynaad is opening to us,—and with such incitement it is not possible or probable that energy will be lacking to carry on the work which contains so much of encouragement in its outset. I hear that the band of Cornish miners who arrived some weeks ago, are working grandly, and up to the present do not seem to have suffered from the proverbially evil climate of Wynaad."

GOLD IN WASH-DIRT.

PRESENT news from Ballarat, received by the Australian mail, is interesting. Early in June a lead of wash-dirt was struck which was named the Hurdsfield, and a number of companies were formed to work various pieces of ground in the neighbourhood, in the hope of finding the run of wash-dirt. Several of these companies have already struck it, and it has proved extremely rich. On the 1st July, the East Hurdsfield Company had 144 oz. of gold for the day's washing up. The Central Hurdsfield Company was said to be washing equally well, and the Hurdsfield Freehold Company had 223oz. from the one machine, and one tubful of dirt. On the next morning the latter company was said to have obtained 130oz. from four candle-boxes of wash-dirt. On the 2nd the Hurdsfield Company reported a yield of 583oz. "What astonishes most people in Ballarat is the extent of this immensely rich field of wash-dirt, for though it cannot be expected to cover any great area, yet no limit has yet been proved; and an impression is beginning to prevail, that the early diggers, who followed the deep beds of the golden gutters only, and who, in those days knew nothing of reef-washes, may have left immensely rich beds of high-lying wash-dirt behind them, and that there is just a chance that a great deal of the area on which the City [illegible] again become the theatre of the wild excitement of a quarter of a century ago. This, of course, is mere conjecture, but it is taking so firm a hold of some people's minds that claims along the course of the Golden-point and Gravel-pits and other old gutters are being taken up right into the centre of the city.

DIAMOND PITS.

THE far-famed Golcondah is no apocryphal place that was visited by Sinbad the Sailor, or Munchausen the Baron; but it is a fortress seven miles to the north-west of Hyderabad, the capital of the Nizam's Dominions. It is proverbially famous for its diamonds, yet it has obtained this fame vicariously, for the diamonds which are cut and polished at Golcondah, are usually brought thither for that purpose from Parteal, close to the southern frontier of the Nizam's Dominions, and about sixteen miles south-west of Ellore in the Ganjam district. But there are six other places in the same locality where diamonds are, or have been found. The names of these places are Mallavelli, Alkur, Parthempadu, Pra'alli, Wastapille, and Kodavetti Kall. Eastwick relates that:—

"The hollow flat, where the diamond pits are, is a low, dry, gravelly plain, but which has the appearance of having once been a lake. Through this plain no steam flows, and the pools, in its lower part, dry up in March, when the excavation may be commenced, and not before. The pits are in general excavated at the north end of the bank that surrounds he hollow. The deepest are not more than 12 ft., and whatever the depth, a hard mass of rock is never reached. The strata penetrated are—first, a grey, clayey, vegetable mould, about a foot or two thick; below this an alluvium of the following pebbles, rounded by attrition: sandstone quartz, siliceous iron, hornstone, carbonate of iron, felspar, conglomerate sandstone, and a prodigious quantity of concretionary limestone. The diamond is never found imbedded, or in any way attached to any of the pebbles, but always loosely mixed with the other little stones. The detritus, forming the diamond stratum, must have proceeded from the hills to the North, the only hills, in fact, near the place. They are the continuation of the standstone range, which extends east from Banganapilli, Knodapilli, and Mallavelli, in all of which localities the matrix of the diamond is a conglomerate sandstone."

From this locality, the world has been supplied for centuries with diamonds of the purest water. The diamond which Mr. Pitt, the Governor of Madras (grandfather of the first Earl of Chatham) obtained, and which has been long known as the Pitt diamond, was found in Golcondah. It was taken by the Governor to Europe and sold to the Duke of Orleans for £130,000. It decorated the hilt of Napoleon's sword, was captured by the Prussians at Waterloo, and it now belongs to the King of Prussia. It weighs in its cut state 136¾ carats, and is said to be unrivalled in its limpidness, and its form. The Kohinoor, the Mountain of Light, was found—according to Hindu legend—in a Golcondah mine. It originally weighed 900 carats, but has been reduced by cutting to 123 carats, and is now valued at £120,604. It is now the personal property of the Queen. There is fair reason to suppose that the wealth of the Parteal region has not been exhausted, and that the appliances of modern machinery directed by men of science may bring to light gems that have not been discovered by rude native processes of search. A rumour has reached us that a scheme is afloat for developing the diamond resources of the Golcondah locality. That it may be worth while to prospect for diamonds is shown by the remarkable facts that the value of Cape diamonds transmitted through the Post Office in the six years 1873-79 was no less than £16,409,417. Besides these gems a large number went to Europe in the custody of the owners, or as freight, and it is likely enough, making allowance for under-valuation that the total proceeds of the Cape mines approximated closely to twenty millions sterling in the seven years. The best Cape daimond is a slightly yellowish, and certainly, inferior gem to the best Indian diamond; yet so great is the demand for the jewel that the world bought the inferior article to the above extent. This seems to indicate that gems of the first quality are scarce, and that if Golcondah should answer the expectations of some sanguine individuals, a great addition may be made to the exports of the country.—*Madras Mail.*

IRON ORES IN MADRAS.

WE quote the following from that interesting and useful book published by Government, "Standing Information regarding the Administration of the Madras Presidency," it will be seen that there are iron ores there, which only require enterprise to make them of great use to us:—

Some remarkable deposits of magnetic iron ores are found in the Salem district. The ores occur in large beds of from 50 to 100 feet in thickness, and the out-crop may be traced for miles. On one hill, six miles from Salem, there are five bands of magnetic iron from 20 to 50 feet thick. In 1825, Mr. Heath of the Civil Service, obtained a Government advance and formed a company to establish iron works at Porto Novo near Cuddalore, at Palampatty near Salem, and at Beypore on the West Coast. At the last place the iron was to be obtained from the laterite. The Porto Novo works were begun in 1833, and those at Beypore some years later. The Government gave their aid, but the experiments failed. The causes assigned were the distance of the works from the source of supply, scarcity of charcoal, and various other practical difficulties. Several companies took up the matter, but with no final success. The information that is available regarding native working in iron will be found under the head of Manufactures. Though not of such extent or thickness, yet still of sufficient importance to be of considerable value in any further opening up of the country by rail or canal, are some great veins of iron-ore in the Kurnool district, which occur in the Gunnygull and other smaller ridges near Ramallakota some 12 miles south of Kurnool. The ore is the grey micaceous or specular iron oxide and is very rich. Old workings on pits are common all over the ranges, showing that much ore has been extracted, but only one or two furnaces appear to be worked now at intervals during the year. The great drawback to the evident richness of this iron field is the scarcity of fuel, which however might be obviated by the conservation of the jungle in the adjacent hill ranges.

We have also lead and copper ores, as will be seen from the following paragraphs which we extract from the same publication :—

Lead ore occurs in the Nullamullay range of the Cuddapah district where it was worked very largely in ancient times ; but although the indications of its extent and richness are fairly good, no continuous or, systematic attempt has been made by Europeans to re-open the mines. Mr. P. W. Wall, the Mineral Viewer to Government in 1858, explored these mines, but did not report very favourably of them, though he seemed to consider the percentage of silver large. The latest assay (1879, by Mr. Mallett of the Geological Survey of India) of a small specimen, gave 78 per cent. of lead, containing silver at the rate of 22oz. 7dwt. to the ton.

Copper ores are met with in the Cuddapah, Kurnool, and Nellore districts in old workings, the best indications being in the latter district, near Gunnipenta, where, some 40 years ago, they were important enough to attract European enterprise, but without any successful result. Within the last year, however, attempts are again being made by a Madras Mining Company, both in this region and in the Cuddapah district, to work these and the lead ores. The Nellore mines are considered by Mr. King, the Deputy Superintendent (for Madras) of the Geological Survey of India, not to have been adequately tried, the traces of ore being frequent and promising, while the old attempts have been carried on by incompetent men met by the usual temptations and insalubrity of the climate.

IRON ORES IN CENTRAL INDIA.

As a means of famine prevention, the devlopment of industrial enterprises is to be ranked with, if it should not take precedence of irrigation works and railways ; and among such enterprises none, perhaps, holds out fairer prospects than that which has contributed so largely to British prosperity—iron manufacture.

Everybody knows that there is iron ore in many parts of India, but it is not generally known that in Central India there are ores of that metal of the best quality.

The Central India iron ores are remarkable at once for their purity and their richness. They are chiefly red iron ores and magnetite, containing sometimes manganese, but there are also brown iron ores and siliceous hematite. As all these ores occur in enormous quantities on the surface of the ground, the erection of costly mining works, which is elsewhere necessary, is here not required. Owing to the difficult treatment required for the magnetites, the native iron-makers prefer the soft red iron-stones of a laminated texture, although the former contain a larger percentage of iron. The brown iron ores and the siliceous hematities are used by them only very exceptionally.

Before showing how the Indian iron ores may be utilised without prejudice to English interests, we will give an analysis of the iron ores of Central India, together with some other details.

The magnetites contain 71 per cent. of metalic iron (or 69 per cent. oxyde, and 29½ per cent. protoxyde of iron), the red iron ore from 65 per cent. to 69 per cent. of iron (or 91 to 98 per cent. of oxyde of iron), the brown iron ore 45 to 55 per cent. and the siliceous hematites 10 to 48 per cent. of metallic iron. The few impurities of these ores are small quantities of quartz, clay, and manganese and exceptionally some lime; of sulphur there are but few traces, of phosphorus none.—at least none have been discovered in the red iron ores and in the magnetites.

So much has the exceptional purity of these ores struck observers that somebody, writing of them in a public paper, some time ago maintained that they were pure iron, which is incorrect ; the richest iron ores can never contain more than 72 per cent. of metallic iron. Iron always occurs in nature combined with oxygen, the lowest degree of oxydation being in magnetite. Pure iron might prehaps be said to occur in meteors, but here also it is combined with nickel from 3 to 8 per cent. We know of no ores in the world which are fully equal to those of Central India in purity, in richness, and quantity over a given area.

In general the European iron ores contain only from 30 to 35 per cent. of metallic iron, therefore half only that contained in the red iron ores and in the magnetites of Central India. How great a value is put on pure and rich ores by iron makers may be learned from the circumstance (which should be made widely known in India) that vast quantities of such ores are yearly imported into England, France, Germany, and Belgium, from the south of Europe and more distant countries.

The iron ores of Central India containing, as was said before, no phosphorus, and little manganese, are suitable for the production not only of bar iron but notably also of steel, and especially of Bessemer cast-steel for rails. It is well known that the amount of phosphorus in the ore determines its fitness for the Bessemer process; and if it exceeds ¾ per cent., the steel cannot be converted into rails, which are now generally made of Bessemer steel. Again, ores containing manganese are known to be especially useful for the production of steel for cutting tools. Equally suitable are the pure red iron ores of Central India, containing manganese, for the production of "Spiegeleisen" (specular cast-iron) a kind of pig iron, which is added to the iron in the Bessemer process, and in cast steel crucibles. Great quantities of this article are exported from Germany and Austria, and the price of it is 60 per cent. higher than that of ordinary pig iron. The same is the case with an article called in the trade *acier sauvage* (wild steel), also a kind of pig iron, containing a very small quantity of carbon. This is exported at high prices, from Styria in Austria to England, France, and Belgium, for the manufacture of ductible iron for wire. Now "Spiegeleisen" and *acier sauvage* can only be obtained from the *purest* iron ores, and of these there are inexhaustible mines in Central India. Here we have then a most valuable raw material for exportation which would not interfere with England's commercial policy as regards India, which has hitherto consisted in the principle of taking India's raw produce and returning it to her in the shape of manufactured goods.

Should the art of iron making in the course of time be so far developed as to furnish us with an economical process of making finished iron or steel direct from the ore, that is to say, without the introduction of the blast furnace and fining process, then pure ores would greatly increase in value and become eventually a most important article of export from India.

The following explanation of the present system of iron making will show the importance of the exertions which are now being made towards the obtaining of iron by a *direct* process.

The object of the blast furnace-process is, first, to free the ore from oxygen, then to induce carbon into the article so obtained, and finally, to melt this compound. The product of the blast furnace is thus iron with a greater or lesser percentage of carbon, called pig iron. The next, namely, the fining process, has for its object, on the contrary, the freeing of pig-iron from carbon or the production of a metal free or nearly free of carbon. To the uninitiated the question will at once present itself why these opposite processes are followed—why the reduced ore, *i.e.*, the ore freed from oxygen, is not melted down direct into iron in the blast furnace instead of first infusing it with carbon, and then freeing it from the same by the expensive puddling or Bessemer process.

The reason is twofold : first, because it is difficult to melt down pure carbonless iron. It would require a very great heat of 1,700° centigrade, whilst pig iron, or iron containing carbon, melts with a heat of from 1,100° to 1,400° centigrade, and it is this excess of from 300 to 500 degrees of heat which is difficult and expensive to attain, both as regards fuel and fire-proof material for the furnaces. The second cause of the roundabout process is the more or less impure state of iron ores, especially in respect of phosphorus and sulphur. Opportunity and time for departure must be given to these impurities, and this is done by the repeated melting and manipulating of the stuff in the so-called fining process.

From this short explanation the reader will easily perceive that, in the case of the magnetite and red iron ores, in which we have to deal with either very small or inappreciable quantities of impurities, the question of producing pure iron or steel by a *direct* process is reduced to one for the science of heat to solve. It is a question, in fact, of producing 1,700° centigrade of heat economically. The solution of this question is approaching. The efforts of Siemens, Dupuis, and others in this direction, if they have not solved this problem, have at least paved the way to its solution. But it may be objected that the best iron ores and the largest quantities of them in Central India are of no avail, as there are no coals there ; the reply to this objection is that there is ample wood available. Again it may be objected as was indeed done a short time ago by a writer in the columns of a daily contemporary, that making iron in India with charcoal has been tried and has failed. It is well known, however, that excellent iron has been made in India, for centuries, with charcoal. Those also who know anything of the iron trade, know that vast quantities of iron are made in Sweden and Styria, both for home consumption and for export with vegetable fuel. It cannot be that the price of charcoal in India is an obstacle since it is about three times as high in Styria, for instance, as in India; neither can the failure have been caused by the experience of charcoal making bad iron, for the reverse is well known to be the case. The true cause is not far to seek; it can have been due to nothing else than to ignorance or bad mechanical arrangements, or bad management, or dishonesty, and very likely to all these combined.

It is on the question of vegetable fuel *versus* mineral coal that the future iron industry of India will depend, and in a future issue we shall probably examine the question in detail.—*Englishman.*

BURMAH GOLD.

Some specimens of gold from the gold washings near Shwegyeen with parcels of the soil or sand from which gold is washed, were forwarded in 1853 for examination to Dr. Oldham, the late Superintendent of the Geological Survey of India. The result of that examination was as follows :—

One parcel, said to be the surface-soil, was found to be a gravelly sand, consisting principally of small grains of quartz, minute flakes of bright-colored mica, generally of a golden tint and of pebbles of various kinds of metamorphic and crystalline rocks. A few small crystalline pieces of topaz occurred in the sand, and one or two minute red garnets were also found. Mixed with this, sand was found in small quantities and in minute grains some magnetic iron sand and a few acicular crystals of schorl. The sand in this parcel did not altogether amount to the fifth part of a cubic foot. By simple washing, it yielded 0·75 of a grain of gold in minute flakes. The residue of the sand was then successfully agitated with mercury in order to obtain by amalgamation any particles of gold which might have been too minute for mechanical separation. By this process 0·20 more of a grain of gold was obtained. Consequently, from less than the fifth part of a cubic foot of soil 0·95 of a grain of gold was extracted.

The second parcel contained a yellowish ferruginous sandy clay, looking as if it were the result of the decomposition of the upper portion of [illegible]. This clay was reduced to a fine state of division and carefully washed—the sandy portion, consisting chiefly of ferruginous quartz grains, being separated. The residue was carefully examined ; but no traces of gold were discovered. The fine, slightly sandy clay, which remained after washing, was considered well suited for the coarser kinds of pottery ; it stood the fire well, and it was sufficiently tenacious to admit of being readily moulded.

The specimens of gold consisted of varieties ranging from dust of the finest kind that could be mechanically separated, to small nuggets. Two specimens described as "purchased at Shwegyeen" very well illustrated the mode of occurrence of the gold in its Native State, imbedded in quartz, while the other specimen showed that the general form in which it is found in these washings is in small rounded flakes or flattened plates of various sizes. This gold was proved to be of considerable purity—yielding on careful analysis 9,200 of gold and 50 of silver in 100 parts.

This result, although tolerably accurate was to be taken only as approximative. It was, however, sufficient to show that the Shwegyeen gold was fully equal in value to the average quality of Australian gold.

The occurrence of gold of fair purity being undoubted, the question remains as to the quality in which it may occur, and the probability of its yielding a fair return. If the specimen of auriferous sand were to be taken as a fair average sample of the kind of soil and of the quantity of gold contained in it, it followed, according to Dr. Oldham, that, as nearly a grain of gold was procured from about the fifth part of a cubic foot of soil, a cubic yard of the same sand should afford about 135 grains of gold, or, if the portion obtained by amalgamation, namely, 0·20 of a grain, be excluded, the yield by washing alone should be 101 25, or say, on an average, 100 grains of gold for each cubic yard of the sand washed. This sand being surface soil, and, therefore, easily accessible without the labor of sinking pit or the cost of keeping such pits open, two men could with great ease raise and wash a cubic yard of soil, daily obtaining for their remuneration, 100 grains of gold between them or 50 grains per man for each day's work. As this gold would be worth £3 British per ounce, each man would realise six shillings and three pence (about Rs. 3-2) per diem—a return, doubtless ample for ordinary workmen, but *utterly insufficient to tempt commercial enterprise and capital*. Dr. Oldham, however, qualified his opinion by adding that the average yield of the auriferous soil would necessarily vary very considerably in character and in richness according to the conditions under which the deposits may have been formed. The geological structure, however, of the greater part of the Malayan Peninsular, extending to Arakan northward, so far as known, indicated the probable existence of auriferous deposits throughout the whole extent, on flanks of the central ranges of high ground. The ascertained existence of gold in more than one locality in Shwegyeen and other parts of the Tenasserim as well as the association in these localities of magnetic iron sand with the gold (a mineral so constant an accompaniment of gold as to have earned among miners the name of the "mother of gold") appeared to Dr. Oldham to confirm this reasoning from analogy. The auriferous deposits he had referred to would, he was convinced, occur at intervals throughout the whole range, and that locality then would prove to be very rich.

Judging from the rude manner in which the gold was washed by the people, Dr. Oldham thought that fully one-half of the entire amount of gold contained in the sand was in all probability irretrievably lost. In his opinion it was extremely desirable that some more efficient, yet simple, apparatus for separating the gold by washing and also for amalgamating it with mercury might be introduced into the district, when the greatly increased quantity of gold which would be obtained by the use of such improved appliances, would quickly lead to their general adoption. The gold washings are, however, still conducted in the same rude manner as before.

We have been induced to reproduce the above, written during a late agitation on the subject as it bears upon what is now being talked of about the gold capabilities of this province, the "Aurea Regio" of Ptolemy, and the *Suvarna Bhumi* of old.—*Eurasian* (*Rangoon*).

FORESTRY.

A FOREST Conference was held, on Saturday 31st July, at Poona in the Council Hall. There were present the Governor of Bombay in Council, the Revenue Commissioners, and Mr. A. F. Shuttle-worth, of the Forest Department. No definite policy was decided upon. Sir James Fergusson is said to be well versed in forest matters.

We learn that the Wynaad Planters' memorial to Government for the construction of a line of Railway from Beypore to Mysore has received the cordial support of Government, as both the Chief Commissioner and the Consulting Engineer for Railways consider the line would yield a fair revenue, and would tap the forest resources of Mysore.

REBOISEMENT.

THE Forest Commissioners of France addressing the Chamber of Peers in 1827, thus expressed themselves :—" The denudation of the hills excites everywhere universal complaints. Their sterility through the carrying away of the vegetable earth which was retained by the trees, the diminution of springs, the augmentation of superficial water, the formation of torrents which overwhelm properties situate below these elevated places, these are the consequences of the wood-cuttings made there, and it will be against these denudations that the administration will arm itself with severity." Accordingly laws were enacted to remedy the danger which had been created by the denudation of mountain ranges, hill, and drainage slopes. And the forest administration have with great success conducted operations more especially under the laws of 20th July 1860, and 8th June 1864, for the reclothing with vegetation of the highlands upon which the great rivers of France—the Loire, the Garonne, and their several important affluents have their sources. Thus under the able and energetic working of a staff of accomplished officers supported by an enlightened Government, the re-afforestation of French Alps, the Pyrenees, the Cevennes, the mountains of Auvergne, and other water-sheds of the country has become a reality in some cases surpassing all expectation. So successfully indeed, has the reboisement of several of the mountain ranges been accomplished that in the Paris Exhibition of 1878, the Government exhibited models, photographic views, maps, drawings, and plans, illustrating the effects of the forest denudation, the different kinds and classes of works adopted for defence against torrents and for eventual reboisement, and finally the beneficial results of these measures. This collection attracted great notice and created profound interest. One set of photographs illustrate the general aspect of the mountains above what was once, and not so very long ago, one of the most fertile valleys of *la belle* France, and they show how the torrents have scoured and cut up the mountain sides, have deprived them of their protecting vegetation, have swept away the soil, and have carried the soil into the valley to cover fields and smother cultivation, and to fill tanks and reservoirs and wells; how the torrents rush down-ward in uncontrolled fury from the rock exposed slopes to interrupt communication by destroying bridges, roads, railways, &c., thus converting civilization into waste, prosperity into desolation, to endanger life by filling rivers and streams with sudden and fierce floods which sweep away homes tea ds and farms, and even inundate and destroy towns. The map of Embrunais shows the public road covered with blocks of stones brought by the torrent from the overhanging slopes. A second set of maps and designs illustrates the different kinds of defence works adopted to fight against torrents and provide for the introduction of reboisement. These works consist of masonry dams across torrent beds, *barrages* or weirs—*contro-barrages* or buttresses—living weirs of stakes wattled with willow branches, dams of earth, dams of dry stone, and many other similar contrivances designed with great skill and ingenuity. Some of these defence works cost a great deal of money; for instance, in the plan of the torrent of Bourget we see a solid stone wall built with hydraulic current about 101 feet long, 25 feet above the torrent bed, having 15 feet of underground foundation and 8 to 9 feet thick, at a cost of £650. Other sets of views, maps, and sketches show the changes which have followed the establishment of defence works, how vegetation has gradually resumed its place, how torrents have gradually disappeared, and finally, how forests begin to cover the mountain slopes. Views of Jabouret show how in less than thirteen years a perfect revolution has taken place. Formerly there were great slopes of blackish marl always slipping away; now they are all covered with trees and with a dense growth of herbage suitable for fodder. Numerous small ravines, once forming so many channels to swell the floods in the main torrent, are now filled up, and the whole basin of the torrent is completely restocked with trees, and this once renowned torrent is now a permanent and harmless stream. The maps confirm what other evidence has established :—*First*, that forests protect the soil so that torrents cannot form and erode it. *Second*, that the removal of the forest renders the soil subject to torrent action. *Third*, that the destruction of forests has entailed and does entail barrenness and aridity in parts of the country affected, and which were renowned for their fertility. *Fourth*, that along with woods, springs, and rivulets disappear and cease to water the parched land. *Fifth*, that the actual temperature of a country is by the destruction of its forests very sensibly increased. *Sixth*, that the rain gradually washing away the vegetable earth from the sides of denuded hills condemns them to sterility, while these latter, no longer able to retain and *regulate* the flow of water that falls in their slopes, are scored by deep gullies formed by impetuous torrents, while the beds of rivers are at one time dry, and at another filled by sudden and short lived floods. *Seventh*, that even while torrents are in existence, planting, and restoring vegetations to the slopes moderate, the violent action of the torrent and ultimately extinguish it. *Eighth* that when torrents have been extinguished, the renewed destruction of the forest may re-awaken them into dangerous activity. Thus it will be seen that the importance of placing all the hills, mountains, and drainage slopes of a country under strict forest protection, cannot be exaggerated. Nature clearly intended that her reservoirs for the storage of water for supply to and for the irrigation of the cultivable lands in the valleys and plains should be placed upon the higher levels of the country; and where these natural reservoirs have been thoughtlessly and wantonly destroyed by man, there has Nature always exacted a terrible revenge But forests and trees upon the plains, also, more especially in a tropical climate, exercise equally important influences on the condition of countries, and well may it then be said that not only the prosperity, but the very safety of a country is dependent upon the proper conservation of its forests. So great value and importance does Austria attach to her forests that they are called the sources of the nation's wealth; while in Germany it is the natural belief that as trees are rooted in the soil, so is the welfare of the German people with its roots bound up in a perfect system of forestry.—*Bombay Gazette*.

GARDEN.

LARGE trees, especially tall poplars, placed near a house may serve as very efficient lightning conductors, but always on the indispensable condition that there is no well or running water on the opposite side of the house, for in that case the electric fluid if it struck the tree might pass through the building on its way to the water. In 1864 a house at Lancy, almost in contact with a poplar on oneside and a marsh on the other, was set on fire by lightning, and the path of the electric fluid from the point at which it left the tree across the roof of the building to the marsh could be distinctly traced. Hence, in erecting lightning conductors, it is desirable that their lower extremities should terminate in a stream, a well, or a piece of damp ground.

A FERTILIZER FOR STRAWBERRIES.

An experiment made last year by myself may not come amiss at this time with those who grow strawberries. I procured a half hogshead, filled it with rain water, and put into it one-quarter pound ammonia, and one-quarter pound common nitre. When the strawberry plants were blooming out, I gave them a sprinkling of the solution at evening, twice a week, until the fruit was nearly full size. The result was double the amount of fruit on those plants the liquid was applied to, than was obtained from those right alongside where none of the liquid was applied. Let all give it a trial.—*Selected.*

FERNS IN THE NEIGHBOURHOOD OF BOMBAY.

The messman at Khandalla Travellers' Bungalow writes to me, under date of July 19, "that for the last three days there have been very few showers, that the rain when it falls is not heavy, only drizzling. The fog occasionally spreads over the place but does not last each time more than fifteen minutes." He concludes his letter as follows:—"The weather is clear and pleasing for the visitors of Sunday passers." I hope the meaning of this sentence will be clear to your readers: it is rather vague to me. I passed through Lanowlee the other day on my way up the line. I bought a magnificent bunch of growing maiden hair, silver, and hard ferns for four annas. The collectors of these ferns should be encouraged. They have to trudge away to the hills two or three miles off, and take their chance of a stray customer. They sell the ferns with plenty of root, so that they are sure to grow when potted.

Though the Khandalla hills are very prolific of ferns, yet the variety is not so great as at Matheran, where one year I collected more than twenty kinds. The most beautiful and rarest of these is the climbing fern, which can only grow as a creeper up the stalk of a friendly sapling. The leaves of this fern are of a most unusual shape, being very much in appearance and size like the human hand. I have only found it in Elphinstone valley in the thick jungle below Hart Point, and even there it is rare and difficult to find. I am told it has been seen growing on Sion Hill near Bombay, and one year I found it growing in profusion in the Tulsi valley near the new masonry dam. This was during an expedition some day made to the Kennery Caves, which are just below the Tulsi valley. This fern grows only on red soil, and thrives well in Bombay. The pot should be suspended in the verandah or hung under a mango tree; the fern climbs the strings and hangs over in festoons. A strong plant will climb as high as nine feet, and as the leaves keep green all through the year, it is very pretty. If any of your readers feel inclined to prospect for this fern the monsoon is the time, when a visit to Tulsi and Kennery is most enjoyable. In cloudy weather one keeps cool, and the chance of a smart shower adds zest to the expedition. I have found the fern *above* the masonry dam on the south side, and *below* the dam on the north side. The roots can only be got out with an iron tool.—*Cor., Times of India.*

TEA.

The imports of tea to Great Britain in June and in the first half of this year exceeded those of the same periods of last year by 2,435,636lb., and 16,794,067lb. respectively. The figures were 4,728,237lb. against 2,292,601lb., and 54.424,937lb. against 37,630,870lb. A comparison of the deliveries for home consumption shows an increase of 4,872,736lb. for the month, but a decrease of 8,701 832lb. for the six months. In the former case the quantities were 12,226,451lb. against 7,353,715lb., and in the latter 78,224,094lb. against 86,925,926lb. For the month, the exports show a considerable improvement, and were 4,101,960lb. against 2,421,271lb. For the half-year, they were 17,346,200lb. against 17,802,491lb. The stock in the bonded warehouses was 61,332,811lb. against 49,092,387lb.—a surplus of 12,240,424lb. instead of as was predicted in October last by some of the trade a still larger deficit.

The prospect of war between Russia and China has raised the question how such a war would affect the tea industry in India, if indeed it would affect it at all, and we observe a letter on this subject from the London correspondent of a contemporary whose energies are entirely devoted to tea, in which this question is discussed to the exclusion of every other. The writer is apparently either entirely ignorant of, or has quite forgotten, the existence of certain Treaty ports. He takes for granted that the great European Powers will not be able to prevent Russia from blockading the whole sea coast of China if she can, and that there will thus be a chance for Indian tea. We ourselves think there would be a chance for Indian tea if the war broke out, but for a very different reason. We do not think that Russia would do much in the way of blockading, because she is totally unfit to provide a sufficient number of vessels for such an immense sea-board, and because she has no control over the Treaty ports. Hence her efforts at sea would be devoted towards intercepting the arrival of military stores, and such tea as is made in China would find its way out in the usual manner, but we do not anticipate that so large a quantity would be made. The people's attention would be distracted, and trade relations generally dislocated, and industry never prospers simultaneously with war in any country. The customary advances would not be made by the hongs in the several shipping ports, at least they would not be made so freely, and thus the entire industry would suffer. In this way we fancy the tea industry of India would have a chance, and no doubt the various tea companies would be eager to avail themselves of the opportunity. This we are afraid they would not be able to do, because of the present system of manufacture. Any deficiency that might arise in connection with the China tea crop would consist of the finer qualities. These require considerable trouble and cost in production, and the general disorganisation of the interior would tend to everything being done in a hurried and perfunctory manner. The necessary attention and time would not be bestowed on the manufacture of the finer qualities, which would hence be deficient in quantity, and what is sent forward would not be so good as usual. But what have our tea-makers to offer instead? Practically nothing that would suit the English palate. The finer qualities of Indian teas are made with a view to mixing with China tea, and are not adapted for being drunk alone. A tea-planter who is in the habit of continually tasting newly made teas at all hours of the day and night, may relish this class of tea, as we know the majority of planters do, but the taste of the general public, not having been thus educated, will not have it. The tea is made with a view to the development of pungency rather than delicacy of flavour, and the ordinary palate prefers the latter.

Why do Darjeeling teas sell so well? Simply because they are made with a view to their being drunk pure and unmixed.

When an article is produced in greater quantity than the demand warrants, stocks rise and prices fall, and we naturally look to find that particular variety of the article which offers the smallest intrinsic value to the public suffering the most. This is not the case with Indian tea, which is vastly superior to the China article, even after making allowance for the increased price it realizes in open markets, but the artificial way in which the whole business is conducted leads to the abnormal result of the rubbish being sold and the good article lying in stock. This state of affairs will not be put to rights till Indian teas are sold pure and unmixed, at their fair market value of course, and manufactured with that view. Then we may look for a healthy trade, and something like a return of the palmy days of tea in India.

Complaints still continue to be received of the adulteration of China teas. "Highly faced with Prussian blue and turmeric, foreign leaves present, sand, magnetic oxide of iron, clay, withered leaves, faced nutshells, redbole, and sulphate of lime,"—such, according to the *Melbourne Argus*, are a few of the ingredients contained in China importations intended for Australian stomachs. We hope our friends relish the mixture. But it seems that there is a limit to the colonists' power of endurance, and we are told that so far from the Victorians drinking the above mixture themselves, it is re-exported from Victoria to tea-drinkers with "less money or less discrimination." Who the ultimate consumers of this stuff are we should be curious to know. They must have stomachs like ostriches. And yet the *Melbourne Argus* asserts that tea imported from China is on the whole "well worth drinking, and well worth the money." We are afraid our contemporary gets a little confused when writing on the subject of tea. We pointed out the other day, the strange incoherency of some remarks this paper made on the Australian wants as regards tea. "Indian teas" said the *Argus*, "which have hitherto come to Melbourne, have, as a rule, been dearer by 5*d*.or 6*d*. per lb., than the teas ordinarily consumed here; cheaper kinds than these will of course be sent, for it seems to be now understood, by the persons interested, that *there is no demand for the high priced kinds in Australia*." A little further on, in the same article, the *Argus* adds:—"*Pekoe Souchongs and Pekoes would be the best varieties to send. The common Souchongs and Congous are too rough to suit the Australian market.*"

Here is another specimen of ignorance taken from the *Daily Bulletin*, a New York commercial organ, from which we should have expected better things. "The Indian teas though lacking the mild flavour of the Chinese plant, have decided merits; they are one-third stronger, can be sold cheaper, and are unadulterated." Now in the first place we are curious to know what sort of a flavour the *Bulletin* refers to. It must be, we should think, the flavour produced by the Prussian blue, &c., &c., as enumerated above. In the course of the comparison it institutes between the products of the two countries, the *Bulletin* says that Indian tea "*can be sold cheaper.*" If this were so, we should very soon see Indian tea assert its proper place in the markets of the world. But it is not the case, although it is now being sold at prices that are ruinous to the growers. It is generally well-known—indeed it is perhaps the chief obstacle that hinders the largely extended consumption of Indian tea—that we cannot sell as cheaply, quality for quality, as the Chinese can, and principally for the reason that our system of classing is so different. But, for all that, we look hopefully forward to the time when Indian tea will have a fair trial everywhere and be judged on its own merits, which it can very well afford to be. Meanwhile, this very practice of adulteration

of tea in China, will doubtless hasten the time when Indian tea will supplant it. The Heathen Chinee may take the warning, however, which our Government have more than once impressed upon him in connection with this subject. It was not so long ago that 7,000 chests of dust-filings and maloo mixture, miscalled tea, were burnt by order of the English authorities. Such measures as this must, no doubt, have a salutary influence on Chinese tea merchants, and they may, therefore, abandon these malpractices as they see people's eyes opening to their impostures, and the trade in consequence slipping, past them.

It is said that some of the great co-operative stores in London are beginning to practice the sublime mystery of "mixing." A correspondent of a contemporary writes :—"I lately purchased at one of them what pretended to be 'pure Indian tea,' and I am very much out in my reckoning if the stuff was not largely composed of Chinese Congou that had done duty in the pot at least once before. There could not be a *stronger proof* of the estimation in which Indian teas are now held, than the frequent announcements one sees in grocers' windows of real 'Himalayan Souchong' 'genuine Assam Pekoe,' and other similar rarities. Not that these goods are really on hand, but the enterprising traders, quickly recognising the public demand for the Indian herb, endeavour to pass off their celestial atrocities under that name."

We give prominence to the following extract from a report on Indian teas by Messrs. Gow and Wilson, dated London, 3rd August :—

"As there is every prospect of a large increase in the yield of Indian tea, it becomes a matter of serious consideration to all interested that the demand should, in like proportion, increase also. In our opinion there is but one way in which this end is to be obtained, namely, by producing an article which can be consumed pure, and unmixed with its China rival. A gradual but entire change seems to have come over the style of manufacture, of late years, and it is now a difficult matter to find a tea which bears the "Old fashioned Assam Tea" character. The main object appears to be to convert the leaf as quickly as possible into dry tea, without regard to the fact that in the process of manufacture certain chemical changes must be allowed to take place in the leaf, if the bright ruby liquor and a full and good flavor is to be obtained. We know that in some gardens insufficiently withered leaf has been rolled and fired off in a very short space of time, without any regard to what used to be called "coloring" or "fermentation ;" it is then as expeditiously sorted, refined, and packed, and the result is that a quantity of the tea that comes to the market, though pungent, is thin and uncured. This we may say is scarcely the description of tea that can be drunk pure and unmixed. We do not advocate the manufacture of teas without pungency, but we must have thicker and richer tea than is now sent. More time and pains ought to be bestowed on manufacture, especially, on the withering and final firing, which latter operation used to take eight or even ten hours, but is now performed in about thirty minutes."

Our American cousins appear to be going ahead in the production of tea. The *Home and Colonial News* tells us that four samples of exceedingly well made teas of American growth have been received in Mincing-lane, for examination and report on behalf of the American Department of Agriculture. The teas were made by Mr. Jackson, formerly of Assam, on his estate in Georgia. The Pekoe and Pekoe Souchong are reported on as being remarkably fine in liquor as well as in leaf, and in a good market would command a long price ; while the Souchong and Congu are reported on as being very inferior to the others in liquor, being weak and tasteless. We doubt whether tea manufacture on a large scale could ever pay in America, as labor, in the Southern State especially, is difficult to obtain and very costly.

TEA ADULTERATION.

THE Melbourne *Argus* publishes a long article on this subject from which we make the following extract :—

A few weeks ago a discussion was carried on in our columns by means of letters, touching the quality of the tea supplied to Victorian consumers. Letters from correspondents well acquainted with the tea market of the city showed that while there is an extensive manufacture of villainous compounds in China, to be exported as tea, there is at the same time a vast export of really good genuine tea from that country. Also that of the adulterated tea sent out, very little comes here, and when it does come, it does not go into consumption, but is re-exported to countries where the tea drinker has less money or less discrimination. Further, we find that the great bulk of the tea sold here is good, pure, wholesome, and cheap—that if we do not get the best, we get what is good value for the price paid for it, and could only get better by paying a higher price.

As to the comparative merits of Chinese and Indian teas that is not a question easily settled. There are excellent teas produced in both countries, but the Indian teas are dearer, and are new to the palate of English and Australian people, while with good Chinese tea we are well acquainted and have got accustomed to the familiar thing. The pure, strong, pungent, Indian teas appear to be most valuable for mixing with weaker teas so as to enrich and fortify them, and it is most desirable that they should continue to be imported into the colony. But the consumer will not be forced to buy what he does not relish, and of course the importer, the middle-man and the grocer, prefer to supply what is in demand instead of exhausting their efforts in a vain attempt to educate the public taste. As a matter of fact, the importation of Indian teas has steadily declined. In 1873-74 it amounted to 77,000 packages, while in 1878-79 it was only 22,000 packages.

In 1877 a series of analyses were conducted in the Technological Museum Laboratory by Mr. J. Cosmo-Newbery, assisted by Mr. Frederic Dunn, to test the quality and genuineness of the tea then sold in Melbourne, and from the recorded results we shall now give a few extracts as a contribution to the tea controversy, premising that the authorities lay it down that :—

"Genuine tea contains between 5 and 7 per cent. of mineral matter, 3 per cent of which consists of soluble salts.

"And that in its ordinary air dried condition pure tea yields an extract equal to 32 per cent., while some choice samples have been found to yield so much as 50 per cent." Accepting this as a standard of quality, we now give a few of the determinations made at the laboratory, beginning with samples of green tea :—

No. 1, classed as "very bad" (2*s*. 6*d*. per lb.), was found to contain, in 100gr., 16·50gr. mineral matter, 28·75gr. extract, 2·00gr. soluble salts, with the following remarks added :—"Highly faced with Prussian blue and turmeric, foreign leaves present ; sand, magnetic oxide of iron, clay, withered leaves, faced nutshells, redbo'e, and sulphate of lime were found."

No. 2, classed as "bad," 2*s*. 8*d*. per lb. Mineral matter 12·90gr. extract 26·43gr. ; soluble salts 1·86gr. Highly faced with Prussian blue and turmeric, foreign leaves, sand, clay, and magnetic oxide of iron were found."

No. 3, classed as "inferior" 3*s*. per lb. Mineral matter 13·69gr. ; extract, 30·95gr. ; soluble salts 2·96gr. "Faced with Prussian blue and turmeric ; sand, clay, magnetic oxide of iron, and sulphate of lime found."

No. 4, classed as "good," 2*s*. 9*d*. per lb. Mineral matter, 5·89gr. ; extract, 31·93gr. ; soluble salts, 3·80gr. "Faced with Prussian blue and a large amount of turmeric ; genuine leaves, much broken."

No. 5, classed "very good," 2*s*. per lb. Mineral matter, 6·5gr. ; extract, 41·28gr. ; soluble salts, 3·34gr. "No Prussian blue, nor turmeric detected ; leaves genuine."

Now for the black teas.

No. 1, "bad," 2*s*. per lb. Mineral matter, 5 60gr. ; extract, 19 57gr. soluble salts, 2·49gr. "Large quantity of stalks and exhausted leaves ; small particles of Prussian blue and turmeric."

No. 2, "good," 2*s*. 7*d*. per lb. Mineral matter, 3·70gr. ; extract, 305gr. soluble salts, 4·90gr. "Leaves genuine and in fair condition."

No. 3, "very good," 3*s*. 6*d*, per lb. Mineral matter 5·12gr. ; extract, 45·77gr. ; soluble salts, 3·67. "Leaves genuine, no Prussian blue or turmeric."

For comparison with the standard, and with the analysis of Melbourne teas (presumably chiefly Chinese) already given, we add the results of an examination of Indian teas, which has been made by Mr. F. Dunn at the laboratory at our request :—

A—A green tea, about 2*s*. per lb.—Mineral matter. 6·57gr. ; extract 41·23 4gr. ; soluble salts. 3·31gr. "Very good. Free from adulteration of any kind, and from colouring matter."

B—A green tea, about 1*s*. 9*d*. per lb.—Mineral matter 6·25gr. ; extract 41 23gr. ; soluble salts. 2·55gr. "Fair quality; soluble salts rather low ; leaves genuine, but very large. Free from coloring matter

C—A black tea, about 3*s*. per lb.—Mineral matter 5·86gr. ; extract. 32·97gr. ; soluble salts, 2·72gr. "Leaves genuine and of good quality."

The practical value of the laboratory tea analysis, of which we have given a few samples, would be greater if we know to what extent the samples examined were representative of the bulk of the tea imported into the colony. In the absence of the information obtained from them is more curious than useful, for while some of the teas found to be of the highest quality may be largely used in the colony, and the worst only to a very inconsiderable extent ; still the direct contrary may be the true state of the case. Still the determinations are useful as well as interesting. Of 33 samples of tea examined, 10 were found to yield higher than the standard percentage of extract, viz., 32 per cent., while a few came nearly on to the 50 per cent. only to be found in choice samples. The Indian samples to be seen stand high in this respect, the best containing 41·23 per cent., and the other two respectively 32·16 and 32·97. But several of China teas gave higher per centages, ranging between the standard and 45·7.

It is in their percentage of mineral matters that the Indian teas show best. The standard of genuine tea being between 5 and 7 per cent., the three samples of Indian examined showed respectively 6·57, 6·25 and 5·86 per cent., being as nearly as possible what they should contain to be pure. Some of the Melbourne teas showed very badly in this respect, ranging up to 24 and 27 per cent. of mineral matters. On the other hand some samples had less than 4 and several less than 5 per cent. Where the very large percentage of mineral matters appears, it is due to the presence of sand, clay, magnetic oxide of iron, sulphate of lime, &c. It is to be observed that some of the samples examined at the laboratory in 1877 may have been Indian tea, but there are not likely to have been many of those, seeing how scarce Indian tea was in the Melbourne shops as compared with China tea.

COFFEE.

COFFEE planting in Ceylon is not just now a flourishing industry. The crops of the season 1880-81 will be very short, and a local paper, which has been going into calculations, observes that taking the three main sources of the world's supply together, it looks as though there would be at any rate more coffee in the next twelve months than in the preceding year, and if there be any force left in statistics, we are unwillingly driven to the conclusion that there is but little prospect of better prices being obtained for the bulk of Ceylon coffee in 1881 than in 1880.

THIS year's Java coffee crop the *Straits Times* tells us is estimated at 731,390 piculs. The spread of leaf disease in Java has led the N. I. Agricultural Society to propose to coffee planters there to subscribe to a fund amounting to 250,000 guilders as a reward to whomsoever shall invent a satisfactory remedy for the disease. The managing committee of the Society acknowledges that there is not much hope of finding this remedy which had been unsuccessfully sought for in Ceylon during the last ten years, but holds that some method of extirpating the fungus hitherto not thought of in Ceylon might be discovered in Java. The Merchants' Association at Samarang has taken steps to call a meeting of coffee planters there to discuss the subject and devise measures to check the disease. The Chief Inspector of Government Cultures in an official report on the coffee leaf disease declares that the latter has long been known in Java, its wider prevalence now being due to the long continuance of wet weather. As remedies for the disease he recommends better and deeper cultivation of the soil, especially heavier manuring, to enable the sickly trees to be strong enough to throw off the disease. The Batavia *Handelsblad* calls attention to this plan having been tried and having failed in Ceylon.

LIBERIAN COFFEE.

I.

AS the cultivation of this product nearly resembles that of the coffee of the hills, any remarks as to its culture, &c., may at first strike the reader as superfluous in a country where coffee has been grown so long and so successfully as in Ceylon. But there is as much visionary expectation on the one hand, as there is unreasonable prejudice on the other, for and against it, so that a few remarks, made after a practical study of its cultivation, may be of use in dispelling both. Thanks to Messrs. Cruwell, Agar, and Smyth who ventured on to the unhealthy West Coast, selected and introduced,—in one case at a considerable loss,—Liberian seed in large quantities into Ceylon, there is now no difficulty in procuring seed, each cherry costing not more than one cent., or Rs. 10 per 1,000. There is little to say about the nurseries; provided the seed is fresh, it will germinate readily; be careful to have no drip, plenty of light under the shading, have the beds well dug up, see that the seed is thoroughly soaked, and is sown very shallowly flat side down, and the nursery will be a success. The beds should be kept only damp until the cotyledon is developed; the seedlings should be pricked out into baskets or bamboo pots until they are large enough to plant out, when they should be carefully and cleanly turned out of the basket, or 'split' out of the bamboo, so that the plant with the earth in which it has grown is undisturbed. The holes should be quite twenty inches, and be carefully filled in, ramming down the earth well. As regards the distance which the plants are to be put apart in the field, it will depend partly upon the seed used, and the climate, in our remarks on cacao we said that *with* cacao, Liberian should be planted 15 feet by 15 feet; planted by itself, with the ordinary seed in a non-forcing climate, we think 9 feet by 9 feet the right distance, although with the giant variety, such as *Hooper's crab apple*, we expect 12 feet by 12 feet would not be found too far. Taking 9 feet by 9 feet as the distance apart or 6,000 trees to the acre, the cost of opening one acre will be as under.

Rs. 30	...	...	for Plants
„ 8	...	...	„ Lining
„ 10	...	...	„ Holing
„ 15	...	...	„ Felling
„ 8	...	...	„ Filling in
„ 8	...	...	„ Planting
Rs. 74 total			

The plant having once started, the growth of the tree is most encouraging: we know of trees ten feet high in two years; and recently saw a considerable acreage of Liberian, topped at five feet, bearing quite seven cwts. an acre and not more than three years old, the clusters growing where they grew last picking,—a distinct peculiarity of this coffee—and numbering from forty to sixty berries each, one large cluster having as many as 110 berries upon it. The best land for Liberian should be flat, or gently undulating, and well drained, the rainfall should be moderate only, and no shade should be allowed. The seed should be taken from as old a tree as practicable, the bean should be short and round, and the skin comparatively thin. Leaf disease, although showing itself in the mottled appearance of the smaller branches and some times on the stem, has no appreciable bad effect on the vigour of the tree, or apparently on its bearing, and the crop ripens steadily if slowly.

Regarding the "extreme pungency," of the liquid, so commonly talked about, we maintain it is a mistake, the flavour, though a distinct, is an agreeable one, and, after having become accustomed to it, we can quite conceive people preferring it to the ordinary coffee; the oft repeated assertion that it is not fit to drink, is only one of many prejudices that exist against this product, which will however rise superior to all such attacks; there is no reason why every low country hut should not be shadowed by its beautiful foliage, or why it should not usurp the place of thousands of acres of tangled jungle, affording a sure livelihood to the native, if he has only the common industry to plant it; and to the planter, who is willing to brave the monotony and heat of the plains, it offers, as recent prices will shew, every prospect of fortune.—*Ceylon Times.*

II.

PRACTICAL HINTS ON GROWING IT.

THE greatest care should be used in selecting the seed, which should be taken from old trees, and of long and full-bodied shape, with a thin skin, a fairly sized cherry will not pass through a half inch ring; fresh seed, in a well prepared and carefully tended nursery, will germinate in three to six weeks. The nursery beds should be sown with parchment (the dried cherry will often not allow the germ to appear for a long time and separating the *two* seedlings of the cherry is risky), the small seedlings should be put out into baskets, and when nine inches high, or about twelve months old, may be planted in the clearing. The young plants will require care and shade to enable them to withstand the first shock of open planting; about ten per centum of failures may be expected: supplies will come on readily; the holes need not be more than 18 inches, they must be carefully filled in; planting by turning the plant out of the basket with the earth adhering to the roots may be safely done; in most soils 8 × 8 feet is sufficiently wide apart for the trees, in which case, at two years, 3 cwt. to 4 cwt. per acre may be expected. The crop will not all ripen, the larger clusters will necessarily diminish as the fruit increases in size by being 'pushed out,' and in dry weather many of the cherries will get dried up and light; about 44,000 beans parchment go to a bushel, and say, fifteen bushels of cherry to 1 cwt. coffee. The fruit takes quite one year to fully ripen. Leaf-disease will invariably attack the nursery, but will gradually lose its ill-effects as the tree grows older; when it also will much better resist the effects of drought; well grown trees should be fully six feet high a two years old.

We imagine the most suitable climate for Liberian coffee is that with a mean temperature of 78° to 80°, and a rainfall of 80 to 100 inches in the year; it adapts itself to almost any soil, but on account of its long tap root, prefers a deep black one; in damp soil, it sometimes suffers from bug. It is one of the most beautiful of trees, and yields both crop and blossom on its generous branches at the same time.—*Ceylon Times.*

COFFEE CULTURE IN JAMAICA.

THE following is an extract from an interesting letter of Mr. D. Morris, late of Peradeniya, to the *Ceylon Observer.*

I have been trying to find out why the Blue Mountain coffee of Jamaica is always so good, and how it is that it obtains such high prices as compared with the fine and highly cultivated coffee of Ceylon. Is the coffee grown here a peculiar variety of *C. arabica*? or is there something in the soil and climate, which promotes the larger formation of the essential oils and secretions in the fragrant bean? Whatever it is, it cannot be in the superior cultivation, the more rational treatment of the crop, or the greater care in the curing. The only cultivation which the estates here receive consists in a rough "hoe-weeding," once or twice a year, with no pruning, except what the hoe does, no system of drainage, no terracing, and, as I mentioned before, no manuring! It is true that one or two estates, such as Radnor, a higher style of cultivation is being inaugurated, but, as a rule, coffee cultivation in Jamaica cannot compare, at all, with what is being done in Ceylon. I say this without the slightest disparagment to the planters of Jamaica; they have had to pass through so many crisis, and to fight against so many adverse circumstances, that, at last, they have been obliged to submit to the inevitable and especially as regards labour, and manage as best they may. It may seem strange to a Ceylon planter, but all the work of pulping, curing, and preparing the coffee, is done here on the estates by the superintendent or overseer, and when the coffee is sent down to Kingston, it is ready for shipment and immediately put in barrels. The system and the absence of large coffee curing establishments must necessarily increase the cost of curing, &c., but it appears to have been pursued here from time immemorial, and planters appear to like it.

Owing to the large areas nominally included under one estate, the different "coffee fields" are sometimes two or three miles away from the works, lying in "bosoms" of the hills, [illegible] for the occasional "hoeing" and picking of crop. Out of a nominal acreage of 1,000 acres, often there are only 160 to 200 acres, and sometimes only about 60 or 80 acres under cultivation. The other parts are in "reccinate" (jungle) or so steep that owing to "breakaways" and rocks it is impossible to cultivate them. This gives a Jamaica coffee estate a very patchy appearance, and as cinchona has not yet been taken up generally by planters, the uncultivated areas greatly exceed those cultivated. Much more might be done with the suitable coffee lands, if a regular system of nurseries was established, and plants put out with greater care. At present new lands are planted up with "suckers" (or rather seedlings) found under the trees. These are pulled up with little or no care, even when they have 6 or 8 primaries, and after being carried in bundles on heads exposed to the full rays of the sun, are put in holes, and allowed to take their chance without shade or shelter. It is strange to hear such plants called "suckers" but that

is the orthodox term for them here, and it is on such plants that Jamaica planters entirely depend for their supplies and for planting up. I was much puzzled the other day with a remark made me by a planter respecting these said "suckers." I asked why these self-sown plants were called "suckers," when evidently they were nothing of the kind. I suggested "seedlings" as an appropriate term, I was told, "No, no, they are not seedlings: a sucker does not become a seedling till it is crowned." This was still worse, and I had to give it up.

With regard to the absence of nurseries and the planting up of land by weekly sown "seedlings," it seems a pity that so much valuable land and so much time should be lost, when the remedy is so simple. The plants thus put in are often 2 feet high, and with several primaries (*i. e.*, crowned, as I found afterwards). Their rootlets are torn and lacerated, and the check they thus receive in transplanting, and in being suddenly taken out from shade and exposed to the fierce rays of a tropical sun, results either in a large percentage being killed or in the plants being two or three years before they produce a maiden crop.

But still, as the planters say, many of the plants do grow, and when they do, they produce some of the best coffee in the world.

In colour, the best Jamaica coffee is darker and bluer than Ceylon coffee and the beans smaller. Whether the colour shows a larger proportion of oil I know not, but the sample appears to be greatly judged and valued according to colour. The sample sent reminds one, in the size of the beans, of Mocha coffee, only the beans of the latter are generally of a dark yellow colour. Nearly all West Indian and Brazilian coffees are bluish or greenish grey.

The colour of the bean must depend in some measure on the manner of pulping and drying, but so far as I have noticed, the processes in Jamaica are much the same as in Ceylon, except that possibly, here the cherry is allowed to stand longer before it is pulped.

But to return to the question of high prices—Why does Jamaica coffee command such high prices? This subject, and especially in connection with Mocha coffee, must have occupied the attention of coffee planters, ever since coffee planting began, but so far, it appears not to have received a satisfactory solution. Is it temperature, atmospheric pressure, natural fertility, humidity of soil or air, amount of sunlight and excessive stimulation which produces the perfect elaboration of those subtle principles upon which the aroma and active qualities of coffee depend?

With regard to Mocha and Jamaica coffee, there must evidently be a combination of very favourable conditions for the production of beans possessing such salutary and agreeable qualities; but from the subtlety and delicacy of the law of vegetable assimilation, I fear it is almost impossible so to analyse and trace these conditions as to produce their parallel in other coffee-producing countries.

For Ceylon planters there is, however, one lesson which Jamaica coffee may fitly yield. It is a subject of frequent remark in Ceylon, that there was no leaf disease before artificial manures were used, and many good planters believe that if the use of artificial manures had not actually introduced the destructive fungus, it had at least prepared the plant for its attacks, so that it became an easy prey.

I know that the fact that the disease first appeared in a comparatively new district where artificial manures had not been used, considerably weakens this theory, but there can be no doubt that by forcing a plant artificially you introduce new conditions of life which may ultimately prove disastrous. The soil of Jamaica is naturally much richer and stonger than that of Ceylon, and the underlying rocks, composed as they are, of loose and easily disintegrated materials, replace soil lost by waste, with great rapidity; but if the system of *tillage* now pursued in Ceylon had been in existence there generally, fifty years ago, and the rich surface soil had been preserved by drains and terracing, it is quite certain leaf disease would never have been so fatal to the old estates, and with a careful husbanding and manipulation of the natural soil manuring would have been unnecessary, and the coffee trees would have been more hardy—and less prolific possibly—but better able to fight against the attacks of fungoid and other diseases. As far as I have noticed, there is little disease on any of the cultivated plants of Jamaica. With the exception of the *Cemiostoma coffeeilum*, a little leaf miner similar to the *Gracilaria coffeefoliella* (Nietner) of Ceylon, which cause the silvery tortuous markings and blotches on coffee leaves, Jamaica coffee appears to be very free from disease. Our old friend the black bug is here, but it does not give anneyance except, sometimes, to badly cultivated and young coffee.

The "Bourbon" sugarcane, which cannot be cultivated in Mauritius, on account of its liability to disease [illegible] productive cane, and similarly with oranges, limes, ginger, and pimento. Jamaica cannot be accused of having forced any of her products by manures, artificial or otherwise, and it may be —but I would not like to commit myself to the conclusion—owing to this, that the plants here are so free from the common maladies of cultivated plants.

Now that the immigration scheme is working so satisfactorily, Jamaica's great want, an adequate labour supply, is becoming less felt. At the Government cinchona plantations creole labour is both abundant and good. By entering into an agreement and paying regular *weekly* wages, we are able to secure a certain number of regular hands: others are taken on only when they are wanted. There are several thousand acres of valuable land on the Blue Mountains admirably adapted for coffee or cinchona, and they only require men of energy and capital to ensure their successful cultivation. I do not desire to appear as an advocate for general emigration to Jamaica, but for young men with some capital and determination, I believe the splendid climate and cheap lands of Jamaica require only to be known to attract numbers who now go farther and fare worse.

In connection with the high prices obtained by Blue Mountain coffee, it would under present circumstances be very interesting to test its value under cultivation in Ceylon. As far as I am able to judge, the trees themselves do not differ much in habit, size, character of foliage, or in floral organs, from those cultivated in Ceylon, but the plants here, in consequence of good soil and no disease, are undoubtedly hardier, and must possess a stronger constitution than trees which have been subject for many years to the enfeebling effects of leaf disease. I believe the experiment worthy of serious trial on a large scale, and it would give me great pleasure to assist any of your enterprising proprietors, who may be anxious to procure a supply of seed from Jamaica, and plant up some 50 or 100 acres in Ceylon for this purpose. The seed has the merit certainly of being thoroughly sound and good, and if in addition it will keep its superior qualities in Ceylon, it would prove a most valuable acquisition. I know that the small lots of Mocha and Java coffee that have been already tried in Ceylon have been severely attacked by leaf disease, but I have not heard whether the produce has ever been tested, or whether Mocha coffee grown in Ceylon is in any way superior to the plantation coffee. To test the matter thoroughly, it would be necessary to plant up a large area with nothing but the imported coffee, so as to be able to ship an appreciable amount at one time. Plants of Mocha coffee being naturally very delicate, they would consequently be very easily affected by the *Hemileia*: but if, as I believe, the Jamaica Blue Mountain coffee is hardier even than your plantation coffee, while at the same time its produce obtains a much higher price, it seems to me to possess special advantages at this juncture. I offer the suggestion as a contribution to the present discussion on coffee cultivation in Ceylon, and in the hope that by the introduction of "new blood" the *Hemileia* may receive a material check in the higher and more recently opened estates.

The experience gained in the case of the vine disease goes to prove that new and hardier varieties of plants have been able to hold their own, and to thrive in spite of the prevalency of such diseases as the ubiquitous *Oidium*, and it is to this that we owe the revival of grape cultivation in Madeira and other places, where after the dreadful attacks of 1848-52, viticulture had been almost exterminated.

CINCHONA.

Mr. Murray, the publisher, will shortly issue a book by Mr. Clements Markham on a subject he has made peculiarly his own: "A Popular Account of the Introduction of Peruvian Bark into British India and Ceylon," and he will give particulars of the progress and extent of its cultivation.

A home paper states that cinchona red bark, grown in Jamaica, realised encouraging prices, being, in some cases, double those fetched by Indian *C. Succirubra*. Ten thousand pounds of dry bark were obtained from 2,490 trees, being at the rate of four pounds per tree. A single harvest realised 17s. per tree—a result highly satisfactory.

It appears that the question of a supply of quinine for India, will not be entirely confined to the alkaloid derived from *Cinchona Calysaya* as we have on our table a very fine sample of sulphate of quinine manufactured at Rungbee by Mr. Gammie, from *Cinchona Succirubra*, which is quite as pure as any we have seen of Howard's. We do not think we are over-sanguine when (judging from present results) we predict that the time is by no means far off when India will be able to produce all the quinine required for the public service of the country, and will thus be quite independent of England.

Now that cinchona cultivation is becoming very general and sites for plantations are being eagerly sought after, it is interesting to note every anomaly connected with the growth of this tree. Mr. Hughes, speaking of Ceylon, lays it down, as a general rule, that stiff and tenacious soils should be avoided for cinchona, which flourishes in the island only in rich, friable, or gravelly soils. Elevation also is reckoned important, both there and on the Nilgiris. Elsewhere, however, cinchona appears to thrive under exactly opposite conditions of soil and altitude. In Jamaica, for instance, where the soil is clayey and stiff, *C. succirubra* has been most successfully cultivated, and the recent exportations of bark have obtained high prices. The elevation of plantations there is 2,000 feet above sea-level, an altitude at which our planters would believe it folly to risk the plant. The prejudicial effects of the stiff and impervious soil of Jamaica are supposed to be counterbalanced by the peculiar geological formation of the subsoil, which consists of a porous lime-stone, full of sink—holes, which convey the surface moisture to subterneau rivers. Thus no hard and fast rule can be followed, and the rejection of a site for some accepted disqualification, either on the score of soil or climate may prove a mistake.

WE are not aware that the present condition of the Dodabetta Cinchona Plantation has attracted the attention of Government; if it has not yet done so, it ought to do so at a very early date. To a private proprietor the state of affairs would be a source of anxiety, if not of alarm. The whole plantation is overrun with that stringy moss which augurs decay, every bough and twig is covered with it, and the lower ones already form dead wood. The upper boughs have a mere tuft of green leaves, towards which decay is fast travelling. The whole estate is thus overrun. Whether the moss has its origin in unsuitability of soil or in exposure, or whether it has been propagated by the remnants of the old forest left, here and there, scattered over the plantation, it is not easy to tell. The condition of the plantation has attracted attention, and those who have invested their capital in cinchona, would wish to be informed whether such a state of things can be disregarded, or whether it means ruin and loss, sooner or later. The absence of information from Government, scientific or practical, on cinchona culture has been very marked of late. State property of this sort has proved remunerative we know, but beyond this, the public has gathered nothing from official papers worth knowing, and Government has even shown itself not posted in, some of the processes which private owners have learnt and practised.

CINCHONA cultivation is now the great rage in Ceylon. The coffee planters, what with leaf disease and other drawbacks, were well nigh driven to despair, when cinchona came as a redeeming angel. But there seems some danger of the new horse being ridden to death. The following extracts from a letter, written by a Ceylon planter to a friend in England, contain some interesting information regarding this cultivation :—"I suppose no cultivation has been so widely taken up and rapidly developed as that of cinchona in Ceylon. It is certainly a most bountiful tree, and has changed the aspect of many declining coffee estates to increasingly valuable properties, and in some cases, notably two, where it has attained too, *regular* growth has brought great wealth to the owners. One local newspaper has given itself almost entirely up to its cultivation, and you commonly hear statistics given, and instances quoted, showing how a hundred acres of four-year old cinchona must be worth £40,000. In fact, the fever is now at its hottest stage. The small leafed variety *Officinalis* I have planted 4,840 to the acre. Say 1,613 trees mature, which at 6 oz. to a tree is equal to about lb. 600 bark, which should be worth say Rs. 900, in four years' time, which means, at an expenditure of Rs. 600, an annual profit of 12 per cent. This is my own estimate. Of course if you are fortunate enough to get fine land with a gravelly subsoil and good natural drainage at an elevation of say 4,000 to 5,000 ft., I know no reason why those enormous profits that have certainly fallen to some, should not also be yours, but it is a venture and in most instances, a terribly disappointing one. To sum up what I have endeavoured to say, I would not advise you with no knowledge of the subject to go into cinchona, but should recommend you to stick to coffee, which to my mind is much safer and generally more remunerative than cinchona, and provided you got into a good district, will give you nearer 20 per cent. than 12 per cent. At the same time I must tell you that the land in which my cinchona is growing is poor, high and exposed, in fact, will grow nothing else, and yet I expect 12 per cent. on the outlay."

A CORRESPONDENT writes :—"I find no mention made any where of an interesting experiment that has for some time been carried out on Mr. Money's Deva Shola Estate. The bark on a portion of the estate was scraped off the entire stem. Although the dry weather succeeded, the trees thus treated showed no symptoms of injury. The entire removal of the bark from the stem is viewed ordinarily, as an operation so opposed to the accepted theory of vegetable life, that the survival of a tree after it is somewhat of a phenomenon, but in the case under notice, thousands of trees have been so treated without any apparent injury as yet. The foliage of the head is green and fresh, and the bark has renewed with wonderful rapidity. Mr. Barlow, the late Commissioner, spent some time on the estate to ascertain the conditions under which the experiment was being carried out, and the mode of operation. These were duly reported, I believe, to Government, but nothing has yet been made public. Surely there is no more important subject to the cinchona planter than the method of harvesting the bark. Government is apparently unconcerned, but Mr. Money, I should think, might oblige by telling us all about the matter."

THE CINCHONA FORESTS OF SOUTH AMERICA.

AT the last meeting of the American Pharmaceutical Association, Mr. Henry S. Wellcome gave a long account of his recent visit to the cinchona regions of the South. Mr. Wellcome expresses much sympathy for the Indian collectors of the bark, describing the climate as deadly, the land as dangerously precipitous and treacherous, and the pay miserably small; he concludes his remarks by saying that continual wars and revolutions render all investments hazardous, and stagnate all enterprise; even, when the bark is collected ready for shipment, the roads and ports are often blockaded for months, entailing heavy losses upon the dealers. From his rather copious notes we have extracted the following, he says :—"I shall speak more particularly of the cinchona forests of Ecuador, once the only source of bark and still yielding large quantities. The bark territory, is divided into the districts known as Bosque de (forest of) Guaranda and Bosque de Loja.

The Bosque de Guaranda is a vast forest, extending from about 1° N. to 2° S., and covers the western slopes of Chimborazo and the outlying range of the Cordilleras to more than 10,000 feet above the sealevel. The district is the source of most of the barks exported from Guayaquil, and has never yet been fully explored. Guayaquil, the main shipping port of Ecuador, is a city of 30,000 inhabitants, situated on the Guayaquil River, 60 miles from its mouth. The river is navigable to this point by large ocean steamers.

The elder cinchona district, Bosque de Loja, was the source of the first barks taken to Europe. It extends from 2° S. to 5° S., the boundary line of Peru, and covers the western slope of the Cordilleras. The district has been worked constantly for over 200 years, and the quantity of bark it furnishes to the Guayaquil market has fallen off during the past few years. Before reaching the highlands, scattered trees of cinchona magnifolia, a valueless species, are met with. Next day our cascarillero soon descried some cinchonas in the distance by the glistening leaves which reflected brightly the vertical rays of the sun.

This characteristic reflex of the foliage, with the bright roseate flower, affords the best means of discovering the cinchonas among the mass of forest giants. The glossy leaf of the India-rubber tree is easily mistaken for the cinchona by a novice, but skilled cascarilleros are usually able to distinguish, at a great distance, varieties, by the colour of the flowers and general appearance of the tree.

At the bottom of the ravine we followed a small stream, till suddenly our guide shouted "cascarilla," and we were gladdened by the sight of several fair-sized trees of cinchona succirubra.

The cinchonas seek the most secluded and inaccessible depth of the forest. They are distributed through in more or less irregular scattered patches, sometimes singly. The older trees are really very grand and handsome, 40 to 80 feet height, trunk straight, branches regular, leaves evergreen, 6 to 10 inches long, of a dark green colour, sometimes tinged with crimson, the upper surface of an almost waxy lustre, flowers in terminal panicles of bright rose tint, and diffusing a pleasing fragrance. The bark of the large trees is usually completely covered with mosses of the most delicate lace-like texture, interspersed with the lustrous variegated lichens and diminutive training ferns. Vegetable growths develop with wonderful luxuriance beneath the interlacing branches, which permit but the faintest rays of sunlight to filter through them. Everything is saturated and dripping with moisture; the very air we breathed seemed a clammy vapour. The atmospheric changes are continuous and very abrupt, drifting banks of gloomy clouds are followed by glaring sunshine, and then tempestuous showers, all in rapid succession. The temperature is more even, averaging about 65° F., seldom exceeding 80 F., falling below 45° F.; altitude about 6,000 feet.

The season for bark gathering begins about August 1 (in some forests as early as June), and lasts till October or November; during these months the bark cleaves most readily, and on account of the smaller rainfall, the forest is more accessible. It is almost impossible to enter it during the wet season. The trees are first decorticated from the ground up as far as can be reached and then, after felling and removing the clinging vines and mosses, the rough outer bark is beaten off with a club or mallet. The bark is then cut round the trunk in sections of 2 feet to 3 feet, and longitudinally in strips of 6 inches to 8 inches in width, then removed with the blade of a machete. The root-bark is obtained by digging away the earth and cleaving with a machete—a large heavy knife.

When first taken from the tree the inner surface of cinchona bark shows a handsome cream tint (with juice of the same colour), but on exposure to the atmosphere rapidly darkens to a dirty red. The barks are usually taken to the main camp for drying and storage. The thick bark of the trunk requires great care in drying because of the excessive dampness of the atmosphere which sometimes necessitates the use of artificial heat to prevent moulding; it is piled up in tiers with sticks between the layers to allow free circulation of air, and weights are placed on top to flatten it. The thin bark from the young trees and small limbs dries more readily and rolls itself up into quills.

One of the greatest difficulties connected with the gathering of cinchona bark is that of transporting it to the coast at the end of the season. It is roughly sorted, according to the part of the tree from which it is obtained, and packed in bales of about 150 lbs. each; the Indians carry these bales on their backs a distance of sometimes several hundred miles to a transfer warehouse, from whence it can be transported by mules to the nearest seaport.*

The final sorting and classifying of barks is done at the main storehouses at the coast,† ... packed in ceroons of cow-hide‡, or bales of heavy sacking; there it is that most of the adulteration and sophistication is done. The admixture of inferior barks with higher grades is not so much the result of ignorance, as has been supposed by many, for the bark dealers are very expert in determining the different varieties and

* The worn appearance of most cinchona barks seen in the market, is produced by the rough handling it gets during transportation to the coast.

† In Bolivia the sorting and packing is usually done before transporting to the coast.

‡ The ceroon consists of a closely-packed bale sewed up in cow-hide (hair side out). The hide having first been rendered soft and elastic by soaking in water, on drying it shrinks and forms a very strong and firm package.

estimating the values of barks; but, strange to say, very few bark merchants ever become wealthy.

All barks enter the market bearing certain brands, such as "J. P." or "T. B." These brands gain a reputation according to the quality of bark they represent, but it is sometimes the case that, as soon as a brand has established a good name, the dealor sophisticates with the inferior grades§. No large buyers of Europe or America purchase cinchona barks without first making careful essays; but, even with this precaution, they are sometimes deceived, on account of the adroit manner in which the barks are mixed.

As regards the prospect for future supplies of cinchona barks from the native forests of South America [illegible] discouraging, the greatly increased use of cinchona alkaloids during the past few years, with the consequent demand for a larger supply of bark, has caused a very thorough working of the old forests, and [illegible] for new ones. The discoveries of paying forests are becoming more and more rare every year, and the new forests are found at greater distances from the shipping ports, and are more difficult of access.

The tract of country yielding the cinchona is not so unlimited as some writers would lead us to believe, nor is the supply inexhaustible; it is a fact recognised by natives and dealers who are well informed about the extent and resources of the cinchona bearing district that if the present ruinous system of destroying the trees is continued, and no effort made to propagate new growths, they will, before many years, be practically exterminated from their native soil.

With the abundance of seeds yielded by the cinchonas, one would naturally expect young plants to spring up in great numbers, but such is not the case, the light-winged seeds mostly fall upon and adhere to the over-moist foliage, where they quickly germinate and decay, or if, perchance, they fall to the earth, it is almost impossible to gain a rooting, as the soil is covered to the depth of 10 to 20 inches with loose decaying leaves. Beyond all doubt the cinchonas might be successfully cultivated in their native country, especially in the localities of the exhausted forests, but the natives show no enterprise, and foreigners receive no encouragement from the Government to attempt it. The Germans have made a venture at cultivating cinchonas near the city of La Paz, Bolivia, but as yet the plants are not sufficiently developed to determine the result.

SERICULTURE.

THE new silk crop in China promises favourable results, and according to the newspapers received from Japan, the crop there also holds out good prospects. The production is expected to be large and of good quality. These facts, coupled with the [illegible] of a good crop in Europe, tend to show that p[illegible] low during the present season.

SILKWORM rearing, to which so much attention and encouragement are now being giving in the Panjab and North-West Provinces, is precisely the sort of industry suited to the Indian *ryot*. No capital is necessary beyond that needed to purchase eggs, &c.; the methods of rearing are simple and easily understood; the food for the caterpillars is never difficult to obtain in this country; there is, and always will be, a demand for the silk, and a fair, if not high, profit may be reasonably expected. The rearing of silkworm may be undertaken by any one without its interfering with his regular occupation. His wife or children can do all that is necessary.

TOBACCO.

EFFORTS have been made, but not with very great success, to cultivate tobacco of superior quality in parts of Arracan in British Burmah. The soil there is said to be as good as the soil in the Phillipine islands, but the Burmese are too conservative to adopt any new-fangled schemes. It is said that if the Government would take the entire scheme in hand, tobacco cultivation might be successfully carried on, and a decided improvement would be apparent in the quality of the leaf.

THE cultivation of tobacco is being vigourously pushed on in parts of Ceylon, and especially in Jaffna where the crop this year has turned out well, and the Colombo market has received large supplies of the leaf. The quantity in store is very large, and we read of shipments being sent to India. The cultivation of tobacco, it has often been pointed out, is one of the most important industries that can be undertaken. In the southern districts of this presidency, particularly in Madura and Trichinopoly, tobacco is extensively grown, and of late years increased attention is given to its cultivation. The cigar manufacturing trade is assuming some proportions, and shipments of cigars are now made steadily to Burmah, the Straits Settlements, and Australia. In connection with the cultivation of tobacco, Dr. Bidie states in the catalogue which he recently published of the specimens sent to the Melbourne Exhibition, that vigorous efforts have been made to effect improvements in the native methods of culture, curing of the leaf, and manufacture of cigars. The Trichinopoly and Dindigul tobaccos are much alike in appearance and quality, but the Lunkah tobacco, grown in the delta of the Godavery, differs materially from both these varieties. As a rule, the Trichinopoly and Dindigul cigars have a stronger taste and flavour than the Lunkah, but the latter although tasting milder, has a more marked effect on the nervous system, and probably contains more nicotine. The exports of tobacco from the Madras Presidency have increased; in 1878-79 the exports were 5,223,829lb., valued at about eleven lakhs of rupees. European firms have started cigar manufactories, and have produced very good cigars which are used extensively in the presidency, and efforts have been made to send supplies to foreign countries.

§ I was told of one merchant who, thinking his brand sufficiently well-established, made a very large shipment of high-grade bark, with which he mixed about one-third of inferior quality; but the trick was detected in the foreign market, and his entire lot could only be sold as inferior grade, causing a heavy loss and serving him a very just punishment.

TOBACCO.

BE[illegible] that many of those who have applied for land in the [illegible], especially in the Eastern Province, may purpose planting tobacco and also that the industry will become an important and remunerative one in Ceylon, as it has already become in India, we have prepared the following remarks on this subject, bearing on its cultivation here. From the data in the Madras Government papers on the subject, it appears that the three best varieties to be planted are *N. Macrophylia* [illegible] heart-shaped Maryland tobacco, which produces a very fine leaf the [illegible] Turkish leaves being probably the produce of it. *N. [illegible]* stalkless Virginian tobacco, leaves fiddle-shaped, three times as long as broad this furnishes good leaves for smoking, produces heavily, and is much grown in Germany, *N. Rustica ovata* small-leaved, Hungarian tobacco, leaves small, egg-shaped, and smooth, this variety furnishes fine aromatic leaves for smoking, but the yield is low, and *Nicotiana crispa*, furnishing the leaves of the celebrated cigars of the Levant, stem very much branched and covered with white hairs, leaves small, stalkless and clasping the stem, flowers red; this species is much cultivated in Central Asia, and we should suspect is a variety that should be introduced in Ceylon.

The tobacco plant has so many species and sub-species, some being valueless, that we recommend all care to be used in procuring seed. In 1875 the Northern Province alone exported over 55,514 cwts. (returns of which were made) which at Rs. 25 per cent. represent a value of Rs. 1,387,850, the value of the tobacco grown in the Northern Province is not more than [illegible] cents. per lb. while in India where the cultivation has been well studied it is worth 11 cents., being just double. The higher class of tobacco (as *N. crispa*) is worth as much more again, however, some Sumatra tobacco having lately sold for the equivalent of 90 cents. a lb. This great difference in price will suffice to shew how much will depend upon the seed procured.

We should imagine that the climate of the Eastern Provinces is most suitable for tobacco damp weather even during the harvesting is fatal to the leaf though it is necessary that a certain amount of rain should fall on the plant after being first put out. It is also necessary that the soil be a very light and friable one A sandy soil containing an average amount of organic matter well-drained, is the *beau-ideal* of a tobacco soil Of course the richer a soil is, the thicker and heavier the leaf and the greater the outturn, but this is by no means the object to be attained. The more clay a soil contains, the less will be the aroma, and the coarser the leaf; still even in a clay soil, by proper tillage and digging a good ordinary smoking tobacco can be produced, and if great attention is paid to the selection of the variety, &c., leaf for cigar wrappers even may be produced Tobacco will not stand any wind, and if planted in new land, so as to avoid it as much as possible, we should strongly advise opening up small plots, well-sheltered, and the result should be a very much larger percentage of first quality leaf. In a rich alluvial soil little or no manure will be required, but as the tobacco plant draws from the soil the inorganic matter with which it is rich, if the same soil is to be used again, a large quantity of nitrogenous manure must be supplied; as much as twenty-five tons of well rotted cattle manure is applied in Holland, whereas in Sumatra the land once cropped is abandoned as useless. The best manure to produce a quickly burning leaf of fine aroma is potash, which can be supplied by applying 200lbs. of good saltpetre to the acre. We have before said that should the same land be used again it would be necessary in Ceylon to manure it very heavily indeed (this is not the necessity in America, where the soil is rich in plant food, or in Hungary and Holland), but we imagine that inorganic matter such as potash and lime taken out of the soil might be supplied by planting in rotation. Indian hemp is said to thrive particularly well after tobacco, and no doubt Indian corn, Helianthus or any cereal or pulse is well adapted for cultivation in the course of rotation.

We would impress upon the cultivator, that though he may introduce a fine species direct from Sumatra or Manilla, he must be prepared for deterioration; it is unlikely that the new *habitat* will supply the thinness and silkiness of leaf and the aroma, unless, climate, soil, and especially treatment are identical. Now supposing that the object to be attained is a wrapper leaf, then the leaf must be broad smooth, thin, and elastic, and dried to a golden color, while fine aroma is not indispensable. The variety that most approaches these characteristics is the heart-shaped Maryland tobacco, grown in Germany, and already largely introduced into India. While for a hardy variety the short leafed Maryland tobacco might be introduced, it is a vigorous grower and a good smoking tobacco; but the tobacco that grows commonly and well in tropical countries is the *N. Rustica* growing in Brazil, Turkey, and Asia generally, and furnishing a large leaf, suitable for wrappers, being worth, approximately, 80 cents. a lb. We do not see, however, why with careful cultivation of a small well-sheltered plot, the higher priced tobaccos of Manilla, Cuba, and Havannah should not be cultivated, and made to thrive in the rich soil of the Eastern Province where irrigation is practicable. We purpose devoting a second article to the drying and curing of this product later on.—*Ceylon Times.*

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NOTICE.

The INDIAN [illegible] *Schools and Missionaries in India at* [illegible] *price.*

R. KNIGHT
Proprietor.

Calcutta, 1st Feb 1876.

CONTENTS

NOTICES TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

CORRESPONDENCE.

CARDAMOMS.

TO THE EDITOR.

SIR,—Having seen an article on the cultivation of cardamoms in your paper of the 1st July, I shall feel obliged if you or any of your readers can inform me where I can procure a book on their cultivation.

[illegible] August 1880. MALABAR.

[illegible] We [illegible] work [illegible] Dr. Pereira on the subject of spices, which [illegible] give [illegible] correspondent all the information he requires. We have [illegible] seen the book ourselves, and cannot therefore speak positively.—ED., *I. A.*

SILK.

TO THE EDITOR.

SIR,—Can you inform me, through the columns of your paper, whether or not the [illegible] cocoon has a marketable value in Calcutta, and if it has what is its value per maund?

Assam, 7th August 1880. W. S. YOUNG LESLIE.

[illegible] always find a market in Calcutta. [illegible] will get you the present value.—ED., *I. A.*

INFORMATION WANTED.

TO THE EDITOR.

[illegible] A. B. has succeeded in domesticating the silk-worm [illegible] will be kindly send particulars and say if he has any eggs to [illegible]. If any of your readers can give information regarding the winding off of the Eria cocoon, I shall feel extremely obliged. Can they be reeled in the same way as the mulberry feeders?

ONE INTERESTED IN SILK.

Gantur, [illegible] August 1880.

PAPER FIBRES.

TO THE EDITOR.

SIR,—Having read in your paper several articles on the matter of obtaining cheap materials for manufacturing paper, I have the pleasure to inform you that I have posted this day to your address a packet which contains two samples of fibres, No. 1 taken from the Lady-finger plant, and No. 2 from branches of Jainti. Both of these plants grow very rapidly, and without any particular care being paid, except to extract the fibres. No other materials could be obtained more cheap than this kind, provided it answer the purposes.

August 1880. B. L. FRIZONI.

NOTE. We are obliged to our correspondent for the samples which came duly to hand. We shall be happy to show them to any one desirous of inspecting the same.—ED., *I. A.*

PRESENT STATE OF JAMAICA.

TO THE EDITOR.

SIR,—This island is a very fertile one, with rich woodlands and scanty sugarcane fields interspersed everywhere. Its rise depends [illegible] on the sugarcane crop, and, as that plantation has failed, the island looks gloomy, not because a huge cloud overhangs her, or because the sun does not shine, but because there is not much work, no demand for labour, and consequently the place has in three hundred and sixty-five days only ninety brisk ones. The land, notwithstanding the several fictions (that it will not yield after two or three years' plough) is highly fruitful, and to add to its fruitfulness, running streams, springs and ponds are to be met with wherever one turns so that when much rain does not fall: there is very little of the cry "everything is scorched."

The disadvantage from which the island is now suffering is not merely from the want of labourers (as is the general rumour) but on account of planters not having sufficient capital to continue on the working of the cane fields. All the old planters have quitted the planting field, and those who have succeeded are inert on account of the prior reason—*viz.*, insufficiency of capital, there fore there is an end to general employment and occupation.

This island which once carried the name of the "great sugar country," is not so now; other places have arisen and she has sunk several steps lower than the rest of the "sugar manufacturing world."

And now the question arises—When shall Jamaica again reach her former zenith? The question may be fairly answered thus:—

1. When planters think again of cultivating those sugarcane fields which have grown with noxious weed and unwieldly wood.
2. When planters know again the value of the products of Jamaica.
3. And when they will plan not only to cultivate sugar and rum, but other products of commerce which will serve to be profitable to them, and of use to those demanding.

Of the many acres of land, not half can be said to be in thorough cultivation, and according to a late report, it is still decreasing on.

Many who have tried to relate of the advantages and disadvantages of this island, say that labourers are required. When this was said before, it conveyed a right meaning; but we may now safely assert that the island is in need of men withstanding, capital, —persevering men, and men who have an adscititious brain than the common majority.

Another cause of this island's failure is party prejudice, but as this exists among the lower classes and the vulgar, who are uneducated, I will not then lay it as a general source of grievance.

Montego Bay, Jamaica, April 25, 1880. CRITIC.

DISEASES OF THE TEA PLANT.

TO THE EDITOR.

SIR,—We read, hear, and see a great deal about the different diseases to which the tea plant is more or less a victim in the various districts where this cultivation has been undertaken, but up to this time no writer has been found to show us clearly the means by which we may be able to keep our plants free from diseases, which in some instances prove fatal.

Some attribute the cause to bad soil, others to pruning, &c.; doubtless the former being one of the chief causes, cannot be disputed. Nevertheless climate too, I dare say, has a share. For instance one may observe that plants on a tea estate at a high elevation are not so much attacked by bug as those lower down. The rapidity with which these little creatures increase in number is marvellous. From the time when first a bush is attacked, the number are so few, that one may almost count them, but note the difference two months later, and you will be surprised; most likely the whole plant is one mass. A little later you may find your plant is no more: it begins with shedding its leaves, and gradually the tree dies out.

Hints from the pen of some scientific man, I dare say, will be of great worth to some who have failed to hit upon means of getting rid of this pest. I have tried lime, tobacco-water, and other things which I thought would be disagreeable to the insect class, but all to no purpose.

A proof of soil being poor, may be somewhat arrived at by the appearance of plants put out on it, which will in the one case show vigour and the other, appear sickly and sluggish in growth, but this may easily be rectified by the attention of the planter being drawn to supplying what is necessary. Much is said regarding chemical or artificial manure, but very few will dispute that ordinary earth manure is as good as any, and, if applied proportionally, will produce the desired results.

I wish here to say a word regarding a disease (I can call it nothing else) which may yet be a stranger in some districts, and as "prevention is better than cure," ere it spreads very far some may, through hints from some scientific writer, be able to check the evil while yet in the bud.

The estate where I first observed, what I am about to point out, is barely four years old.

The soil though not of the very best kind, is to all appearance one that could nourish tea plants for the next twelve years to come without application of manure of any description. I observed till May last the plants looked quite healthy. Since then several have as though commenced to fall back, and a great number seem dying. These appear to commence dying at the branches, beginning at the upper end, till they reach the main stem, and gradually the tree perishes. The space of time I calculate from the first signs of dying to the complete dying out of a plant does not exceed three months. On digging up one of the bushes which perished in this manner, I observed that the roots were slightly covered with a white substance, much like fungus in appearance, or as may be seen on trunks of decayed trees.

It would be a great favour conferred if any of the contributors to your valuable journal would be good enough to give us an insight as to cause and remedy, by which we may be saved a further loss of our tea plants by this disease which is quite a new thing to me, though to men of long experience it may be quite familiar. We can but look to men of sound practical experience to help and enlighten the ignorant and

Neilgherries, 21st July 1880. "IGNORAMUS."

THE FOOD OF CATTLE.

TO THE EDITOR.

SIR,—With respect to several letters that have appeared in the *Agriculturist* on the subject of feeding cattle, I would offer a few remarks, leaving it to those interested to think and act for themselves. In the matter of feeding cattle with either raw or boiled grain, I have seen horned cattle fed with raw gram, a bean called "Moochacotay" in Tamil, in Bengal called "same." This when well soaked, they pounded into a thick pulp in a mortar and gave to the cattle. In this way the cattle must derive more benefit than by simply soaking, and giving the grain entire, because, as one of the writers has acknowledged, the grain is sometimes passed out entire. This method of giving the grain in pulp can only remove one objection, *i e.*, there can be no loss of food from indigestion. But who that has seen grain in its various conditions, will be satisfied with that? If the grain is simply to be soaked, then what becomes of all the worms, and such like, as well as their eggs which both horses and bullocks have to swallow, breed, and in some instances develop into other stages of existence, and which meantime go on drawing all the nourishment required for their existence at the expense of the health as well as the life of the animal they are breeding in and living on? If boiling is really objectionable, then *broil* well; the gram may then be given in that state or soaked. By this means, about one-half, or less, fuel will be required, and all vermin will be destroyed, the grain meantime becoming more palatable and easier of digestion. Your Seringapatam correspondent's letter contains these words:—"But it is the belief amongst the native that this would produce colic, inflammation of the bowels," &c. I will just give one instance from my own observation to prove the soundness of the native views. During the late famine in Madras, as horse gram (*coolty*) had become very scarce residents in those parts bought the Bengal gram (*chenna*), soaked it and gave it to their horses. A friend complained that "not only were people of all classes suffering in various ways, but horses too; and I was assured that both the horses of the house in question had been totally unfit for work for some time, as shortly after their feed their belly would swell, and they would lie and roll and groan as if in great pain. I learned during the day that these horses had the Bengal gram *soaked* and given them, and I at once advised the boiling of the gram, when to the astonishment of all, the horses became perfectly well, and fit for work: there was *no more soaked gram*. The cause in this case no doubt lay in the germ which heat neutralised Not a particle of the strength of boiled gram need be lost to cattle. Cool the water that is strained from the boiling, and give it to the horse to drink. If the horse won't drink it that way, pour it into a tub to ferment, then with the addition of his usual allowance of water give it to him. He will certainly drink with a relish in its sub-acid state. To this add the water that rice is washed with in the first instance, before boiling, as well as the water strained from the rice after it is boiled—this in hot weather will be drunk with great relish by all cattle. In the days of yore, say sixty years ago, ship captains in Madras paid *one double fanam* (2¼ of an anna) for the full of a quart-pot, a couple of green chillies being cut up in it as a zest, But there is another item of diet for the horse that must not be lost sight of, *viz.*, grass. How is this got? A woman or man digs it up, roots and all, with a kind of hoe, consequently it has to be washed, to free it from the clay, &c. During the rains there may be plenty of clean water handy, but in the dry season water is not only scarce, but what little there may be is often in the filthiest condition, and quite alive with animalcula, &c. Into these sinks the grass is thrown to get rid of the earth, and there it is often allowed to lie, to enable it to get a fresh appearance. Is it not likely that in those stinking cesspools the grass gets filled with animalcula, worms, &c., and is it not from this that the horse gets all the ringworm, sores, and itch he may be attacked with? Let your readers think on this and insist on grass being brought to them without being washed outside in the fields or villages; let it be washed at the house or stable with well water. I recollect seeing a buffaloe killed as an offering to "Mariatha" during cholera time; the stomach was full of the grass it had eaten, and in it there

was an immense amount of small leeches, which were all of a pale pink colour and alive. If the animal had the power of digesting these, well and good, but if they had the power of adhering to its intestines, then what wonder at the great mortality that often carries our cattle off by scores, while all directly interested, wonder why, and never know.

Now if it is a fact that gram becomes "heaty" if boiled, the remedy is within the easy reach of all. To a measure of wheat or fine rice bran, add one desert spoon of nitre (saltpetre), finely powdered, and about a tumbler of treacle that has been well boiled, give this once a week during the hot season, to your horse; it will cool his blood: I know this to be given, and with good result.

Give your horse, occasionally, some ripe plantains of the large coarse kind, slices of ripe pumpkin and water-melon, all of which are cheap and plentiful in most parts of India.

Take a real interest in your cattle, look at all that is given to them, see that all is clean and wholesome, and put a proper quantity of salt in their food. Sometimes give good, clean treacle; let this be well boiled and kept corked in bottles; it will do more good than the bare insipid gram and other grain, without the least particle of anything to make it palatable.

The health of our cattle depends often on the care bestowed on them, let us do our duty to them, as they minister not only to our wants, but to our comfort; and let us always bear in mind that the righteous man is merciful to his beast.

Those who give cotton-seed to milch cows, should make sure that the seed is fresh and sweet; old and rancid seed is only fit for manure.

12th August 1880. OBSERVER.

TEOSINTE A MEXICAN FODDER GRASS.

(To the Editor of the Ceylon Times.)

SIR,—I am surprised that no one has recorded their experience of the Teosinte fodder grass. The prickly comfrey was decidedly a failure —not to say a swindle. Of course it is a fodder for cattle and so are turnips and cabbages. It can be made to grow luxuriantly by garden cultivation, but it "won't pay." The Mexican grass is certainly a paying thing to grow, for while in guinea grass the thick stalks are unpalatable to cattle, the Teosinte has an advantage, *viz.*, that the thick stalks no matter how thick, are devoured by horses, cattle, and pigs, owing to the saccharine matter they contain, the manure would not only be superior, but the beasts themselves must fatten. There are certain places where Guinea or any grass won't grow. It is not expected that Teosinte can flourish on such soils. As a rule instead of a bad piece of ground being turned into a grass field, I would advise a small portion of really good ground to be selected for any kind of fodder grass. A little trouble in loosening the soil occasionally and replanting after breaking up the old clumps and clods, a little expenditure on artificial manure to be applied at the rate of 10 per acre including labour, will go far to give an immense quantity of substantial fodder making rich manure. The proportion in weight is as nearly three of Teosinte to one of Guinea grass, judging from the result obtained from a small plot of each grass treated equally. The quantity remaining in stalls of Guinea grass after feeding cattle when weighed, shewed 27 per cent. unconsumed, of the Teosinte only 11 per cent. To those who take an interest in a fair number of cattle and look to improvement in the stock, and to a good supply of rich manure, with but a small porportion of troublesome long stalks to impede the turning over and heaping or removing the manure. I strongly advise the planting of the Teosinte. It grows well on banks of roads and drains, and luxuriates in ravines. Its habit is not unlike the Indian corn these are the male and female flowers. The grass should not as a rule be allowed to run to seed. The rapidity with which it grows after each cropping is simply extraordinary, and from a single stool raised from one seed, as many as 17 perfect stems have been got by mere cropping. Length of average blade is 3 feet 9 inches, but many a foot more; general width in centre 2 to 2½ inches. Mind I speak of grass well attended to. I had read and heard of the grass, but never cared to experiment until in Galle a ship captain who had been to Mexico and knew the grass, confirmed the accounts given of it. He spoke also of two other good prarie grasses which he thought would suit the low-country marshes.

L. T.

FORESTS AND RAINFALL.

(To the Editor of the Bombay Gazette.)

SIR,—Anent the subject of forests and rainfall, I would remark that the pretentions of forest conservators remind me of nothing more vividly than the claims of the African priest and medicine man. To quote a popular work:—

"The African priest and the medicine man is one and the same, and his chief function is to make the clouds give out rain. The prepartions for this purpose are various—charcoal made of burned bats; internal parts of animals, as lion's hearts and hairy calculi from the bowels of old cows; serpents' skins, and vertebræ, and every kind of tuber, bulb, root, and plant to be found in the country;" in short, all "forest produce." Although you disbelieve their efficacy in charming the clouds to pour out their refreshing treasures yet, conscious that civility is useful everywhere, you kindly state that you think they are mistaken as to their power; the rain doctor selects a particular bulbous root, pounds it, and administers a cold infusion to a sheep, which in five minutes afterwards expires in convulsions. Part of the same bulb is converted into smoke, and ascends towards the sky; rain falls in a day or two! The inference is obvious!"

So also is it with the forests and rainfall! The thing is quite plain. The rain tree must induce rain, and the Jovian functions of forests conservators and their assistants are beyond all proof and question. Some things are above reason!

July 23.

JUPITER PLUVIUS.

THE COFFEE BORER.

(To the Editor South of India Observer.)

SIR,—In your issue of the 31st July, there is a local para. referring to the ravages of the "borer" in the Nellacotta to the district. It has been very generally remarked here, by all who have seen the para. in question that it is calculated to convey the impression that some of the estates in the district are suffering from exceptionally severe attacks of this insect. This is by no means the case. The facts are rather that there is less "borer" this season, on the whole, than there has been for years past. Every season we have borer, more or less, but during my six years' experience in the district, I have never known any estate to have suffered from an expectionally severe attack. As is the rule in the Ouchterlony Valley, so here, the trees attacked are regularly and systematically cut dowh and burnt at this season of the year. If the insect does make an invidious distinction in the trees it selects to attack, I should certainly say from my experience that weak and indifferent trees very generally appear to bear the honor of the distinction, and not so much the best trees, as stated in your para.

NELLACOTTA PLANTER.

Nellacotta August 4, 1880.

A NEW VEGETABLE.

(To the Editor of the Ceylon Times.)

SIR,—As you are paying a good deal of attention to new products, perhaps you will allow me to call your attention to the following account of what is termed in home papers "a new vegetable," and to ask if it has been grown in this island. It is the *Soja hispida*, a species of leguminous plant, somewhat resembling in habit and appearance the well-known pea. Unlike the latter, however, it has two distinct uses—industrial as well as alimentary. It is highly prized in China and Japan, and is said, indeed, to take its scientific title from the Japanese name of a sauce-sooja—which is made from its seeds. The seeds are very similar to a "marrow-fat" pea, but contain a large quantity of oil, which is either pressed out of them or boiled out in process of cooking the seeds for the table which is effected by simply throwing them into boiling water, when the outer skin bursts and floats to the surface, together with a quantity of oil, both the oil and the husks being skimmed off together. These may be either used as cattle food, or the oil may be separated and employed for various purposes, while the husks are still valuable as a feeding stuff or as a manure. The peas are boiled for about twenty minutes, and furnish a dish which is highly relished, not only by the Celestials, but by many Europeans who have tasted it. It is said to resemble in flavour the green pea, but lacks its sweet taste. The boiled sofa is also prepared as a cake and as a sauce, being fermented for the latter purpose, and salt, pepper, &c. being added. The sauce has a high reputation among the Chinese and Japanese, not only as a condiment, but as a medical agent.

The plant is described as thriving in very poor thin soil, and as adapting itself to a variety of climates. In Ceylon we are most deficient in the matter of vegetables for culinary purposes, and this would, from the account given of it, appear to be well suited for us and easily grown.

B. R. D.

July 16.

THE WILD VINE OF CALIFORNIA.

(To the Editor of the Englishman.)

SIR,—I have just brought from San Francisco a small parcel of seeds of the wild vine of California (*Vitis Californica*), which I shall gladly distribute to persons desirous of having them, and who may be able to put them out in suitable localities.

The California vine is now very much valued in Europe, and if these seeds should be successfully grown in India, they might be the initiation of an important and valuable industry, either for making wines or raisins.

Will you please make this known in your paper and oblige—

JOHN MARTIN.

5, Garstin's-place, August 14, 1880.

WHITE ANTS.

(To the Editor of the Times of India.)

SIR,—Your Ahmedabad correspondent "Hortus" calls for a cure for a disease which does not exist. It has been proved scientifically that white ants will not eat any vegetable with vitality. I would, therefore, suggest that HORTUS should look to his *malee's* method of planting or weeding, for I find if a rose-tree gets a knock with a *khurpee* or other tool injuring the bark, it admits water and causes death, when the white ants immediately seize it, the top remaining fresh and green for some days. Probably the *malee* detects, or you yourself notice, that the tree is looking sickly, and the roots are then examined for the first time, but the white ants may have found it out long before.

Baroda, August 8. GUZERAT.

The Indian Agriculturist.

CALCUTTA, SEPTEMBER 1, 1880.

THE BENGAL RENT LAW COMMISSION.

WE expected a good deal from the Commission appointed to draft a revised rent law. The experience of Mr. Dampier, the industry and legal lore of Mr. Field, the talent of Mr. Mackenzie, and the critical acumen of Mr. Harrison, with Mr. O'Kinealy's zeal for the improvement of the condition of the cultivators, could scarcely have failed to produce much when applied to a subject so important as the reform of our land system. And the report which the Commission has sent in fully justifies the hopes which had been entertained. Taken as a piece of literary and legislative work it is the best of its kind, as far as our experience of such productions in India extends. The Digest, which is its basis, gives a complete statement of the law as it stands, incorporating all changes, additions, and explanations by which the decisions of the High Court have supplemented the regulations and laws passed in Council. Sir Richard Garth has pronounced this work excellent, so that there is the best authority for assuming that the labours of the Commission rested on the only solid foundation,—a thorough knowledge of the laws which it is desirable to amend. The draft Bill now submitted goes over the whole ground to be covered; it is clear, logical, and exhaustive. The report by which it is prefaced gives in forcible language the reason for every change which it is proposed to make. We may say that the light of day has for the first time been let in upon the subject, that it has been treated in such a manner that any statesman or student, whether in another province or in England, can master it without the aid of local knowledge. On the question itself it is vain to look for any general agreement; in India, as in every other country, there is a landlord's party and a tenant's party, and the two can never agree when the measure under discussion is really important; but we believe that all will be glad to acknowledge the utility of a work which ensures that the legislature, in whatever direction it moves, will have the guidance of light and reason.

The Commission has made several proposals most favourable to tenant-right, and which certainly should meet with our approval, as we have long advocated them. It is a defect in the present law that, while careful of the rights of privileged ryots, it has no provisions whatever for the protection of the ordinary tenants who form a moiety of the whole, and are becoming a majority. The landlord may rack-rent them or eject them at pleasure, or may appropriate without payment such improvements as they have made, such as the trees planted and reared, the wells sunk, the enclosures formed. It has even been decided in a recent case that a landlord thus evicting may take the standing crop, however valuable, and however near maturity. With regard to these unprivileged ryots, the Commissioners have remembered that, as a Trinity man at Cambridge is said to have charitably remarked of the undergraduates of the smaller colleges, "these, too, are our fellow-creatures." Ryots who have been in possession for three years are declared to be entitled, on ejectment for some cause other than an arrear of rent, to compensation for improvements effected by them. They can also get one year's rent as compensation for disturbance. In Ireland, from which the phrase and the thing is borrowed, compensation for disturbance may amount to five years' rent, so that it appears that the Commissioners can move in the direction of tenant-right only at one-fifth the pace of Mr. Gladstone's mighty strides. The compensation for improvements, too, is not assigned as freely as in the Act of 1870. Moreover, it is not clear why a tenant so unfortunate as to be ejected before he has been three years in possession, is to get no compensation for the improvements from which he cannot have as yet derived benefit. It would have been better had the proposal of Mr. Mackenzie, supported by Mr. O'Kinealy and Baboo Rajendro Kumar Seal, been adopted, and the three years' ryots raised at once to the privileged class, in which case their proposed status might have been inherited by the residuum, the unfortunate tenants left unprotected because they have not held for three years. But we must say that, voting in January, before the recent change of Government, the Commissioners went as far as could, at that time, have been expected. It is of little use to propose measures which, with reference to the known views of those who from above control our policy, are sure to be rejected. The Commissioners did as much for the ryot as was possible at the time; when Sir Ashley Eden meets his Legislature next season, he will be in a position to go much further, and really to settle the question.

On the occupancy or privileged ryots it is proposed to bestow this further right, that their holdings shall be alienable. At present such holdings may be sold or not according to custom, and it is always difficult to find out what the custom is in a particular place. There are some who believe that if ryots are given the right to sell, they will dispose of at once their tenures to the money-lenders; but this view, though plausible, is not borne out by experience. At present there are at least a hundred thousand alienable tenures in Bengal, from those of the peasant taluqdars of Chittagong on the south-eastern frontier, to the Surbarahars and privileged ryots of Orissa on the south, and the Gurjashtadars of Shahabad on the west. These are bought by money-lenders only occasionally, and the class connected with them shows no tendency to die out. The idea of declaring all occupancy right saleable is, as far as we know, Sir Ashley Eden's own, and it strikes us as being what *Punch* calls a happy thought. Nothing gives the proprietory feeling but the power to sell, and it is to the pride of proprietorship that we must look to to urge the ryot to improve. In fact it may be said, as a general rule, that all ryots with alienable tenures are now well off, and no others, except where population is thin. If the bulk of the ryots are given this privilege, there is room for a reasonable hope that they may become prosperous.

Since Sir Ashley Eden took the reins we have heard less of the wild schemes for unlimited enhancement of rent on new principles, which Sir Richard Temple declared that he would have invented. Baboo Kristo Das Pal heads a party which openly aims at depriving the occupancy ryots as a body of the statutory privileges they at present enjoy as to fixed rent rates, giving them in exchange other privileges of less value. He nearly succeeded in carrying out his purpose in Sir Richard Temple's time, procuring the introduction of a Bill which, if passed, and maintained, would have led first to an agrarian insurrection, and then to the general impoverishment of the cultivators. We are glad to see that the Commissioners have given no encouragement to these wild and pernicious views, and that even the native members who represented the landlords' interests, did not put them forward. The occupancy ryots under the draft Bill retain their right to hold at the old rates, subject to enhancement only on the old grounds. They are further protected against rack-renting by some new precautions. Enhancement can take place only once in ten

years, and in certain cases it cannot be carried to so great an extent that the rent shall be more than doubled, and in no case shall the new rate be more than equal to the value of one-fourth of the staple crop. It may, moreover, be made by instalments.

The equivalent given to zemindars for the curtailment of their powers involved in the extension of tenant right, is the power to put in motion the revenue machinery of Government for the purpose of raising rent rates, as far as the law permits that they should be raised. The landlords complain that they cannot enhance their rents through the Civil Courts, the process being too clumsy and expensive. They are to be given the use of the agency with which Government effects its own settlements, and which may be supposed to be the most suitable which experience can suggest. This is undoubtedly a great boon to the landlords, and a great injury to the tenants. We, however, doubt whether it will please the shrieking brotherhoods of the Associations, which have got up the agitation for new means of enhancement. These are formed by the more powerful, active, and pushing landlords, who have already enhanced by what they are pleased to call the consent of their ryots to rates beyond those to which they are entitled under the substantive law, and no change which merely gives increased facilities for enforcing existing powers will be of any use to them. What they want is either that the ryots shall be deprived of their present substantive rights, as by Sir Richard Temple's Bill, or that their own hands may be strengthened for the purpose of extorting further "voluntary" enhancements, as by the late Bill, to enable Judges to refuse to hear witnesses for the defence in rent cases. The concession now given will be of use only to the quiet and moderate landlords, who remain in the background, and have no influence in the press or at public meetings, the organs of public opinion.

We may, therefore, expect, indeed we have already witnessed, a strong opposition to the Bill from the party headed by Baboo Kristo Das Pal, the only native influence which is a real power in the country. Sir Ashley Eden's personal connection with many of the leaders of this combination may do something to soften their hostility, but, as we apprehend, not much, their disappointment at the result of the agitation which, since the movement of the ryots of Pubna in 1871 to maintain and assert their position under the present law, has been carried on to change that law to the detriment of the ryots, will be too great. And the question arises, if the opposition of the zemindars must be encountered in any case, why make concessions to it which will not satisfy or mitigate it? If we are to have a tenant right measure, why not make it effectual, and therefore final? Why not dispose of the matter once and for all, as Stein did in Germany? The draft Bill, excellent as it is when compared with other measures recently introduced in the Indian and Bengal Legislative Councils, stops far short of this. For instance, it permits the landlord to contract himself out of all his obligations under the Bill. Now tenant right can never be permanently defended where such a breach for attack is left as this. It is the rift within the lute that maketh all the music mute. The Conservatives knew this, when, in passing a law to give compensation for improvements in England, without intending that the right to receive such should be effectual, they provided that the rule should not over-ride any contract. Mr. Gladstone knew it when, in 1870, he enacted that any contract between Irish landlords and tenants, purporting to exempt the former from obligations under the Act should be null and void. Under the Bill of the Commissioners, a zemindar may keep all his ryots tenants-at-will at rack-rent rates, if he only takes sufficient trouble. He can do this either by registered agreements, or by making them change their fields every three years, on the system which Sir Richard Garth states has been adopted for that purpose by landholders in the Central Provinces. The principle in Bengal should be that, as the revenue is moderate, so should the rent be also; and this rule should be made so strong and close, that the most powerful landlord should be [illegible] through it or the most cunning to creep under [illegible] such a policy, Bengal must in the end be ruined by rack-renting, like Behar and Oudh. It would have been useless to have asked for a law of this kind a year ago, but now the hour has come, and we hope that Sir Ashley Eden will prove to be the man.

IRRIGATION IN SINDH.

IRRIGATION in Sindh is a subject of more than ordinary interest, as being attended by unique conditions. Elsewhere (except in some parts of the Punjab) irrigation is more or less of a luxury; in Sindh it is a necessity. The extension of civilisation in that region is commensurate with the water spread of the canals. These, of course, are all fed from the Indus; and indeed that river might claim honours not inferior to those of the Nile, if practical benefit were the test, apart from historical and traditional glories. Like the Nile, the river of Sindh flows through a rainless country, and swells mysteriously when the drought is greatest. Its floods are more widely used than those of Egypt; the cultivator does not merely scatter his seed as the waters retire, but tills fields far removed from the river by the help of long canals. The system of Indus Canals counts up no less than 5,643 miles, and waters more than two million acres, or about 3,200 square miles. To this area must be added the aggregate area of the tracts directly submerged by the annual floods, it is not shown in the canal returns, but may be assumed at about half as much again, making a total of some 5,000 square miles redeemed from the desert by the bounty of the river. Sometimes the river fails in its ministrations; more frequently it overdoes them, sending down a volume of water that sweeps away embankments and bursts the canals. Such was the case in 1878-79, when the Kusmore embankment above Shikarpore was breached, and the floods joining their waters with those hastily contributed by the hill streams from the west, the gift of a sudden shower, swept over the whole country from Kusmore down to Sehwan. Repaired and strengthened, the Kusmore dam stood against the inundation of 1879-80; but a few weeks ago, it was breached again. These floods do great damage to the autumn crops, which are destroyed by submersion; but some compensation is got in the spring, when wheat and oil-seeds can be sown over a larger area than usual. Wheat, indeed, depends almost wholly on direct flooding, as distinguished from canal irrigation. The latter suffices to water the autumn crops while the canals are full, but when the river shrinks into its normal dimensions, the canals run dry, and there is usually no water left for cultivation in the spring. Exceptions are found in some favoured places, where the canal supply, besides irrigating the autumn fields, yields a surplus which can be stored in reservoirs or water-holes for use several months later, so that a crop of wheat can succeed one of rice or millet. Generally, however, canal-watered lands produce only autumn crops, and lands watered by floods give only the products of the cold months—wheat, oil-seeds, and pulses for the most part. Great uncertainty attends cultivation of this kind. If the floods come in short measure, the area sown is deficient; if they are excessive, it is an advantage to have a large area for sowing, on the condition that it can be sown in time; but often the waters refuse to recede till the season is past. The ideal floods, so far as wheat cultivation is concerned, would be those which should submerge the greatest possible area, and recede with the greatest possible rapidity. The character and extent of the inundation vary greatly from year to year; but on the whole years of flood are commoner and less harmful than years of drought. The year 1878-79 produced the highest inundation, yet recorded, and as a consequence, floods of a magnitude unknown since 1826; nevertheless, irrigation prospered, and the official report on Sindh Canals has little to chronicle but success.

Capital accounts are not kept up for all the canals, but the returns given show that a capital expenditure of 81½ lakhs on certain lines brought in a net return of 2,40,000 rupees; that is to say, about 3 per cent. This return, however, ought to have been about 5 per cent., had revenue been fully levied from the canals in the frontier districts and Khelat territory. There are two works bearing the ominous names of the Desert and the Forced Labour (Begari) canal; and the [illegible] dues on the lands they water seem to be the same

as those which prevailed generally throughout Sindh until recent years, but never worked satisfactorily. The desert landholder is assessed to water at 10 annas 8 pie per acre, on the entire area of his holding; and he is supposed to cultivate one-third of this area annually, so as to effect a proper rotation of fallows; thus the rate per acre of cultivation would be two rupees. What he actually does, is to water the entire holding whenever he can get water enough, and then to cultivate it all, whether with autumn crops, or, if the water lasts, with wheat and other spring grains. In this way he gets off with one-third of the proper assessment per cultivated acre. Of course he loses his chance of fallowing the land, but that gives him little concern, for waste land is plenty, and he has only to throw up his whole holding when the year is out, and take up another of equal size. In Sindh Proper, this plan of cheating the revenue has been stopped by requiring the landholder to pay at full rates for the whole of his holding, whether cultivated or not; while the areas of holdings are at the same time restricted to what can fairly be brought under the plough in an average season, and fallowing is provided for by allowing the holder to relinquish fields successively, retaining a lien on them for two years after relinquishment. Some such arrangement will probably be introduced into the frontier districts sooner or later. Meanwhile, if the revenue returns for 1878-79 be examined, the productions of irrigation in Sindh will be found such as to satisfy the most exacting critic. The expenditure on maintenance and collection was 16½ lakhs; the revenue realised on account of canals was 29½ lakhs. But in truth, from the revenue officer's point of view, the virtue of the canals is inestimable; for without them there would be no revenue from these lands at all. The whole area of Sindh is about 34,000 square miles, only 13,000 of which are recorded as culturable, and about one-fourth of this latter area is, as we have seen, under canals. These figures convey a graphic idea of the desert and sterile character of the region; yet the lands recorded as unculturable owe their unenviable distinction simply to the fact that they lie above the level of the canals; and it may be found possible, in the long course of years, as the canals extend and trees are planted, to bring even these high levels under cultivation, by attracting rainfall as a consequence of afforestation. At present along a single canal (that of Forced Labour) the Canal Department can point to nine thousand trees planted by the waterside, eight thousand of which are *babul*, a tree very suitable to a country which has been called Little Arabia, for the *babul* is the very acacia which in the greater Arabia waves her yellow hair

> Lonely and sweet: nor loved the less
> For flowering in the wilderness.

But the yellow hair of the Indian *babul* waves unnoticed, save haply by some solitary Englishman riding home through the thorny jungle in a golden afternoon of March, when the air is heavy with faint perfume.

Sindh is in several respects one of the most remarkable provinces of India, and not least so with regard to irrigation. Nowhere else do we find an entire province dependent upon a periodical water-supply, and nowhere else are canals so emphatically productive works. The annual Canal Report for Sindh furnishes the most striking testimony to the benefits of a strong and upright Government, however far removed by alien blood and creed, from sympathy with the people, under its rule. Native governors designed some of the most important works, but it is only British supremacy that can guarantee their continuance. Persia, Mesopotamia, parts of Arabia can offer examples of the fate of embankments and canals under the vicissitudes of Oriental despotism. A great monarch accomplishes a gigantic work; and his successors allow it to go to ruin; while the people, disheartened and pillaged, have neither the energy nor the means to do the repairs themselves. Even in Sindh, the annual clearances, so necessary to the efficiency of the canals, are not managed without some trouble. An inundation canal differs from a permanent canal in the circumstance that it receives flood water only, which cannot be turned on and shut off at pleasure. Stones and silt come down with the flood; the volume of water cannot be regulated at discretion, and often breaks away from control altogether, striking out new channels and leaving the old one almost undistinguishable. Another tendency of flood irrigation is to convert the canal into a river, and thereby destroy its utility as a channel for the economical distribution of water. Even in the best years, the work of clearance is no light one, and but for the steady pressure of the canal officers, it would be very imperfectly done. Here it is that the regularity and persistence of a civilised administration prove so useful. Much depends, too, upon the careful collation of statistics, shewing how irrigation stands from year to year. Greater accuracy in these returns of areas is expected as the revised land-revenue settlements are gradually introduced. At present, the estimates of irrigated area are to a certain extent approximate. In the settled taluqas, the data of calculation are the known areas of the 'survey fields' into which the land has been divided for settlement purposes. These fields, however, are often very large (some of them, in the earlier settlements, were as large as 60 acres), and the whole of a field may not be watered; so that in fact the irrigated area has to be estimated by a rough comparison between the known area of the field and the apparent proportion borne to that area by the portion irrigated. In the unsettled taluqas, which are found chiefly in the Hyderabad district, where irrigation is by the Persian wheel, the area is calculated by allowing an average number of acres to each wheel actually in work; while the area of flow irrigation is roughly measured each year. With the revised settlements, more manageable 'survey fields' will come into use, and the cases will be rare where any part of a field has to be left unwatered; thus the area of irrigation will be known with much more precision than at present. There is every reason to believe that it will go on steadily increasing. Sindh is a province which has a future before it. The opening of the Suez Canal has invested the Sindh canals with a new importance; and the wheat growers of Kurrachee now enjoy the advantage of greater proximity to the European market than their rivals in the broad valley of the Ganges or the rich uplands of Chuttisgarh. Nor is Kurrachee alone in this favoured position. Thanks to the railway, which now traverses the length of the province, the remotest taluqas of Shikarpore are but little behind-hand; and Sindh officers may well be excused for the peculiar pride with which they profess their belief in the development of a province which has been redeemed from the desert not less laboriously than Holland from the sea.

UNANIMITY AMONGST TEA PLANTERS.

THE recent meeting of planters in Cachar has illustrated an important phase in connection with the tea industry, and that is—the utter want of unanimity that exists among the planters, as to their wants from a legislative point of view. We remember—several years ago, the Government asked the tea interest to meet and help in compiling such regulations as should be calculated to give the greatest satisfaction in working, and an influential commission of officials was deputed to meet with these delegates. What was the result, why nothing, no two of them agreed on any point, and the only conclusion the Government could possibly arrive at was, that it would be time enough to redress grievances when the aggrieved should decide on what constituted their grievances. For years the friends of the planters have urged union among them, but it has all been in vain. Petty jealousies and local interests have interfered; for it is absurd to say that indifference is the cause, the planter is sufficiently active in airing his own personal grievances. The real cause is that what suits one planter, does not perhaps suit another, and, as each clings pertinaciously to his own idea of what is wanted in the way of legislation, nothing can be done. It is absurd to blame the local Government, which doubtless would so legislate that all parties would be satisfied, if that were possibility. But as there seems no chance of unanimity, what can the Government do? The new society at home, the *Indian Tea Districts Association*, has petitioned the Government for sundry alterations in the existing law, reforms the memorial calls them, and among these that urgently wanted improvement, the propriety of substituting a five years' agreement for the present three years' engagement, occupies a prominent place. Recently a meeting was held in the sudder station of Cachar for the purpose of emphasis

ing this memorial, with the result of as usual agreeing to nothing. The motion for supporting the movement for a five years' engagement as against one for three, was lost, and that by the casting vote of the Chairman.

This must tend materially to weaken the hands of the Association at home, and make them ridiculous in the eyes of the Government. Here they have been most earnestly urging a reform for the planters, which a large section of those planters have just declared they do not want. If the tea industry is to be relieved from oppressive legislation, the first step towards this enfranchisement will be the formulating of the objections to the present Act (VII. of 1873, B.C.,) and submitting a list of such amendments as are calculated to put matters on a fair and just footing. There is no one who knows anything of the tendency and working of that Act, but knows that it bears with undue severity on the planter; we shall simply indicate one or two points in proof of this. In the early days of tea-planting in India, when coolies were imported from their homes and set down in the midst of dense jungles, there existed room for such a regulation as that regarding the maximum price of rice, which was often only obtainable at famine rates. Gardens were frequently situated in isolated spots, far away from bazaars or centres of supply, and were often separated from those centres by long stretches of almost impassable roads, not unfrequently by immense distances without any trace of a road at all. Under these circumstances it was but fair to throw the onus of providing food for these ignorant strangers on the planter, and the fixing of a maximum rate, although not exactly in accord with the principles of free trade, was unavoidable. Now, however, everything is changed, the coolie can always command a supply of grain at ordinary bazaar rates, and if it be considered necessary to keep to the rule of making the planter supply rice at a fixed maximum rate, it would only be fair to make that rate fixed, whatever the price of rice. As matters stand at present, whenever rice goes above the maximum price, the coolie demands his thirty seers per month at the Government fixed price, but should prices fall below that limit, the coolie goes to the bazaar and buys in open market. This we hold to be unfair in principle. The planter loses heavily on rice, and he should be allowed the opportunity of squaring his account, when the price of rice is in his favour. If it be considered advisable to adhere to this idea, it should be so modified that the coolie should be bound to purchase from his employer all the year round at the maximum rate. A much fairer plan would be to assess the average loss to the coolie on this article of consumption, and add that, in monthly increments, to his wages, leaving him all the year round to make his own arrangements as to purchasing. The bazaar is usually close at hand, and there is now no difficulty in procuring supplies within easy distance of each factory. For his own benefit the planter might be depended on to see that the local bazaar was sufficiently close to be convenient to his labourers. This has long been a steady grievance, and one upon whose merits no difference of opinion exists. Another hardship is the ease with which a coolie can break his agreement; although the planter feels this sore to be a severe and costly one, his sense of fair play impels him to do justice to the labourer. He knows for instance, that the coolie may have cost him one hundred rupees to land on the garden, but he also knows that this sum did not go to the coolie's pocket. The whole system of recruiting wants remodelling, but it might perhaps be the quietest plan were the planter to allow this grievance to right itself, which it is doing steadily and surely by the help of improved communication between the recruiting districts and the gardens. The planter must, however, lay it to heart—and this brings us back to the subject we started with—that no satisfactory redress of this grievance or of any other, will ever be attainable until a network of associations is spread over the tea districts, each one independent locally, but all affiliated to some centre, and all bent on carrying out the same rules, which shall have for their object the general good of the industry and not the furthering of private interests. Then a coolie who breaks his agreement without just cause, will have his descriptive roll sent to each garden, and will find it utterly impossible to obtain employment. He will thus be compelled to go back to the planter who imported him at great cost, and with whom he entered into an agreement for a term of years. A few experiences of this sort will put a stop to deserting voluntarily, or with the help of the sections of Act VII. We need not enlarge on this subject, as we imagine we have said enough to point the moral of unanimity and union.

THE SALARU FARM.

THE report on the Government Farm of Salaru for the half-year ending 30th April 1880, has recently been issued, and if nothing else has been effected, a clear proof of the benefit of deep ploughing has been adduced. But we do not get all the information we should like, and which is necessary to enable us to form a clear opinion on the point. For instance, we are not told how the ordinary country cattle managed to drag the English ploughs, nor is a word said as to the relative depths of the furrows as compared with those of the ordinary country *hal*. The experiment referred to was made with *bajri* and cotton. The field selected for the *bajri* experiment, was one overrun with a perennial grass crop, and while this was naturally against a good yield of grain under ordinary circumstances, it served the more clearly to prove the value of the work done by the English plough. The great difference between the English and native ploughs is that the former gives a deeper furrow, and besides it does what is never attempted by the native implement—it completely inverts the mould. Two advantages accrue from this—a new stratum is exposed to atmospheric influences, and the roots of perennial grasses and weeds are exposed to the action of the sun. Thorough exposure to the atmosphere constitutes the best manure the farmer has at his command, and it is one which after all does not cost much. Instead of ploughing so many beegahs per day, according to the cattle power at his command, if the rayat would only do, say two-thirds as much, and do it deeper, he would be astonished at the result. The country plough scratches the soil, and exposes the roots of the weeds to atmospheric influences thus fostering their growth in a remarkable degree, while the stratum of soil which he actually loosens and leaves to a certain extent to be acted on by the air, is the same stratum which has done duty in this way for centuries, and which has as little humus in it as a handful of sand. With regard to the grass and weeds, the mould board of ploughs on the English system completely inverts the soil and exposes the roots inverted to the influence of the sun, which speedily deprives them of their germinating power. The plough used at the Salaru Farm was a Howard's English, and must of course have been of very light draught, turning over the soil to the depth of perhaps 3½ to 4 inches. We should have liked definite information on these points, and also as to whether the draught was within the reach of the ordinary country bullocks, without having to increase the number of cattle yoked to the plough. In the case of the crop of *bajri*, the result was so satisfactory as to be decisive.

The following table will give at a glance the results.—

	Scinde plough.	English plough.	Excess of English plough over Scinde plough.	
	lbs.	lbs.	lbs.	Percentage.
Grain ...	1,259	1,578	619	49
Straw ...	3,215	4,439	1,224	38

Otherwise than in the matter of ploughing, both plots were treated exactly alike, both having received two artificial waterings.

Now we turn to the cotton. Two acres were ploughed with the English plough, and five acres with the ordinary village implement. In other respects the plots were treated exactly alike, and the results obtained were as follows (in lb. of uncleaned cotton per acre.)

	Scinde plough.	English plough.	Excess of English plough over Scinde plough.	
	lbs	lbs.	lbs.	Percentage.
Uncleaned ...	1,164	1,564	400	34½
Equal to cleaned	388	526	138	35½

The value of the excess 133lbs., was Rs. 28-10-4, it having actually sold for this sum, while the cost of the extra deep ploughing was Rs. 5-5-7, leaving a clear gain of Rs. 22-4-9 per acre. And this is not all. The improvement resulting from the deep ploughing will be found to be permanent, and future crops will derive benefit from it. In this way the value of the land will be improved.

During the half-year under notice, sundry other experiments were entered on, but as they do not seem to have been followed up carefully, they were bare of useful results. For instance, in one case, village cattle were permitted to destroy a crop, and surely where the exact results of experiments are aimed at, such a contretemps should have been prevented. The experiments with different manures gave much less of a valuable residue of results than did the deep ploughing trial, and we would strongly urge on cultivators, both of cereals and perennial crops, such as teas, coffee, &c., to give a large amount of attention to deep cultivation, where of course the soil is suitable. Where the subsoil is cold and sour, it would be ruinous to bring it up to the surface, but where there is a fairly good subsoil, as is the case in most cereal soils and in almost all tea soils, the advantages of deep ploughing and hoeing cannot be overrated.

EDITORIAL NOTES.

WITH the view of promoting agricultural improvement in Bengal, and encouraging the study of scientific agriculture, the Lieutenant-Governor has determined to create annually two special scholarships of £200 a year each, to be held by science graduates of the Calcutta University at the Royal Agricultural College, Cirencester. The first two scholarships will be tenable for two and-a-half years from the commencement of the January term in 1881. Only natives of Bengal, Behar, or Orissa, who have passed the B.A. examination on the Physical side, will be eligible. An allowance of Rs. 1,000 will be made to defray the expenses of each scholarship-holder in proceeding to England, and a similar allowance will be made for the return journey on the completion of the course. Applications will be received by the Director of Public Instruction, and will be submitted to Government with a report from a Committee consisting of the following gentlemen: The Director of Public Instruction, Mr. C. H. Tawney, Baboo Bhudev Mukerji, C.I.E., and Mr. A. W. Garrett.

WITH reference to the Indian Famine Report, just issued, it is stated that the questions of tenure irrigation, railways, &c., will be dealt with exhaustively in the second part of the report, which will, it is hoped, be ready for presentation to Parliament, before the close of the session. The first part of the report relates to famine relief; the second deals with the measures by which Government, through its action, may place the people in a better condition to withstand the effect of droughts.

WE have before us the last General Administration Report of the Patna division, from which we learn some of the excellent results that have attended an increased cultivation of the sugarcane. Canal irrigation has done much by reclaiming and fertilising waste and barren lands, to develop the area under sugarcane, especially in the Gya district and in the Jehanabad sub-division. In the latter district the canal water, by means of the great facilities it afforded to the cultivators, has given a great impetus to the sugarcane industry. The results of last year's operations, we are told, paid very well, and there is no reason to doubt that the cultivation of sugarcane will continue to extend in the immediate future. Some remarks of the Sub-divisional Officer of Johanabad are especially noteworthy, and we shall reproduce them here in the shape of a brief extract. He says that :—

"A ryot has made a clear profit of Rs. 80 per beegah by sugarcane. Comparing this with the sum of Rs. 8, which is considered to be a good profit in a beegah of *rubbee* or *khureef*, and that of Rs. 20 which poppy yields, there can be no doubt that sugarcane is the most valuable crop, and that an extensive cultivation of it is more likely than anything else to raise the condition of the ryots. There are no doubt certain drawbacks, namely, that the crops remain longer on the ground than any other, and that the work of preparing the land and irrigating the crops is extremely arduous. Still, the cultivators say that it does not require the same unvarying and engrossing attention that poppy cultivation does. It has been found that the sugarcane has in some places superseded poppy cultivation."

It will be seen that some most important statements are contained in the above paragraph, and we shall be glad to hear of further attention being paid to the subject. Many improvements have been made of late in connection with the sugarcane industry in Bengal. Experiments in agriculture have been carried out by European and native gentlemen, of practical knowledge, and new machinery has been invented and introduced in some parts. Conspicuous among these have been the gentlemen in charge of the Beheea estate—Messrs. Burrows, Mylne, and Thompson—whose new sugar-crushing machine, by reason of the great saving it effects in the outturn, is destined apparently, soon to be universally adopted. According to the Lieutenant-Governor these gentlemen, by their experiments, are "rapidly revolutionizing the whole (cane) sugar industry of Bengal."

PERHAPS the most marked instance of success in the way of improvements that do not interfere with the rayat's prejudices is Messrs. Thomson and Mylne's Beheea mill. An improved cane-crushing mill was called for, and these gentlemen responded to the call, with the most gratifying results to all concerned. Their mill has many points to recommend it: first, it is simply the old native mill improved upon, and this is a strong point in its favour. It does not look like an English mill, but has all the characteristics of the old country mill the *kolhu*. Then it takes no more power to drive it, no more bullock power we mean. It would doubtles be easy to construct a mill which should do its work in a very complete manner, if no limit were placed on the power necessary to drive it, but with the average rayat, this is all important. He has a certain amount of bullock power at his disposal, and if you make a demand on him beyond this amount, you at once call on him to make an extra outlay to which he objects. The Beheea mill is worked with the same bullocks which worked the *kolhu*. That is another strong point gained. The patentees claim for it the advantage that half the number of bullocks suffice as are necessary for the other, but to be safe we will say that no more power is required. Then the *kolhu* being a fixture, necessitates all the cane being conveyed to it, whereas the Beheea mill can be moved by four men from field to field, a great saving in cartage being thereby effected. It does not require so many attendants to work it. For the old mill the cane has to be cut into short lengths, and as at the ends of each length fermentation is apt to supervene, it is easily understood that the quality of the juice is prejudicially affected thereby. The Beheea mill takes the cane whole, thus saving the labour of cutting and obviating the chance of fermentation. The juice from the latter sells therefore at 25 per cent. higher price than the other. Besides this, the rollers having more grip, the percentage of juice is larger than from the *kolhu*. Against all these advantages, there is only the drawback of increased cost. The prices are from Rs. 80 to Rs. 95, according to size, a sum considerably higher we presume than the cost of the other, but this does not weigh as a feather in the balance with the rayat, when he sees that this extra cost will be more than recovered in the course of a single season. Consequently we are not surprised to find that over nine thousand of these mills have been purchased in the Shahabad district alone.

We have repeatedly pointed out the absurdity of India purchasing sugar from other countries, when she can grow it so well herself, and we have also made the same remark regarding other articles. A few such successes like that of the Beheea cane crushing mill, and we shall have no cause for complaint left.

A CIRCULAR has been addressed by the Director of Agriculture and Commerce in the North-Western Provinces to all persons interested in the improvement of agriculture. The circular makes some very important suggestions, which we make no apology to place before the reader. In the first place the liberal use of bone dust as a manure is recommended. The circular says :—"The great increase in produce which results from the use of crushed bones as manure seems quite unknown to the people of this country, although in England bone dust is extensively

used and paid a high price for (Rs. 3 a maund). On the Cawnpore Farm, during the last *rabi* season, bone dust applied at the rate of 3½ maunds to the acre, gave a wheat crop of nearly 24 maunds of grain and 35 maunds of *bhoosa* to the acre which was 8⅜ maunds of grain and 15 maunds of *bhoosa* more than was gained from unmanured land."

The crops for which bone dust will be found most useful are, maize, sugarcane, wheat, and barley. Then we learn that the urine of cattle is a far more potent manure than their dung. The circular says :—" In Europe it is carefully collected by keeping bedding of grass or straw under the cattle in their sheds, which absorbs all the urine as it falls, and which when rotted is applied to the land as manure. In this country it is inadvisable to use bedding since in the hot weather and rains it harbours insects and rots the feet of the bullocks, but I recommend that an attempt be made to collect cattle urine in the following manner. Have the floor of the bullock shed sloped off to a pit in one corner, and well rammed with clay, so as to let the urine drain off it into the pit. Keep the pit half filled with loose earth, taking out as much of it as is saturated with urine, say, once a week, and replacing it with dry earth. The earth saturated with urine should be kept for 3 or 4 months, and then applied to one-half of a field, and its effect in increasing the produce judged of by comparison with the other half."

Deep cultivation is highly recommended. The chief difference between the Indian and European methods of tilling the soil lies not so much in the *depth* to which the soil is cultivated, but in the fact that the European plough *turns the soil right over* while the Indian plough merely stirs it. Most European ploughs are meant to be drawn by horses, and are too heavy for bullocks, unless two or three pairs are yoked. But a plough on an American model has, we learn, been adopted by this department which is very light, cheap, and simple and which with an ordinary pair of bullocks will plough to a depth of 5 inches and turn the soil completely over to that depth. Many district officers and native gentlemen have used this plough, and given very favourable accounts of it. The Agricultural Department, we learn, is willing to lend ploughs of this kind for trial on application.

THE Bengal Government has granted a sum of Rs. 2,000 for the importation of good potato seed from England and Australia, which on arrival is to be planted at Kalimpoong. Some years ago Darjeeling used to be famous for the excellence of its potatoes, and a very considerable trade in this produce with Calcutta and other places existed. Of late years the Darjeeling potato has been steadily deteriorating in quality, and the export trade which formerly existed has in consequence become almost extinct; Calcutta being now almost exclusively supplied with Bombay potatoes. The deterioration of the Darjeeling potatoes is apparently due to the native *jhooming* system of cultivation having become impossible in this district of late years, to the use of inferior seed year after year, and to the native cultivators knowing nothing about the rotation of crops, and never manuring the ground before sowing. The usual practice with the native cultivators is to sell the largest and best potatoes and to reserve only the smallest and worst as seed for the next season's crop, with the inevitable result of yearly deterioration both in quantity and quality. The introduction of a new and improved strain of seed in this district is calculated in time to restore a trade which has, owing to the causes above enumerated, almost ceased to exist, and it may safely be predicted that Government will in a very short time recoup itself for the Rs. 2,000 sunk in the very laudable effort to encourage the cultivation of a better class of potato by the hill people. That really splendid potatoes can be grown in the Darjeeling district is very well known, and the fact has been proved by a local gentleman, who imported some seed from Messrs. Sutton at the beginning of the year, and who planted it out on carefully prepared land. The crop is now being dug, and the results are more satisfactory, the potatoes being fully equal, both in quantity and quality, to English grown potatoes.

THE *Pioneer* says that "the Government of India has ordered the extension of poppy cultivation to the Agra, Muttra, Aligarh, and Moradabad districts of the N.-W. Provinces, in addition to an increase in the area in districts where the cultivation at present exists. A considerable increase in the staff of the department, European and native has also been sanctioned. Mr. H. Rivett-Carnac, C.I.E., the Opium Agent, to whom the necessary measures have been entrusted, is now on tour, arranging in communication with local officers, the details of the new scheme."

THE Lahore paper publishes a long letter on the Hissar Cattle Farm, and the vast improvements it has undergone under the able management of General Angelo. Beneath his fostering care, the writer tells us, jungles have given place to luxuriant and neatly kept fields, order has ousted disorder, neatness taken the place of untidiness, and economy that of lavish expenditure. He has initiated a new of system of ploughing and cultivation, to see which the zemindars not only flock in crowds to Hissar, but of which they have expressed their approval by adopting it themselves.

THE news from the Berars is very bad, we are sorry to say; the clouds are carried over the country by strong westerly winds and no rain falls. A six-anna cotton crop is the utmost that is now hoped for.

A *Daily News* telegram from Alexandria states that the cotton and other crops in Egypt are looking splendid, and that the Nile promises to be equal to last year. Land is increasing in value.

WHEN we are hearing such an outcry from most quarters regarding what is called " the deplorable state" of Indian trade, says the *British Mercantile Gazette*, it is well to look into the facts as represented by recent statistics. As for the financial blunder, that belongs to a totally different aspect of the question, but looking at the returns regarding India's foreign trade, there is no evidence of retrogression, but of steady progress, only temporarily interrupted by the universal depression. During the last ten years the imports of merchandise into India have increased 25 per cent., and transactions in cotton manufactures have gone up 50 per cent. The exports during the same period have increased over 20 per cent. Jute, hides, and skins, opium, grain, seeds, particularly represent a fair increase, but the most remarkable figures are in regard to tea, which has improved 200 per cent. during the last ten years.

THE weekly report of the Bombay Chamber of Commerce just issued, gives the details of the trade for the first seven months of the year :—

		1879.	1880.
Cotton	... bales	551,978	816,036
Wool	... „	40,228	59,506
Linseed	... cwt.	421,931	1,400,318
Wheat	... „	8,590	1,075,509
Coffee	... „	90,969	106,895

It will be seen that cotton has increased 48 per cent., wool 47 per cent., linseed 230 per cent., wheat 12,304 per cent. (!) and coffee 18 per cent. No little part of the enormous increase in wheat shipment is owing to the opening of the short distance of the Rajpootana railway. The *Bombay Gazette* says there is still a good deal of wheat and seeds to go forward, and the stock of cotton in Bombay is much larger than for many monsoons, so that prospects for the rest of the year are encouraging.

CEYLON promises to make a good show at the forthcoming Melbourne Exhibition. Tea, coffee, cinchona, cacao, and cinnamon will be among the chief agricultural products, while in the ranks of manufactures the cabinet work of the Kalutara and Galle carpenters will stand well to the fore. Mr. A. M. Ferguson, senior editor of the *Observer*, who goes as the Ceylon Commissioner, carries with him the confidence of all classes, and there is no doubt but that he will do full justice to all Ceylon interests committed to his charge. The Madras specimens have been sent to Melbourne, and, according to the catalogue published, they ought to attract some notice.

PROF. BAEYER has, says the *Athenæum*, discovered and patented a method of obtaing artificial indigo, which is to be worked on a commercial scale by the Baden Aniline Company. The indigo is obtained from chloride isatin which is produced from benzole.

THE Rangoon trade in salt shows considerable improvement annually. During the past official year, says the *Gazette*, 1,430,208 maunds of this article were passed through the Custom House for consumption on payment of a duty of

Rs. 1,71,816, while in the year previous, 1878-79, only 905,712 maunds nett, yielding a duty of Rs. 87,697, were consumed. Of the first mentioned quality, 894,323 maunds were consumed locally on payment of a duty of Rs. 1,67,686, at the usual rate of 3 annas per maund, and 535,885 maunds were exported to Upper Burmah and charged with duty at one per cent. of the market value of the commodity under the provisions of the Treaty of 1862. The latter quantity then paid the nominal tax of Rs. 4,130 only, whereas if charged with duty at the usual rate the amount collected thereon would have been Rs. 1,00,479.

NEW rice mills are still the order of the day in Rangoon, amongst both European and native firms. Three new ones are being put up now, and are expected to be ready for working by the next rice season; and we believe one additional rice mill is to be started in both Bassein and Moulmein. Improvements in rice machinery are yearly effected, and with the rapidly extending demand for cleaned Burmah rice in China and South America, there will doubtless be profitable trade for all the new erections in a few years. It is to be regretted, however, that the mercantile community do not interest themselves more in the land question, and move the Government to make more liberal grants of waste land, for the purposes of cultivation. There is no doubt a more liberal system would attract to these waste lands the population and capital which are now confined to the large towns, and if new rice mills continue to be erected in the numbers that they have been of late years, the difficult question for their owners to decide will be where to get sufficient supplies of grain to keep them constantly working. It would, therefore, be advisable for the merchants to look a little ahead, and to do all they can to encourage an increased cultivation of rice, or they may find in a few years that they have gone so far ahead of the present capabilities of the province, that their mills will be forced to remain idle for a great part of the year owing to the inability of the present population to supply them with paddy or unhusked grain in sufficiently large quantities. The capability of the soil may be boundless, but with the slow rate of increase amongst the agriculturists, which may be put down to the restrictions, red tape, and routine which has to be gone through to acquire land for cultivation, we may shortly find that the milling power in Rangoon is enough to convert the whole produce of the province into rice in a very few months of the year.

OUR Rangoon correspondent writes to us:—Government recently despatched a model of a Burmese kyoung or monastery to the Melbourne Exhibition. Had specimens of our lacquered-ware, silver workmanship, rice and tobacco been sent, I think it would have given the colonists a better idea of the province, and possibly induced some orders from Australia to our merchants and traders. Tea from Arakan and coffee from Tonghoo might also have been exhibited. Both are of the finest quality, and it is greatly to be regretted that unwise land legislation keeps the cultivation of both products backward. Surely to encourage the cultivation of such valuable articles for export, Government might offer land, of which there is such abundance here, free to any company or private person who could shew they possessed adequate means for cultivation, and on such terms that if the land was not used for the purpose it was applied for, or a certain proportion not brought under cultivation within a certain number of years, the land would be liable to be resumed. It can only be by some such liberal terms offered to the first in the field that we can hope to attract capital and population to this province. This has been pointed out over and over again, but still the Government made no move, and only offer leases where they should gladly make a present of the free hold to induce capitalists to come forward.

THE experiments in jute cultivation that have been carried on lately in Brazil are likely, it is said, to turn out a success. Both the soil and climate of the Brazilian lowlands are well fitted for growing jute; in some places two crops a year are obtained. The fibre of the Brazil jute is said to be of a superior quality; and the Brazilians are prepared not only to grow the raw material, but also to start manufactories.

THE *Lucknow Times* gives the following interesting account of the growth and manufacture of Chinese white wax:—

The white wax of Sze-chuen, China, is most peculiar in its growth. We observe that Baron Richthofen estimates the value of the annual crop, on the average at about £650,000. In 1879, upwards of £81,000 worth of this curious entomological secretion was exported from the one port of Hankow alone. White wax is the mere exudation of an insect in a state of disease, aggravated probably by the operation of an uncongenial climate, and favoured by the presence of a tree for which the creature has an affinity. In the Keenchang district, an evergreen, known as the *ligustrum lucidum*, thrives in abundance, and on its twigs in the spring of the year countless flies swarm like a brown film. The branches soon become covered with a white, soapy incrustation that increases in volume until the commencement of the fall of the year, when the sprays are cut off and immersed in water, which is kept boiling. The viscid substance rises to the surface, and is skimmed off, melted, and allowed to cool in deep pans. It was accidentally discovered that by transporting the insects from their native district to the more vigorous one of Keating Fu, in the north of the province, their capability of discharging wax was largely augmented, a property which was promptly and extensively availed of by the Sze-chuen traders. The period between morning and evening is chosen for conveyance, because many hours of sunlight would percipitate the hatching. This should take place only after the females have been attached to the trees. Arrived at their destination, six or more of the mothers—which are enormously prolific—are tied, wrapped in a palm leaf, to a member of the *ligustrum*. A few days later the young flies are swarming on the twigs, where they fulfil their mission by the month of August. Then they perish in the caldrons, where the results of their brief existence are collected. It is said that this peculiar industry requires the exercise of great care, forethought, and experience.

A DUBLIN paper, the *Farmer's Gazette*, says that the durability of wooden posts planted in the ground depends in a great degree on whether they are planted in the position in which they grew or *vice versa*. Owing, it is supposed, to the moisture not being able to ascend against the grain, posts planted top downwards remain sound many years longer than those not so reversed.

SELECTIONS.

THE MUDDAR PLANT.

A MEMORANDUM on materials suited for paper-making that we have received from the Agricultural Department, contains a most interesting monograph on the above weed.

We use the term "weed" advisedly, for though gifted with almost every quality that can make it useful to man, the Muddar still continues a useless jungle plant, that can be viewed in almost every part of India from the windows of a railway carriage—a standing example of how much yet remains to be done before the much-talked of development of the resources that lie at our feet, becomes an accomplished fact. The whole of Rajpootana so far as we have seen it, may be called a Muddar preserve; the plant abounds all over the Punjab and the N.-W. P., is found in moist and marshy Bengal (we have seen a splendid specimen of it in a compound in Calcutta), occurs again in Madras and Mysore, everywhere in fact where there is soil on which to grow, and where no care is required for its growth. In the words of the Report before us, it will grow where nothing else will grow—on beds of sand for instance. But it is equally at home on rich soil; a perfect cosmopolitan in short, that presents itself everywhere whether it is wanted or not, and always with a kind of mute reproach expressive of—"Why do you not make use of me? You could easily do so if you would only take the trouble, in place of frittering away your time on other plants that have not half the good qualities which I possess."

We must confess the Muddar is a perfect pariah amongst plants. Nobody takes care of it, for it takes such good care of itself that it is looked upon rather as a nuisance by those who have an eye for the picturesque. Its tough sea-green leaves are suggestive of leather, and it is only while the pods are bursting and the silky contents floating about upon the wind that the plant can lay any claims to beauty. But that is a matter of opinion. The homely useful qualities of the weed we shall attempt to describe as briefly as possible in the following lines.

So far back as 1852 Dr. Riddell, Officiating Superintending Surgeon of his Highness the Nizam's Army, came to the conclusion that the milky juice of the Muddar, was not unlike guttapercha. After drying, he tried experiments with it in acids, alcohol, liquor potassæ, and spirits of turpentine, and the tests corresponded exactly with the established results of the real guttapercha. Captain Meadows Taylor of the Hyderabad contingent on hearing of these experiments tried another test. A piece of the real guttapercha of commerce and a piece of the new substance, both of the same size, were softened in hot water and united readily. He then submitted the mixed substance to a test by acids, and the results did not differ from those on either of the two original separate substances. In May 1858, Captain Hollings, Deputy Commissioner of

Shahpur in the Punjab, obtained precisely similar results with the juice of the plant grown in that province. He also used the Muddar guttapercha, instead of silk, for isolating wires used for the conveyance of electricity, and he found it to answer very well. He placed a wire covered with the substance in a brass vessel filled with water, and found that the electric spark was carried along the inner wire without interruption. Dr. Riddell sent some specimens of the new guttapercha to be examined by a chemist in London, who put it into the hand of a scientific gentleman, Professor Redwood, who said :—"The substance resembling guttapercha, obtained from the Muddar, I find possesses several properties in common with guttapercha, while in other respects it differs." He tried to vulcanise it (*i.e.*, to combine it with sulphur) but did not succeed, and he did not think it could be deprived of its property of being a conductor of electricity.

No further attempt has been made to solve this problem for more than a quarter of a century!

The next good point about the Muddar is the toughness of the fibre yielded by its stems. Ropes of surprising strength can be made of it, and it is also suitable for weaving as it blends readily with silk. Fishermen in Sind use it for their nets, and the hillmen in the Rajmahal Hills use it for their bowstrings, which are said to last five years in constant use, and exposed to all kinds of weather. Some twine made from this (the Rajmahal variety) bore 248lbs. and 343lbs. in the dry and wetted conditions, when hempen twine of the same thickness bore only 158lbs. and 190lbs. in the same conditions. Some experiments on the Madras variety again showed that it bore 532lbs., when the *sunn* of Coimbatore bore 407lbs., the *agave* (aloe) 362lbs., cotton 346lbs., and coir 224lbs. only.

The extraction of the fibre is the difficulty. It has to be picked off the inside of the bark, *not* from the stem itself. Captain Hollings says :—

"The workmen bite through the bark about the centre of its length ; they then hold the tissue of threads in one hand and separate the bars with the other. I have tried hot and cold water, and all the arrangements known for the separation of hemp, or rather the preparation of *sunn* jute, &c., without success ; as yet human teeth and nails are the manipulators, but it is not unreasonable to suppose that some chemical process will be discovered by which the bark will be easily separated from the fibre."

In 1855, practical men in England pronounced the fibre to be well calculated for supplying the place of good flax for making prime yarns, and it was considered at that time to be well worth from £30 to £40 per ton. Here too nothing has been done to improve the methods of extracting the fibre for the last quarter of a century.

The third product of the Muddar is the smooth glossy cotton, yielded by the bursting of the pods, and which resembles short lengths of pale yellowish-white floss silk. In France and Germany this has been worked up into articles of dress, and Messrs. Thresher and Glenny also succeeded in manufacturing a texture composed of equal parts of Muddar floss and cotton, and also a flannel from Muddar in one part and wool two parts. In October 1849, Mr. Monckton, C.S., of Etawah, sent to the Agricultural and Horticultural Society of Bengal some specimens of cloth manufactured from the Muddar cotton. In one of these the warp or longitudinal thread was of common cotton, and the weft or cross ways of pure Muddar. In other specimens the warp was half common cotton and half Muddar, and the weft three parts Muddar to one of common cotton. At the International Exhibition of 1862 the Shahpur Jail gained a medal for its manufacture of Muddar cotton stuffs. And in the Punjab Exhibition some table napkins were exhibited made of Muddar cotton in Dehra Ismail Khan, also towels made of Muddar and ordinary cotton mixed ; also a rug made of Muddar (coloured) from Rawul Pindi.

We have now said enough about the products of this valuable plant. It only remains to add that its cotton is supposed to be peculiarly well adapted for paper-making, and that it is probably in this direction that the Muddar will first be utilised. As his Highness the Maharajah of Gwalior has set an example of enterprise in starting paper mills, he may as well follow up his venture by bringing into use a material which can be had for the picking over a great part of India.—*Delhi Gazette.*

THE RAINFALL OF INDIA.

THE rainfall in India varies greatly. Cherapunji, on the Khasia Hills, north-east of Bengal, has the heaviest known rainfall in the world. Rain is estimated in inches. Every inch multiplied by 14½, represents the number of millions of gallons which fall per square mile ; each gallon weighing 10lbs. At Cherapunji the rainfall averages 524 inches a year. This means that if all the rain which falls there during a year remained on the ground, it would form a lake 43¾ feet in depth—sufficient to cover a large house of two stories. On the other hand, in Upper Sindh the average rainfall is only about two inches a year, while sometimes a twelve-month passes without a single shower. Between those two extremes, there is every intermediate gradation.

The rainfall in India is greatly influenced by the monsoons, or periodical winds which blow alternately from the south-west and the north-east. The South-West Monsoon, lasting from May to September, causes two belts of excessive rainfall. One extends from the mouth of the Irrawaddi along the east coast of the Bay of Bengal, up to the valley of the Brahmaputra, and along the skirts of the Himalayas. The other streches along the west coast of the Peninsula, from the seashore to the summits of the ghâts. In both cases, wind from the Indian Ocean, highly charged with vapour, drives against the face of a mountain range. The air in rising expands and is cooled, precipitating therefore a considerable part of its vapour. The rainfall increases with nearness to the hills in the direction of the wind. Thus at Lahore, 100 miles from the nearest hills, the annual rainfall is 15 inches a year ; at Rawul Pindi, near the foot of the hills, 29 inches, and at Hazara, on the hills, 44 inches.

On the *lee* side of a range, that is, on the side opposite that on which the wind blows, the rainfall is comparatively small, the air losing its vapour in crossing the mountains. At Bombay the annual rainfall is 71 inches ; at Mahableshwar, one of the highst points of the Western Ghâts, it is 260 inches, while at Poona it is only 27 inches.

Madras draws its chief supply of rain from the North-East Monsoon. The wind in its comparatively short passage over the Bay of Bengal, does not collect the same amount of moisture as the South-West Monsoon. The avarage rainfall at Madras is about 49 inches a year.

On the west coast most rain falls from May to August ; in the Carnatic October and November are the wettest months.

In the north-west corner of India there is an arid region, including all Sindh and half the Punjab, where the average annual rainfall is less than ten inches. Next, there are two zones of dry country, with an annual rainfall between 15 and 30 inches. One, named the Northern Dry Zone, surrounds the arid region in the north and east, in a belt from 100 to 200 miles wide. It includes Delhi and Agra. The Southern Dry Zone is in the peninsula, extending from Nasik to Cape Comorin at a distance between the two seas. The next region has a rainfall between 30 and 60 inches, and includes the upper part of the valley of the Ganges, Central India, and the eastern coast of the Madras Presidency. The deltas of the Mahanadi and Ganges, and the lower part of the Ganges Valley have a rainfall between 60 and 75 inches a year. The coast of Burmah and part of the west coast of India have a rainfall of above a hundred inches a year.

The rainfall of a few other places may be mentioned.

The highest known rainfall at Calcutta for 35 years was 93 inches ; the lowest but one, 41 inches. The average is 66 inches. According to Parkes, Benares has, on an average, 37·4 inches annually ; Agra, 28 inches ; Delhi, 25 ; Meerut, 1[illegible] ; Nussorabad, 15·8 ; Peshawur, 13·7.

At Madras* the highest known rainfall for 67 years was 88·41 inches ; the least was 1[illegible]·45 ; the average 48·56. The rainfall at Moulmein is said to be about 180 inches a year.

Colombo, Galle, and Kandy, in Ceylon, have nearly the same annual rainfall,—about 80 inches a year. The rainfall in the north of the Island is only about half that on the south-west coast. At Ambagamuwa, the average is about 20[illegible] inches a year.

THE GROWTH OF BARLEY.

I WAS much struck with two letters which appeared in your valuable journal some weeks ago, the first from INQUIRER, asking for information from some of your numerous readers, respecting the barley crop of 1879 ; the other letter, signed BOTHERLY HELP, quoting an extract from a speech of Mr. Gladstone's, in which he rebuked farmers for the want of mutual interchange and communication of successes and failures in their business. As a proof how well we farmers deserved the rebuke, we find but two of our *profession* troubling themselves to give the asked for information. If the details of the different experiments made by many of us were given in our agricultural papers (of which we consider yours one of the best) much time and expense would be saved to many beginners, as they then would have simply to refer to their extracts from your Journal, and find whether or not their idea was worth trying. With your permission I will set an example by giving you a few of the wrinkles I have learned during the last thirty years in preparing the land for growing the best quality of malting barley, which is, from all accounts, to be one of the principal mainstays of the British farmer for years to come, the area where it can be grown being so small, and the demand likely to be large as soon as trade revives and our mechanics have plenty of spending money.

On no single subject connected with farming have I found such a diversity of opinion as on the preparation of land for the barley crop. If we take the Norfolk farmers for example, you will find one who will follow with his plough immediately after the sheep fold, just turning over the land with a furrow two inches deep, his neighbour will break his land up six or eight inches deep, with a plough without a breast. This will leave the droppings of the sheep as near the surface as his neighbour has done, and besides, will, by breaking up the land, have rendered it less likely to suffer from heavy rain or drought. They both will follow with

* The following statistics may interest some of our readers. Average monthly rainfall at Madras ; January, 0·95 ; February, 0·28 ; March, 0·44 ; April, 0·68 ; May, 2·87 ; June, 1·99 ; July, 3·79 ; August, 4·53 ; September, 4·74 ; October, 10·84 ; November, 13·97 ; December, 4·98. *From Madras Observatory.*

The *Madras Adminstration Report*, for 1877-78, gives the average rainfall of the districts for ten years previous to 1876-77 :—Bellary, 22·34 inches ; Coimbatore, 23·71 ; Tinnevelly, 26·91 ; Kurnool, 27·38 ; Cuddapah, 28·01 ; Madura, 28·81 ; Kistna, 30·41 ; Nellore, 33·47 ; North Arcot, 33·83 ; Salem, 34·66 ; Godavari, 36·49 ; Trichinopoly, 37·06 ; Tanjore, 37·87 ; South Arcot, 38·29 ; Ganjam, 40·48 ; Vizagapatam, 41·01 ; Nilgiri, 44·68 ; Chingleput, 50·64 ; Madras, 53·33 ; Malabar, 107·95 ; South Canara 136·60.

another ploughing just previous to drilling the barley. The second is the system from which I have seen the best results. Again, you hear another light land farmer as strongly recommend ploughing but once after the sheep fold. This may answer in a favourable season, when your land suffers from neither heavy rains nor droughts, but it is not one that I would recommend. Then, with respect to the mixed soils and so-called heavy lands of Norfolk, you find just the same variety of opinion. My experience, and what I could learn from successful barley growers, convinced me that it was necessary to get the major part of the land folded and ploughed up before Christmas, giving it one fair earth of some five or six inches deep, then letting it lie until the latter part of March. Then scarify it across the furrows, harrow, and drill from six to eight pecks of the best barley you could obtain, and hope for the success you deserve. By the coast you find still another plan in operation. They grow heavy crops of swedes and white turnips, all of which are carted either on to the wheat stubbles, and there thrown about for the bullock to blow themselves out with, or are carted home and given without stint to the bullocks in the boxes. The land is then ploughed once, and sometimes twice, about three inches deep. Then in April they drill from three to four bushels of barley per acre, and, as any one out of the district would suppose, they grow a heavy crop of weak soft straw, with an equally light crop of inferior barley. One or two outsiders adopted the plan of feeding a third of the roots on the land, then first ploughing it six inches deep without the breast, and afterwards about four inches in the usual way; drilling in March from eight to ten pecks per acre, with a marked improvement both in quantity and quality.

The system of growing barley after wheat has very much increased of late years, neither the crops of straw nor corn are so heavy as after roots, but the quality of the barley is generally much superior and more suited for malting purposes. The cultivation found to answer best is ploughing the wheat stubble in, soon after harvest, then another earth in January or February, the manure being applied during the frosty weather. If any artificial manure is used, it might consist of two to three cwt. of superphosphate and one cwt. of nitrate of soda.

The growth of barley on heavy clay lands has also come more into favour since the price has increased, and that of wheat decreased. The usual cultivation is as above, if it is grown after wheat; and if after dead fallow, the land is summer-fallowed in the usuel way, mucked in autumn or winter, and again ploughed during the winter. The first time for this last operation is when there is a frost, which will require to be very severe to prevent one's getting on with this work; the land will then fall down like lime, and take but little working when the barley is drilled. Two cwt. of superphosphate will improve the quality of the crop.—*Cor., L. S. Journal.*

ABOUT PAPER FIBRES.

WERE we to ask any ordinary reader what paper is made of, the answer would probably be promptly "rags, of course." This is so nearly correct that if it be recollected as the leading idea in the subsequent remarks on materials for paper-making, they may prove interesting, if not, also useful. The Government have for some time been inquiring as to India's capabilities for producing such materials, and the results of those inquiries in all parts of the country have been curious and will probably be utilised by commercial people.

We associate the word "rags" chiefly with cotton and linen rags rather than with woollen. Woollen is unfitted for paper-making, but the other two materials well represent almost all others. The one, cotton, is a fibre derived from the "seed-vessels" of a plant: the other is fibre from the "stock" of a plant. Cotton is the commonest material, and India is the home of cotton. Then, say some, the question is settled, 'let India sell cotton to the paper-maker.' But this will by no means do. The paper-makers cannot afford new cotton; old rags easily collected are good enough for them, and the price is incalculably cheaper. It will not do even to send refuse waste home. The question is, is there no other cheaper source of fibre in the jungles or deserts of India, which will pay to collect and export.

Our first inquiry is, what are the exact requirements as regards such a fibre. This is answered by the curator of the Victoria and Albert Museum, Bombay. "To be successful, a raw material for paper-making should possess certain qualities. The first and most important is an abundant and lasting supply easily procured, and cheaply prepared for exportation; nor should its bulk be too great. When in the hands of the paper-maker, it should work up cleanly, and at a moderate cost, and present no difficulties in bleaching: a fibre should have a certain amount of roughness to enable it to 'felt' or cohere in the massy, and lastly it ought to turn out at least 50 per cent. of good marketable paper."

First, as regards "an abundant and lasting supply," it is unlikely that it will ever pay to cultivate good land for this special produce, unless systematic paper manufactories were started in India itself. To this point we shall afterwards revert. But it appears from the various reports returned to Government that some of the best fibres are produced on land otherwise useless. Some grow in thick trackless jungles: some, such as the bamboo, in endless forests in difficult tracts; others, such as the *mudder* and certain grasses, in ground otherwise perfectly sterile and desert; and others in equally useless swamps and marshes.

This then, to start with, is very hopeful. It is said that the wise, good hearted Linnæus defined a *weed* as "a plant whose virtues and uses have not yet been discovered." If the weeds of our immense deserts are discovered to be useful articles of commerce as regards the important art of paper-making, weeds merely waiting to be gathered and sold, no doubt an impulse will be given to investigation in many other similar directions. The question of bulk in packing is of course an important one as regards cost of transport and freight, but, if the fibre is worth having, doubtless processes would soon be invented to eliminate the rubbish from the useful part and economise the bulk of the latter, just as in the wool-trade it is the most economical plan to clean it before despatching it to consignees, who do not wish, if they can help it, to pay freight for filth, mud, and refuse. The bleaching is more a question for the manufacturer than for the collector of the fibre, because if it is good for bleaching at all, the maker perfers to do it himself, from the beginning of the process. This therefore need not trouble the exporter: what he has to see to is that the fibre is what the maker will buy.

The question of "felting" of the fibre is a curious one to those who have never seen a paper mill. It is not a question of long or short fibre, or of fineness or coarseness. It is not whether it will make fine tough threads or close lasting fabrics. It is simply this: given a fibre which must be cut, torn, and minced and pounded into particles so minute that they cannot be distinguished except by a microscope; so minute that when boiled and mixed with water, they merely make it like milk or cream, so like butter-milk, indeed, that you could not tell the one from the other; yet, if that creamy fluid is poured out anywhere on a fine sieve or a flannel cloth, or some such surface, and pressed and dried, it will form a firm felted mass such as we can best describe by telling the reader to examine coarse blotting paper. One would think that any stuff that would thus make a pulp would make paper. For example, some juices make a pulp and turn out India-rubber and guttapercha. But paper pulp is quite different and its requirements special.

We come now to the consideration of certain substances that fulfil or partly fulfil these requirements. A number of them we are wholly unacquainted with, but there are some with which every one is more or less familiar. We have already set cotton aside as too valuable to be cultivated solely for paper. But flax deserves attention. In many parts of India the stem is wholly thrown aside as refuse, the seed alone being valued for making oil. A great industry seems possible in flax fibre, which at present is only used for string and rope. So also is *sunn* or tow, from which a good deal of native paper is made, but even that is often mixed for paper with a certain amount of cotton. The American aloe is counted a specially valuable fibre. When pains have been taken with it, it turns out first-rate, and is remarkable for the extraordinary strain it stands when made into rope. But at present no economical process has yet been invented to eliminate the fibre from the refuse easily and cheaply. When this is done, it will attract more attention. The leaves of the wild date palm appear to be a very promising fibre. The palm grows in the most miserable sandy deserts and down the Indus Valley in great forests, only utilized by the natives for toddy making. As toddy-drawing spoils the fruit, but does not kill the leaves, there seems a hope that the licenses for toddy drawers may, some time or other, be printed on paper made from the leaves of the trees themselves.

Sugarcane refuse, which is now made into ropes for wells, &c., is also a substance that is now wasted in great profusion. In the United States, the home of economy and invention, the refuse is greatly made use of for the coarser kind of paper, and doubtless if we had local paper mills, we should also use up much of this for the same purpose.

From the above enumeration we have omitted all we did not think of much importance, and those also we thought of extra importance. One of the latter is the plantain. It cannot affect the Punjab much, so we may let it pass. The next is the bamboo. The bamboo grows freely in great forests all along the base of the hills. It already furnishes an important traffic, and it appears that its fibre is very valuable for paper. The Chinese have used it from time immemorial. It would scarcely pay to send home, but it grows just in the places where Indian paper mills would necessarily be started, that is about the clear streams of the lower hills, so that it is especially important to consider it always as a source of supply upon which a paper company could depend.

In the Government Report it seems to us that the river side grasses have not received enough of attention. Perhaps it is our misfortune that we do not recognise the various *hibisci* under their scientific names, but if they were thought valuable, they would probably be better described. Yet the two most ancient papers in the world were swamp reeds—papyrus and rice. Moonj grass is barely mentioned, yet its fibre is incontestably very valuable. Rice straw is noted merely to be passed over. Wheat straw, which is here pounded up into bhoosa, if capable of making good useful paper. Wild bhung gives a very strong fibre and grows wild everywhere, especially in the hills; so common is it that its young leaves alone sell for about a rupee a maund as an intoxicating medium.

And lastly, we recur to a plant which we mentioned incidentally towards the beginning of our remarks. It is called in Punjabi *muddar*. Every one knows it. You have only to glance over the Anarkulli maidan to see it growing everywhere—a shrub about three or four feet high with thick greenish blue leaves and a thickish stem, generally considered an instrusive weed. As for the jungles, it grows everywhere over them and on the bare plains of Mean Meer just as it does at the back of your cook-

house, it is not particular. If you give it a flick with a whip, instantly milk springs out from the leaf. If that milk gets into your eye, it will blind you; if it is rubbed on your skin, it will raise a blister; if cows or sheep eat the plant, they will die; if goats eat it, it improves their digestion. If you collect the milk, it will form guttapercha, and can be worked in the same way and submitted to the same tests. It has, at the proper seasons, a large violet coloured flower which turns into a seed pod, which when it opens, displays a beautiful floss-silk down which the wind scatters everywhere. This down makes up into a beautiful fabric, but it has not been much experimented on. It makes, we may remark confidentially, a most beautiful stuffing for pillows, rezais, and cushions. But its chief importance is that it has been found to be a splendid fibre plant. It bleaches beautifully, it is very strong, and it turns out an economical paper even when gathered in the jungles here and sent to England. In short, to recapitulate, it produces "a first class fibre, tenacious, elastic, and lustrous; and a cotton silk-like, smooth and glossy; and a juice with some of the properties of gutta percha," and certain medicinal qualities which have only partially been investigated, and it grows profusely as a weed in the worst and most desolate soils and regions of the Punjab. Its scientific name is *calutropis gigantia*, or C. Hamiltonii.

The above remarks have all had reference to the export of fibre for the English mills. But why is so little done in India? Whatever is done must be done in the pleasant little lower hill valleys, the land of clear streams and bright foliage. But, as yet, no railways approach these districts, and until feeders are thrown out to the foot of the hills, we shall see no such enterprise flourish. Beer seems to flourish apparently, because people will drink beer when they hate the very sight or mention of paper. Sugar in the Punjab has as yet scarcely had a [illegible], combined with rum, will probably make its own way. Whisky distilleries have not started yet, all the Scotchmen hereabouts being busy as yet in less congenial but more urgent labors. Wool mills are in a similar state of dubious popularity. But we prophesy that the next company will be a paper mill, and would indicate the localities of Kalka, Hooshiarpore or Pathankote as very suitable places for such a venture.—*Civil & Military Gazette.*

SUGAR-CANE IN AUSTRALIA.

THE different varieties of sugar-cane removed from the Botanical Gardens in 1878, to a portion set apart for them in the Oxley Reserve, have thriven exceedingly well, and answer in every respect my most sanguine expectations. The whole appear to be in a thoroughly healthy state, many of the canes having joints from 8 inches to 9 inches in length. I had intended this season to have each variety tested as to sugar-producing capabilities, but, considering the comparatively recent removal, and finding some difficulty in forwarding the cane to the mill, I have decided to allow the test to stand over until next season. Specimens of the principal varieties will be exhibited in stools at the forthcoming exhibitions. During the past year I have received the following:—From Hawaii—*Saccharum officinarum*, var. *Mamulele*, Striped Bourbon or Black Striped; from Singapore, Saigon, and China—*Blanche du Cap*, Gingan, Chinese, Annamite Vambeir, Coki, and Diard; making in all a most valuable addition of 78 new and different varieties, all of which are now under successful cultivation. Promise has also been received from H. Murton, Esq., Director of the Botanic Gardens, Singapore, of varieties of cane from Pondicherry, which will be most acceptable as an addition to those already in our possession. This gentleman has always evinced a most lively interest in the progress of the sugar industry in this colony, and it is to him specially, and others in the southern islands of the Pacific, I am indebted for the most valuable specimens of cane we possess. From the period of my first entering into the duties of these gardens in 1864, I have endeavoured to collect as many varieties of sugar-cane as possible, not only up to the time of its cultivation in the colony as a commercial industry, but up to the present, and by closely observing them during their growth, and noting their peculiarities as to climatic and other natural requirements, have invested the collection with an amount of interest which will, I am persuaded, prove to be of considerable value in the future. Both individual experience and correspondence prove that the use of one class of cane, continued for successive seasons and extending over many years, materially deteriorates the quality; and the substitution of new varieties, to ensure successful growth and productive qualities, becomes imperative.

The applications for cuttings have not only become very numerous, far exceeding those of previous years, but have arrived from various parts of the world where the growth of sugar is an established industry. Different varieties suitable to the climate have been forwarded by request to the West Indies, South Carolina, and other States of America, the Sandwich Islands, Hawaii, and the Mauritius (no less than two tons weight of cuttings having been sent to the latter place), all of which were supplied from the plantation at Oxley previously referred to. I am glad to be able to report, also, that the demands for cuttings from the various districts of Queensland, from their large extent, show in a marked degree the increasing popularity this important interest is gaining with our agriculturists. Rockhampton, has not hitherto been tried as a sugar-producing district, in a commercial point of view, although I have repeatedly called attention to it, as possessing a climate suitable for its cultivation. I am, however, glad to say that an experimental plantation is about being formed by Mr. Hall, of Rockhampton, consisting of about fifty acres of selected ground, and I have arranged to supply him with sufficient cuttings (98,600) of suitable varieties to plant twenty acres of ground, in the hope that with proper skilful attention the venture may prove a success, and become the pioneer of more extensive operations conductive to the permanent establishment of the industry in the district. Instancing the large proportions to which sugar cultivation has attained in this colony in a comparatively few years, I find the following results, obtained from official sources, of the operations for the year ending December 31st, 1878:—

Areas under sugar-cane	16,584	acres.
Acres of sugar-cane crushed	11,005	"
Sugar produced	12,356	tons.
Raw sugar exported	3,380 $\frac{13}{20}$	"
Refined sugar exported	754	"

whilst the importations for the same period amounted to 250 tons of raw, and 51 tons of refined sugar. The quantity of molasses manufactured considerably exceeded half a million gallons, and the quantity of rum distilled, over 200,000 gallons—a vast and notable increase during the space of eleven years; the number of tons of sugar manufactured in 1868 being reported as 619. I am also credibly informed that the acreage under cultivation at the present season is considerably beyond that of last year, and the crushing has commenced under most favourable circumstances with every prospect of a most satisfactory yield.

The disease, or rust, which has made its appearance upon some of the plantations in this colony still occupies the attention of the growers and scientists, but, notwithstanding continual experiments both here and upon specimens specially sent to England for the microscopic examination of most eminent men, nothing definite or conclusive has yet been arrived at as to the actual cause of the disease, although the effect of it, so far as the rust is concerned, is generally conceded. Professor Liversedge, of the Sydney University, attributes the disease *to defective conditions of cultivation*, and I am still of my previously expressed opinion, which is corroborated by the majority of the planters with whom I have been in communication on the subject, that the true cause of the disease is the climatic changes to which some of the canes have been subjected, by being removed from their natural habitat, and being of too weak constitution to sustain the extraordinary claims upon their being placed under an uncongenial influence; and experience has shown that where diseased cane has been removed to a position where the temperature assimilate with its original growth, the disease entirely disappears. I may also, with equal confidence, express my opinion that the disease is not contagious, for I have witnessed in plantations, where several varieties have been planted in close proxmity to each other, some were to be found afflicted strongly with the disease, whilst others of a more robust nature in their immediate vicinity were entirely free from it. Another and most important question arising out of this vexed question is, how far the disease retards the growth of the cane or reduces the density of the juice? This is a matter not yet touched upon by those who have made this inquiry a speciality, but, so far as I can understand from those most interested, the damage is slight, if perceptible at all.—WALTER HILL, BRISBANE, in *Journal of Applied Science.*

SERVICES OF BIRDS IN AGRICULTURE.

PEOPLE often venture the statement that every object in Nature is of some use, directly or indirectly; but I fear if they were questioned as to the precise use and benefit we derive from certain members of the animal and vegetable kingdoms, they would find it rather difficult to prove the correctness of their assertion. Among the many natural enemies of the cultivator of the soil, slugs, snails, grubs under, and weeds on the surface, form a large and by no means contemptible part. That it were useless and unavailing for man himself to endeavour to exterminate these pests, is undeniable; and the only help he can expect must be from birds who, in their search after food, are unwittingly of immense use to him, some of them carrying destruction amongst the animal pests, and others against the vegetable ones. Some notes and facts on these services may not be out of place in this journal, and we will first take an insight into the way in which the former are kept under; of course the eventual extinction of these pests is not to be hoped for.

Amongst all our larger birds the *Corvidæ* or ravens are far and away the most aiding to the farmer, and of these the Starling shows to the fore in a useful aspect, its services being something, incredible; slugs, snails, worms, and beetles all form indiscriminate food for this most valuable bird. Statistics in such a case may seem odious, but I believe a German naturalist, with the extreme perseverance characteristic of his nation, once computed, and not incorrectly, that a single young Starling will stow away 140 snails in 11 hours out of the 21. Now, if we deduce further facts from this, we soon see what a valuable aid to the cultivator the Starling is and how deserving of our protection. Nor is there, as far as I know, any set off against these good works; the Starling never attacks plants or grain of any kind, but will search with great diligence amongst new-sown wheat after noxious things, especially young slugs and worms.

Passing to our old and well-known friend the crow, we find that we are indebted to it also for services which, although rendered on behalf of itself, benefit us in no small degree. Not only grubs and their countless more or less distant relations fall victims to their accommodating and lasting hunger, but insects of all sorts and sizes, whose unwelcome pre-

sence is so detrimental to the soil on or in which they are, besides mice, which they destroy in great numbers and greedily devour.

The old discussion, whether the rook does more mischief than good, or *vice versa*, crops up continually from time to time, and the same old arguments are put forward by both sides to prove what is really a question more of locality and circumstance than a general one. Under certain conditions I consider the rook to be a nuisance, and under others a thing to be sought after, and therefore, without offering an opinion, I will state the facts of the case, and leave others to draw their conclusions. For the most part the food of the rook consists of cockchafers and their exceedingly destructive larvæ, besides slugs, worms, and grubs in lesser quantities: but it is also exceedingly partial to fruit, corn, and seeds of all kinds, not to mention young ducklings, chickens, young hares, rabbits, and game of all sorts. Then it must be allowed that the number of the former that they destroy is very considerable, especially the cockchafer larvæ, the liking for which they also seem to have amongst birds.

Another exceedingly useful member of the *Corvidæ* is the jackdaw, but it is not nearly so plentiful as the crow and rook; consequently—for the same reason that white sheep eat more than black—they do not destroy so many hurtful insects as their [illegible] relatives. Insects, snails, worms—in short the whole category of the animals, are devoured by the jackdaw, especially grubs in ploughed land. Mice also form a part of their food, and they eat a little corn as well, but not much; in fact, the loss could never be noticed.

One cannot help admiring the wonderful and surprising instinct of these three birds in discovering the whereabouts of the animals and insects on which they feed. They seem to be guided to the exact spot, and all they have to do is to thrust in their beak and draw out whatever may be the unlucky victim. It is curious that the ravens should include amongst their members really useful birds, thoroughly worth the farmer's protection, and birds so undeniably destructive as the magpie and jay, the [illegible] even more so than the latter. The mischievous and hurtful propensities of the magpie are only surpassed by its extreme daring while in search of its food. The first of these two birds eat a minimum of insects, and feed chiefly on fruit seeds, corn, in fact anything it can find to suit its by no means dainty palate; and does incredible harm in field and farm-yard. What is more the crow gets blamed for a great deal of the mischief the magpie perpetrates, I doubt if there is any, among all the birds we are proud to call British, whose mischievous propensities are so widespread.

Although the jay is not quite so unwelcome on farmer land as the magpie, still it is a bird whose room is always preferable to its company, for it is most impartial as to what it eats. Like the magpie, it will consume a few insects, but while it can get corn or seeds in plenty, coupled with an occasional duckling, or chicken, it will always prefer this comparatively easily collected food to the more scarce and less tasty and satisfying insects.—*Moorman, in L. S. Journal.*

THE CAWNPORE EXPERIMENTAL FARM.

THE experiments made in the Cawnpore Farm last year, as detailed in the report for the *rabi* season, 1879-80, seem to have been of a more practical kind than usual, and remind one of the doings at Sydapet in the Madras Presidency. The first series referred to in the report under notice are those made with different kinds of manuring. We are sorry to see that no attempt was made to introduce poudrette, which has, of late become so popular among the cultivators around Poona. The manures tried were—bone superphosphates, dissolved guano, and green manure consisting of a crop of indigo ploughed in. The table recording the result is so interesting that we make no excuse for transcribing a part of it:—

Manure applied per acre.	Outturn, grain.	Straw.	Total value.			Cost per acre.			Profit per acre.		
Mds.	lb.	lb.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
Bone Superphosphate, 2 mds.	1,627	2464	49	10	8	27	12	9	21	13	6
Ditto, 3½ mds. ...	1,894	2,937	59	0	11	31	4	5	26	12	0
Dissolved Guano, 1½ mds. ...	1,427	2,196	43	11	2	34	6	5	9	4	6
Ditto, 2 mds. ...	1,778	2,881	55	0	8	39	9	7	15	7	1
Indigo crop ploughed in ...	1,430	2,994	47	0	3	30	8	3	16	8	0
No manure	1,171	1,662	35	4	7	19	12	3	15	8	4

It will be observed here that guano stands low in the matter of profit. This was brought about by the great cost of laying the guano down at Cawnpore, amounting to Rs. 9-14-8 per maund equal to Rs. 270 per ton, a price which practically placed it out of the competition. The bone superphosphate, obtained by crushing bones, and treating them with sulphuric acid and hot water, furnished a manure, which cost Rs. 8-7-3 per maund, and could, in fact, be made much cheaper were it not for the very high cost of, and frieght on, sulphuric acid. This solvent stands the cultivator in 3 annas per lb., at Cawnpore. Three-and-a-half maunds per acre raised the produce from 19·5 bushels—the outturn of the standard and unmanured plot—to 27·1 bushels per acre. It must be remembered that the whole of this soil, having been more or less under experimental treatment during the past three or four years, was in better condition than the ordinary soil of the country, hence the high outturn of 19½ bushels per acre. We should mention that wheat was the crop experimented with. Mr. F. N. Wright speaks of this rather as "a full average outturn for good lands, under the native system of cultivation." We must point out here that the general average all over India is 14 bushels, therefore 19½ is a high outturn, and 27 a striking illustration of what high cultivation can do. The cost of each experiment is very carefully debited—a matter not always attended to in these experiments. For instance, the land being on a Government farm, it is customary to ignore rent. This is unfair, and in this series of experiments, the cost has been made up as follows:—

	Rs.	A.	P.
Rent	6	4	0
Irrigation	3	12	0
Cultivation	8	8	8
Total, Rs.	18	8	8

The rent is based on the average rent of 12 fields adjoining the farm, and the outturn is valued at the rates current at Cawnpore when the grain was ready for the market. The experiments, therefore, have a value not always to be found in such trials, and they are conclusive as to the benefits of manuring. When will the ryot understand that he has just the same rent revenue, and canal dues to pay whether his crop is 14 or 27 bushels per acre; or, in other words, whether his profit is Rs. 10 or Rs. 26, per acre per crop? It is worthy of note, too, that the amount of straw—the value of which was included in the above tabulated figures—was very much increased in amount, and when farmers use this for cattle-feeding, it must be of great value to them. The increase on the plot, with 3½ maunds bone manure, was 75½ per cent. Not the least interesting feature in this series of experiments is the result obtained from the so-called unmanured plot. It is true that no manure was applied with the crop, but in 1877-78, a mixture of blood and bones, to the extent of 5 maunds per acre, was applied, and it is well known that the effects of bone manure are lasting, as was clearly shown in this plot producing 19½ bushels per acre, which is 39 per cent. above the average of India. A second series of experiments was tried, in order to find the effect of carefully selecting seeds, instead of taking it at random from the *bunnia*. The result was a wheat crop of 23½ bushels per acre from the selected seed plot against 18½ from the other. The respective merits of thin and thick sowing were tested, and resulted in favor of close sowing.

We do not, however, consider the experiment to have been at all a fair one, as the amount of seed, used for thin sowing, was ridiculously small, being only 16lbs. per acre, as against 116lbs. This, we consider, to have been too extreme a test. Two plots were alike treated to 50 maunds farmyard manure, and in every other respect, except irrigation, they were treated in the same manner. The unwatered plot yielded 17 bushels grain, and 24 maunds straw, while the irrigated plot gave a return of 30½ bushels grain and 41 maunds straw, the extra cost of watering having only amounted to Rs. 3-12. Some experiments were made in the way of introducing wheat and barley from England, America, and Australia; and the general conclusion arrived at seemed to be in favor of improving the indigenous variety by careful selection. This, we believe, to be a thoroughly sound decision. Dr. Forbes Watson has told us that, in many districts in India the finest wheat in the world is grown; and there does not seem any reason why we should not indent on those districts for seed wheat to replace the more common varieties of other places. The Indian ryot has been for centuries engaged in cultivating the same grain on the same fields, and deterioration has invariably been the result of such a course all the word over.—*I. D. News.*

CITY REFUSE AS MANURE.

THE importance of having an adequate supply of manures in this country cannot be exaggerated. Mr. James Caird, the great authority in such matters, has, by carefully conducted experiments, proved to demonstration that the difference between the best and inferior agriculture on the same *soil* may be more than treble the produce. Wheat grown without manure yielded 730lbs., and wheat grown with special manure yielded 2,342lbs. The great difficulty in the way of the introduction of improved methods of tillage in India is the want of a sufficient supply of manures. The Indian cultivator must afford to manure his fields properly, and that is the main reason why the soil is becoming gradually exhausted. Such being the case, a peculiar interest attaches to the experiments now being made at Poona to utilise city refuse as manure. The use of poudrette as manure was unknown in the Bombay Presidency until recently; but the Poona Municipality has now been realising a considerable revenue from the sale of poudrette since the opening of the Mutha Canals. Some information about the manufacture and sale of poudrette in Poona will no doubt interest the reader. The population of the city is 90,436 souls. About forty-four cartloads of night-soil, equal to 575 cubic feet, are collected daily, and carted out to a depôt at the village of Dhanpodi, two and-a-half miles off from the extreme limits of the city. Then there are the street and house sweepings collected from the dust bins of the city. They amount to sixty-five to seventy-five cartloads, equal to 1,950 cubic feet, per day. These are carted out; and when burnt and sifted, the produce is 300 cubic feet of ashes. The process adopted in the preparation of the night-soil of

the city of Poona into poudrette is what is called the sun-drying process. The 575 cubic feet of night-soil shrinks in drying to 430 cubic feet of night-soil. Mixed with 300 cubic feet of ashes the produce is 730 cubic feet poudrette per day, or 226,450 cubic feet per annum. Experience has shown that to ensure thorough deodorisation, complete freedom from stink, and the best poudrette, the proportion of ashes to night-soil should be about equal; but as this is not now the case, the supply of night-soil being 430 cubic feet, and that of ashes 300 cubic feet per day —the Municipality are now trying to augment their collection of ashes to the required amount. The price realised is one rupee per cubic yard, or 27 cubic feet. The annual value of the poudrette prepared and sold by the Poona Municipality is Rs. 9,870. The revenue realised by the Municipality from this source has been steadily increased. It has risen in five years from Rs. 766 to nearly Rs. 10,000. The cost of conveying night-soil and sweepings to the depôt comes up to Rs. 11,736; but as this cost has to be incurred in any case, it need not be taken into account. The manufacture of the poudrette costs Rs. 6,264. The annual revenue from the 266,450 cubic feet of poudrette prepared by the Poona Municipality is almost Rs. 5,000. The Secretary to the Municipality thinks that this revenue is susceptible of considerable development. The expenditure for removing the refuse of the city and the cost of preparing it into poudrette can be reduced by Rs. 3,000, while the sale proceeds of the manufactured article can be raised to Rs. 7,500 by increasing the price of the manure. The Secretary to the Poona Municipal Committee makes the following remarks on the value of the manure prepared by the Municipality :—"The manure prepared in this manner is much valued by cultivators, and is in great demand. Applications for the manure have been increasing since the opening of the Mutha Canals, and consequent extension of wet cultivation. Five years ago agriculturists would not touch the poudrette then prepared, and could not be induced to take away at even a nominal charge. At the present moment the outturn of manure is not enough to keep pace with the demand, and it has become necessary to take special precautions that the poudrette is not taken away in its raw state which the cultivators sometimes attempt to do. They frequently pay for manure from four to six months *in advance*, in order to ensure a timely supply. The poudrette manufactured by the Municipality is clean and free from brickbats, broken glass, and other rubbish or common earth. This is secured by the ashes being sifted before being mixed with the night-soil." Those who are never tired of speaking of the prejudices of native cultivators as an insuperable obstacle in the way of agricultural reform in India, should carefully note the facts recorded by Mr. Narso Ramchunder, Secretary to the Municipal Committee of Poona. That the cultivators did not touch the poudrette, when it was first prepared five years ago, was no more than what could have been expected. But as soon as they found that the use of the manure would prove remunerative, their prejudices at once vanished into thin air. They are now so anxious to have a supply of the manure that at the present moment the outturn of the article is not enough to keep pace with the demand, and that cultivators frequently pay for manure to the Municipality in advance, in order to ensure a timely supply. A fact like this is enough to overcome a thousand speculations. Show the Indian cultivator that he will be a gainer by the introduction of any new method, and he will be at once found ready to adopt it. It may be supposed that the manufacture of the refuse of the city of Poona into poudrette is carried on in such a way as may prove injurious to the public health. But we are glad to see that there is no ground for such a supposition. The Sanitary Commissioner of the Presidency has placed on record his opinion that the management of the depôt reflects the highest credit on all concerned. "I have," he says, "visited it often and unexpectedly, and remembering how rude are the means as they generally are in India, I can answer for it that every process is very carefully conducted." The example set by the Poona Municipality should induce other Municipalities in India to utilize the sewage of their town. —*Deccan Herald.*

CACAO PLANTING.

THE cultivation of cacao in this island has for some time past assumed proportions which promise to render it, at no distant date, a very important feature of our local industries and the increasing favor in which the article is held at home, added to the decline in its cultivation in other countries, seems to indicate a steady demand for it at remunerative prices.

There is no published account of the mode of cultivating the tree, and preparing the product, and the letters from the father of Ceylon planters on this subject, did not convey much that was new or of a practical character. There are accounts of the article by Simonds and other writers, but these are of a very general nature and chiefly statistical, and of little practical value therefore to the planter. We think it may be useful to many of our readers if we place before them our own experience, and such information as we have gathered on the subject.

To begin at the beginning, we may say to the cacao planter, choose well-sheltered land with a deep soil as cacoa is deep rooter : the more loamy the soil is the better, rocky or stony land should be avoided. As to shade we believe that it *is* necessary, and we cannot think of a better shade tree than the *Inge Saman*, which grows rapidly, and casts during the day a checkered acacia-like shade, and closes at night so as not to intercept the dew : until the trees are large enough to give shade, we should recommend the annual planting of castor-oil plants, which will grow to a height of 15 feet in six months, so that during the hot season the young cacao could be overshadowed by it, and at the return of the cool season, the castor oil tree be bodily cut down, and returned to the soil ; if this method is adopted, the plants must be vigilantly watched, as a most destructive caterpillar sooner or late developes upon the castor oil plant, when it must at once be cut down, but as this pest never attacks very young trees, it is not a material difficulty. Another common plan is to clear the land, and quincunx the cacao with Liberian coffee, that is to say the cacao planted 15 × 15 with a Liberian tree in the square : this no doubt adds quickly to the value of the clearing, but our opinion is that shade-grown clearing of cacao alone is in all respects more satisfactory, and in the end, more profitable. As regards the distance of the plants apart, it, in a measure, may depend upon the variety selected, and the altitude of the land, but supposing a rich low-lying flat be obtained, and Caraccas cacao be the kind selected, we think 12 × 12 as close as the clearing should be planted. On one fine cacao estate, near Kurunegalla, the proprietor has planted 9 × 9, with the idea of taking out alternate diagonal lines in about five years, after which the remaining trees will be in squares 18 × 18, with a centre tree to each square (or 13·4 × 13·4) : in consideration of the value of seed-pods in Ceylon, this may prove to be good policy. It is considered a mistake unless in an exceptionally wet season, to plant *in situ* ; the safest method is to put out young *plants*, under shade, in clay pots (the pots are merely long and narrow cylinders) ; while the young plants are growing in the pots, great care must be observed to keep them from the effects of damp, too much shade, and the attacks of insects, up to a certain stage the Cacao plant is extremely delicate, but once past this it may be considered a hardy tree. We have said that we think 12 × 12 to be the proper distance apart for planting ; this will allow three hundred plants to the acre, the approximate cost of opening an acre may be estimated thus :—

Plants	...	...	...	Rs.	25	0
Felling and burning	...	...	...	„	15	0
Lining	...	...	...	„	1	50
Holing 2	...	...	...	„	6	0
Filling in	...	...	...	„	4	0
Planting	...	...	...	„	3	50
				Rs.	55	0

The growth of the plant, once having well started, is remarkable ; plants put out at two months old, have grown to a height of four and five feet in the year. It will be necessary at about seven to eight months carefully to remove all suckers ; regarding pruning, Simond's model is a "straight single stem up to three feet from the ground, and dividing into two or three as it grows higher : each of these again, divided into two or three branches make up the framework or principal branches which terminate numerously in the leafy branches, regularly disposed into a well-formed head ;" practically this means that all matted and weak branchlets are to be removed as well as lateral branches growing at *right angles* to the stem, and a "chick-like" growth encouraged. Should the young trees as, often happens, lean to one side the top should be nipped off, and it will ultimately recover its shape again. The cacao tree, though it will bear at two years, is not fully mature until its seventh or eighth year, and the probability is that pods on trees younger than this contain immature and consequently unreliable seed. A gentleman on whom we place reliance, lately told us that in the London market it is said that we have not yet sent home the higher class of cacao, and we certainly think that more care should have been displayed in its selection. The Venezeula, or Caracca, Cacao, is the best, although it, according to Simonds, has deteriorated in Trinidad. The pods of this tree are small, but the seeds are more luscious, and globular in form, while the price is very much higher than the common West Indian variety, and we strongly advise intending cacao planters to take care to obtain this seed, especially as we consider that the Caraccas tree will soon become acclimatised here. We confidently prophesy a great future for cacao in Ceylon, and shall be glad fully to ventilate the subject of its cultivation in our columns : experience will no doubt teach us many things not now understood, and it will be well that the results of observation be brought together for the general good. —*Ceylon Times.*

VEGETABLE IVORY.

AS a substitute for ivory, in the manufacture of certain small articles such as buttons, rings, umbrella handles, &c., where hardness is not so much a desideratum as a fine white colur, the use of the so-called "vegetable ivory" is largely increasing, and the trade in the nuts producing the material is becoming very extensive. The vegetable ivory nut is the produce of a species of palm which is met with in a wild state in South America and Africa. When imported into Europe the nut somewhat resembles a Brazil nut, only it is circular in shape, instead of triangular ; and they are about the size of a large walnut or small orange. Inside the hard shell is the hard, white "kernel," resembling ivory in appearance. This solid matter, being softer than ivory, and easily carved, or turned in the lathe, and being easily dyed, and less brittle than bone, is largely employed in the manufacture of buttons and similar articles. When exposed for length of time to the air it assumes the granular appearance and the rich yellow, or rather creamy, tint of old ivory. This hard "kernel" is, in its natural formation, of the same nature as the kernel of the cocoanut. The unripe fruit consists of green shell, containing a watery fluid, which, as the nut matures, gradually thickens till it becomes a pulpy mass, and eventually hardens into solid matter. The water, though bitter to the taste is wholesome, and often renders invaluable service to travellers who cannot otherwise obtain water to drink. It becomes sweeter as it thickens, and in South America the pulpy mass is mixed with sugar and water, and largely consumed as a favourite beverage. The tree on which the fruit grows is unlike an ordinary palm, having little or no stem, and drooping downwards, especially when the weak branches are overweighted by the six or seven bunches of nuts—each bunch containing six or seven seeds enclosed in their thick and heavy shells and outer sheath, and weighing altogether from 20 to 24 lbs. Birmingham alone often uses as much as a ton weight in a day, of these nuts, and the annual import into this country (England) amounts to a value of at least £100,000, while equally large quantities are used in France and in other parts of the Continent.—*Hatters' Gazette.*

PAPER FROM BAMBOOS.

THE attention of Forest Officers in Burmah has lately been turned to the possibility of making paper from bamboos. Experiments were made last summer in Clazheugh, near Sunderland, with bamboos sent from Burmah, and the result, it is officially reported, "was an exceedingly strong and even paper, marred only by numerous yellow, scabby looking spots, which, under a magnifying glass, it was easy to see were pieces of hard silicate, the outermost skin of the bamboo, which had not been sufficiently affected by the boiling in the alkali solution." By a more effectual treatment in the caustic solution, it is conceived that these glassly scales would be destroyed; but in any case, if bamboo shoots are used while they are still young enough, there is no glassy skin to be afraid of. Well then, it will be said, cut the shoots young enough, and the difficulty is overcome; but this is not so. After they are cut, they soon harden on the surface. To use them for paper making successfully, it is necessary to work them up while they are still freshly cut, and the inference from this, it will be seen, is that the manufacture can only be successfully carried out in the country where the bamboos are grown. The production of bamboo paper, in fact, is pointed out by Providence as a Burmese industry. The Pegu conservator, who has been employed by the Government to report on this subject, has made some interesting calculations as to the prospects of the undertaking. In order that a factory may be profitably worked, he says it is necessary that it should turn out [illegible] 000 tons [illegible] annually. Now it would take 1,000 large green bamboos to yield one ton, or 3,000,000 shoots for each factory. A good bamboo forest can yield 150 young shoots per acre, and would therefore consume the outturn of nearly 32 square miles. But bamboo forests of this extent are available in many parts of the Pegu circle. Obviously it would not answer to depend permanently on the wild growth of Nature, but persons interested are clearly of opinion that it would answer to irrigate bamboo plantations with the view of producing a perennial supply of young shoots, and that meantime a factory could be profitably established at Pegu.—*Pioneer*.

THE PRODUCTION OF SUGAR.

THE production of sugar from the "Imphee" of Africa has engaged attention for some years past in several tropical countries. As closely allied to our "Jowar" or "Janera," it has naturally attracted notice in India, and under the name of *sorghum saccharatum*, its cultivation has been attempted in various districts, but, we believe, unsuccessfully as a sugar yielder. The idea of obtaining sugar from this plant and from maize, in sufficient quantity, or good enough, for public consumption, has been ridiculed by many, more especially in the West Indies. But our indefatigable trans-Atlantic brethren have nevertheless been persevering in their endeavors for some time past, and success is now crowning their efforts. The Indians, too, have taken kindly to the culture and to the extraction of the sugar. The result of trials, so far, has led to the conclusion that sugar of a first-rate quality is obtainable, and that it compares favourably with the best product from sugar-cane grown in the most favourable localities. The cultivation has, it appears, been tried far down in Texas and high up in Minnesota; and that plant has everywhere been successfully raised, and has proved prolific. One great point claimed in its favour is that its saccharine matter is entirely derived from the atmosphere, so that, even though cultivated year after year, there is no reason why it should not increase in fertility. This seems rather doubtful, but those who make the assertion have, they say, good authority for it. The crop of seed is very important for breadstuff. Moreover, good vinegar is obtainable from sorghum skimmings and refuse: The best manures are phosphates, lime, wood ashes and plaster of Paris. An important authority, Professor Caldwell, of Cornell University, is in favour of beet sugar production, and thinks that sorghum stands little chance in competition with beet; but he agrees that there is one advantage in its favor, in the fact that it requires less machinery and less capital. In other words, "sugar can be obtained from the cane, in a small way, for home consumption better than from the beet." Be this as it may, this new industry is regarded as of the greatest importance to the country.—*Englishman*.

THE IMPROVEMENT OF THE POTATO.

WHILE commending the action of Government in its endeavour to introduce a good description of potato in these hills, and thanking Lieutenant-Governor for the liberal grant of money which he has made for the purpose, we would strongly deprecate any importation of potato seed from America. The desire is, we believe, to try various seeds with a view to ascertain and establish those descriptions that give the best results, and with this object seed will be imported from England, Australia, and probably America. We have nothing to say against importing from the two first countries, but we would warn those concerned against having anything to do with seed from America, as it is almost certain to be accompanied by that dreadful pest the Colorado beetle. The ravages of this prolific and almost indestructible insect have been fearful in America. At one time this beetle was an object of great dread on the other side of the Atlantic where the most careful measures were, and are still, taken to prevent its introduction. Nearly every mode of destroying it has been tried with very doubtful success, as the pest is still spreading. We read the other day that Colorado beetles have late been making themselves unpleasantly conspicuous by their proceedings in Westchester country, New York, where they have appeared in alarming numbers. The farmers and gardeners have pressed all their households and all the additional help they can muster into service to make war upon the pest in the potato fields; but it seems likely that in the end victory will rest with the Colorado beetles. The great specific is Paris green; but it requires such frequent application, and is, moreover, so dangerous to use where there are domestic animals that many farmers hesitate to resort to it, and prefer destroying the bugs by means of boiling water. Boys and girls and many other assistants are paid three cents a quart for picking bugs. One smart boy will pick from 15 to 20 quarts of bugs a day. The potato bug is, however, a cunning insect, or it thinks it is. It knows instantly when the vine is assailed, and drops on its back as though it were dead. When the intruder has passed on, it climbs up the stalk, and begins to feed on the leaves again. The effect of Paris green is most instantaneous. The bug drops rolls on its back, gives a few spasmodic kicks, and is dead. Whether it suffers much under these circumstances is a matter of doubt. The farmer generally hope it does but some of them are inclined to think that it does not.—*Darjeeling News*.

THE INDIAN WHEAT TRADE.

THE Indian wheat is a splended grain second to none, full of glutinous qualities which causes it to be in great demand, not only in England but also in France and Italy. It is grown most extensively in all that tract of country by the Nerbudda, spreading in the valleys to Cawnpore in the north, and the Raipore districts in the south, Jubbulpore being as near as possible the centre of the grain districts. The cultivation extends over hundreds of square miles, and although we are accustomed to read of the marvellous crops the virgin soil of the Western States of America and Canada will produce, yet here in India under our very eyes it is grown at a minimum cost, to which no other country can [illegible]. The almost nude native, with a pair of bullocks, and two rough pieces of timber made into a plough, constitute the sole farming stock, and a favourable monsoon the only fertilizer. With these advantages Indian wheat ought to be the largest item of export. The G. I. P. Railway runs through the heart of the wheat country from Sohagpore to Jubbulpore and Nagpore, is in direct through traffic with the East Indian Railway to Cawnpore; the distance is less from Jubbulpore to Bombay than to Calcutta by 168 miles. Yet it is cheaper to send it to Calcutta. The charges are as follows:—

			as	p.	
Nagpore to Bombay,	520	miles	... 11	9	per cental.
Jubbulpore to Bombay,	616	"	... 12	8	"
Jubbulpore to Calcutta,	784	"	... 10	3	"
Cawnpore to Calcutta,	684	"	... 11	0	"

This shows clearly how excessive the G. I. P. Railway chareges are, and although the old excuse will doubtless be urged, of the extra expense this railway incurs through having to traverse the Ghât, yet add 40 miles more to the distances of Nagpore and Jubbulpore for the extra expense of the ghât traffic, and it will still be seen the G. I. P. Railway rates are far in excess of the East Indian. Wheat is an article which has to enter into keen competition with other countries, and the slightest addition to railway charges takes away the small margin of the trader's profit. Our railways charge as much for a distance of a few hundred miles as the Americans do for thousands. For easy reference we quote at par exchange:—

Jubbulpore to Bombay ...	1*s.* 7*d.*	per cental.
Chicago to Liverpool ...	1*s.* 3½*d.*	"

With the splendid facilities of a new Prince's Dock and warehouses our grain trade ought to multiply tenfold, if the zeal which is exhibited in the United States were only imitated in India. It is a matter our Chamber of Commerce ought to take up warmly, for the interests of the Port Trust, and the port and trade of Bombay are most deeply concerned in seeing that the main trunk railway puts forth every energy to foster the wheat trade, instead of charging a prohibitive tariff, and if the object was to check and suppress it.—*Bombay Gazette*.

TREE PLANTING.

THE question of replanting many portions of tropical countries which have become denuded of forest trees, is one which is being taken up in India, and acted upon by the authorities. In the Madras Presidency, in some districts, the collectors call upon the cultivators to plant a certain number of trees during each rainy season, and the question has been seriously taken up, whether it may not be desirable to plant large districts of waste lands, and the roadsides with useful fruit-bearing trees, so that in seasons of food scarcity, if not in times of famine, the people may obtain relief from the produce of the trees. In some districts forest planting or renewing, is taking place in order to maintain the supply of firewood for the railways, in others, to ensure a supply of useful building timber which in many parts of India is becoming scarce.

In Ceylon, apart from the question of timber-supply or effect upon the rainfall, there is the other question in reference to fruit bearing trees viewed either as producers of food for the people, or as a means of improving the public health, where, strange as it may appear, vegetable food is often very scarce; it is an admitted fact that in our towns and chief centres of population the supply of vegetable food is out of all proportion to the number of the inhabitants, and in a tropical country this is particularly to be deplored, as there can be no doubt that the absence of vegetable diet exercises a prejudicial influence on the health of the people.

It should be the effort of our Government to encourage, by all means in its power, the planting out of fruit-bearing trees by the

people, a course which could easily be adopted through the agency of the village Councils; the same rural organisation which takes account of the repairs of fences and ellas might readily be called upon to see to the planting and keeping in order of a certain number of jack, breadfruit, and other trees, the produce of which would be at the disposal of the population. As we have advocated the propagating and the distribution of useful economic plants by Government authorities, so we would wish to see a distribution of fruit trees through similar agency. This has been attempted in one or two districts, but unfortunately the climate of those localities were ill-suited to the growth of young plants, but there can be no reason why in a large number of districts the rearing and distribution of useful friut trees should not be a most complete success.—*Ceylon Times.*

MANGABEIRA RUBBER.

THE largest quantity and the best quality of rubber has hitherto been imported from the Province of Para, Brazil, and although it has long been known that other provinces of that vast empire contained forests of rubber-yielding trees, these have never been taken advantage of, owing to the ignorance or supineness of the natives. The inhabitants of the province of Hernambuco are now beginning to realise the vast stores of undeveloped wealth existing in their virgin forests, and rubber is being exported from that province, which may, soon rival Para in the extent of its exports of this article. This action is almost entirely due to the exertions of Sanhor Joao Fernandez Lopes, who has spared neither time nor money in his endeavours to improve the agriculture of the province, and to develop its vast stores of natural wealth. This gentleman has issued a circular (dated April 26th, 1880) calling attention to this important source of wealth, and giving practical instructions for the collection and preparation of the rubber, from which the following is extracted:—

"Mangabeira rubber is the most suitable for the springs of railway wagons, tramway cars, and different machines, and for an infinity of other purposes. The process of extracting the milk from the Mangabeira tree is very simple and easy. Each person must be provided with fifty or more small tin basins and a small axe. He should make eight oblique cuts, sloping downwards at a little distance from each other, all round the trunk of the Mangabeira, cutting only the bark, and placing immediately below each cut one of the basins, securing these either with adhesive clay or nails. These small basins will collect the milk that exudes from the cuts, and when full, they must be emptied into a larger vessel. This process should be continued during the whole day, and thus three or four bottles of milk may be collected, according to the fertility of the trees. The cuts should not be deep, as the milk is secreted just below the outside bark; and a great number of incisions should not be made on each tree, as these may weaken or kill the trees, which has been the case, in some instances with the seringueira, the tree from which the Para rubber is obtained.

"The Para rubber is made in the place where the milk is collected because, in the process of preparation by smoking, there is not time for the milk to be carried to the houses of the collectors; but here we do not prepare the rubber as they do in Para, but make use of the process introduced into the province of Para, in 1860, by Senhor Strauss, which being much simpler, gives admirable results.

"The process is as follows:—Put a little powdered alum into a teacup full of water, mixing it well, then put a few spoonsful of this solution into a vessel in which three bottles of the milk have been placed, properly strained, to clear it from any extraneous matter. Immediately the milk coagulates, which will be in two or three minutes, the rubber must be exposed to the air on sticks and allowed to drain for eight days. After thirty days, it is ready to send to market in cases or barrels. We have tens of leagues of Mangabeira trees, and long ago we might have made use of this wealth, according to the opinion of Senhor Joaquino d'Almeida Pinto, an intelligent botanist of this province. The seringueira planted here grows perfectly, and there is no lack of different milk-giving trees that might be made useful. The province of Para exported last year three million kilogrammes of rubber, valued at six thousand contos (£600,000.)—*Journal of the Society of Arts.*

THE PAPAYA.

A CORRESPONDENT supplies a Batavia paper with the following particulars of the properties of papaya juice:—

"I have again met with something new about the papaya tree. A short time ago, I reported that in the West Indies, meat is wrapped in papaya leaves to make it tender. Now I see that Frenchmen, on examining the white milky fluid present in the stem, stem fruit and leaves of the papaya, has found that this sap works like *pepsine.* Albuminous substances are consumed by it. It also attacks living tissues, so that the experimenter has tried it on living animals. He has thereupon injected it into hardened swellings which caused great pain accompanied by fever, but very soon made the hard swellings soft after which they were cut into and cure followed. Into a mixture of 4 parts water and 1 part papaya sap he also put a frog, of which after two days, nothing but the skeleton remained. All the flesh had been digested in the bottle just as it would have been in a stomach. After all this it is surprising that now that people know of so many plants which feed on flesh [that of insects, &c.], the papaya which possesses such a flesh consuming sap has no means of catching those insects it might so well feed upon."

OPIUM REVENUE.

Opium Revenue to date compared with the estimate for the year 1880-81.

THE following is the result of five sales of Bengal Opium and 4 months' pass duty on Opium exported from Bombay:—

PRESIDENCY.	Estimate.	Actual.	Better than estimate.	Worse than estimate.
	Rs.	Rs.	Rs.	Rs.
Bengal ...	2,52,62,500	3,19,77,995	67,15,495	...
Bombay ...	1,07,53,000	[illegible]	[illegible]	52,45,375
Total Rs. ...	3,60,15,500	3,74,[illegible]	[illegible],120	...

CALCUTTA BOTANICAL GARDEN.

THE Annual Report of the Royal Botanical Garden, Calcutta, for 1879-80, was read on the 21st ultimo, and the resolution passed thereon is as follows:—

The work of remodelling the garden made considerable progress during the year. Additions were made to the ornamental water; land was levelled and raised; avenues were opened out and connected with the main roads; and swampy ground was reclaimed and prepared for planting. The avenue of *Albizzia Paludosa*, which was laid out some years ago, promises to become one of the principal ornaments of the garden. Dr. King hopes to complete the laying out of the garden in two years more. It will then be possible to devote more minute attention to neatness and general maintenance.

2. Experience appears to have shown that *Rhea* cannot be produced in Lower Bengal as cheaply or as plentifully as was supposed. The plant makes little progress in the cold season, and the stems produced at that period of the year are short and woody. To secure even a moderate yield of well-sized stems deep-hoeing, manuring and irrigation are necessary, and it is only on good land and at a considerable outlay that three cuttings in the year can be looked for. At present the practical importance of this inquiry depends in a great measure upon the result of the attempts to produce an efficient machine for cleaning the fibre.

3. The results of the trial in England of certain coarse grasses of Orissa, to test their suitability for paper-making, are not discouraging. It seems that the two varieties known as *Ranikharia* and *Tiansi* are little inferior to *Esparto* grass, which is so largely exported from Spain for this purpose. The *Saru* grass also appears to be of good quality. Dr. King's correspondent states, regarding *Ranikharia* and *Tiansi*, that "if they can be had in large quantities and at the price of *Esparto*, they might be worth trying on a large scale." Larger quantities will be sent to England for further trial at the close of the present rainy season, and the Lieutenant-Governor requests that the result may be specially reported as soon as it is known. Dr. King explains satisfactorily his failure to examine the long grasses on the banks of the Adjye and Damuda rivers. The Lieutenant-Governor trusts that this work will be taken up during the ensuing cold season.

4. Among the economic plants of which trials have been made in the garden, the *Carob*, the *Eucalypti*, the *Pará* rubber, and the fodder-tree *Symphytum Peregrinum* must now be pronounced failures, and the Lieutenant-Governor sees no advantage in further attempts to induce them to grow in an uncongenial soil and climate. The *Ceará* rubber, on the other hand, promises very well. It is extremely hardy and is readily propagated. The Lieutenant-Governor hopes that it may be possible to tap the trees and test the produce during the current season. Dr. King anticipates that indigo and tea planters in the plains will find it to their advantage to cultivate this valuable and hardy tree. He has made a *Ceará* plantation "in expectation of large demands for young plants and seeds." Dr. King makes the following observations regarding the Guango or Rain-tree (*Pithecolobium Saman*):—"This wonderful tree grows faster than any hitherto introduced into Bengal, with the single exception of the *casuarina.* It gives a beautiful shade and yields a pod with a sweet pulp, which is greedily eaten by cattle. For avenues, cantonments, squares, and situations where dense shade is wanted, no tree is more suitable than this." The Lieutenant-Governor has already directed the attention of the District Road authorities to the advantage of planting fruit-bearing trees along the sides of the roads, and thus increasing the resources of the district, while promoting the comfort of travellers. The Rain-tree appears to be well adapted for this purpose, and also for the formation of fuel reserves near stations.

5. Altogether 46 Wardian cases of plants were received from different parts of the world and 59 were despatched, against 21 and 24 respectively in the previous year. Dr. King justly points to this increase as evidence of the growing usefulness of the garden in the distribution of exotics. The number of plants sent out in open boxes and pots was 19,447, and of plants so received, 6,055 in 1878-79. In the interchange of seeds there was a large increase, 6,457 packets having been distributed, against 3,972 in the previous year, and 2,448 received, against 1,307. There were also considerable additions to the herbarium. Among the chief donors of plants and seeds were Mr. Bull of Chelsea, M. LeBœuf of Argenteuil, Messrs. Haage and Smidt of Erfurt, and Mr. Van Houtte of Ghent. Those who made the most valuable contributions to the herbarium were Mr. Brandis, Inspector-General of Forests, Mr. Sykes Gamble, Conservator of Forests. Mr. Duthie, Superintendent of the Botanical Garden at Saharunpore. Mr. Fisher of the Assam Forest Department, Mr. Ford of the Hong-Kong Botanical Garden, Major Collett, M. Godefroy Le Bœuf, Archdeacon Hose, and Mr. H. O. Forbes.

Dr. King himself was able to add his own collection made during his visit to the Straits and Java. To all these gentlemen the thanks of Government are due.

6. The garden sustained a serious loss during the year by the death of Mr. Biermann, an officer of much experience and worth. Dr. King also refers to the departure of Mr. John Scott on sick furlough, and the Lieutenant-Governor has, since the submission of this report, heard with regret of Mr. Scott's death in Europe. Mr. Scott had been connected with the garden for seventeen years, and had held charge of the herbarium for a considerable period.

7. The progress of the *Lloyd Botanical Garden*, during the year reflects much credit on the Curator, Mr. Jaffery; several thousands of seedlings were raised and considerable quantities of plants and seeds were received and distributed.

8. The Lieutenant-Governor again tenders his acknowledgments to Dr. King for the thorough efficiency displayed by him in the management of the [illegible].

Well then, it ... the difficulty is overcome; ... burden on the surface. ... necessary to work ... this, it will ... carried out in

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday, the 22nd July 1880.

W. H. COGSWELL, Esq., V. P., *in the Chair.*

THE proceedings of the last Meeting were read and confirmed.

The following were elected members:—

Mrs. J. G. Macdonald, Messrs A. Springer, W. F. Swan, James Murray, and Rajah Rajendro Narayan Roy.

The names of the following were submitted for Membership:—

Secretary, Patna Municipality,—proposed by Mr. R. Bell, seconded by the Secretary.

W. Mackenzie, Esq., Huttowrie, Belsspore, Tirhoot,—proposed by Mr. G. Toomy, seconded by Mr. G. Swaine.

Mrs. A. J. Hughes, Mosufferpore,—proposed by Mr. H. Stanley Collier, seconded by the Secretary.

Newton E. Jennings, Esq., Engineer, Kimedi Estate,—proposed by Mr. W. F. Grahame, seconded by Mr. H. J. Leitch.

Rejoined.—A. J. Farquharson, Esq., Tea Planter, Gowhatti.

CONTRIBUTIONS.

1. Proceedings of the Boston Society of Natural History, Vol. 19, Parts 3 and 4, and Vol. 20, Part 1, Memoirs of Ditto, Vol. 3, Part 1, Nos. 1 and 2. From the Society.

2. Notes on Tea and Coffee Fertilizer, prepared by David Waldie. From the Author.

3. Memoirs of the Geological Survey of India, Vol. 15, Part 2. Records of Ditto, Vol. 13, Part 2. Memoirs of Ditto, *Palæontologia Indica*, Vol. 1. Part 5. From the Superintendent.

4. Journal of the Asiatic Society of Bengal, Vol. 49, Part 2, No. 1, and Vol. 49, Part 1, No. 1, and extra No. to Part 1 for 1878. From the Society.

5. Plants and seeds from the Nicobars. From E. H. Man, Esq.

6. Seed of the yellow flower variety of the Dhak (*Butea frondosa.*) From J. V. Sturt, Esq., V.P., Municipal Committee of Mau, Rampore. Mr Sturt remarks that it is a rare variety, and very pretty seen in blossom alongside of the common or scarlet variety.

7. Seed of *Millettia ovalifolia*, from Rangoon. From R. Rowett, Esq. This is a handsome tree and supposed to furnish the "Moulmein Rosewood."

8. Seedlings of *Amherstia nobilis* and plantain shoots from Moulmein. From C. Ady, Esq.

9. A quantity of Mahogany seed. From Dr. G. King.

10. Bulbs of *Eurycles Cunninghamii* and seed of *Acronychia Baueri*. From L. Bernays, Esq., V.P., Acclimatization Society of Queensland.

REPORT ON NEW PLOUGHS.

A second report of a Sub-Committee of the Council (Dr. S. Lynch, Mr. W. H. Cogswell, and Baboo P. C. Mittra) in respect to trial of certain ploughs, was read as follows:—

Your Committee presented their preliminary report at the general Meeting in March last on a plough submitted by Mr. Martin of Etawah, when it was resolved that another trial be given to this and any other ploughs submitted for competition, when the rainy season had fairly set in.

Accordingly, on the 23rd June, your Committee met again at the Society's garden, when the following ploughs were arranged for trial:—

1. A combined plough from Mr. Martin, of Etawah, single handle, weighing about 12 seers, selling price, Rs. 3 at Etawah, in Calcutta, Rs. 4.

2. A plough from Mr. Crawley of the Cawnpore Model Farm, made of wrought iron, weighs 14 seers, said by the maker to plough 6 inches without any pressure whatever being used by the ploughman, the cost of making will not exceed Rs. 5, single handle.

3. A plough from the central prison, Benares, double handle, and no beam, cost Rs. 15.

The land on which the trial was made may be termed grass land. It had never before been prepared for any purpose, the grass was in most parts short and close, nowhere long and jungly. Sufficient rain had fallen to render the ground soft and practicable for ploughing purposes.

The cattle employed were the ordinary village plough bullocks.

With respect to the Benares plough (European in all respects, except in the absence of the beam,) it was found to be beyond the powers of bullocks of the above description owing probably to a defect in the shape, the soil clogged at the shoulder of the mould board, increasing the draught whilst the soil was not turned over; when it was attempted to increase the depth of the furrow, the heel of the plough was lifted off the ground. This is one of the results of the absence of the beam. Another is that the ploughman's command over the plough during heavy work is lost owing to the absence of leverage. The body of the plough is a heavy inert mass in the ploughman's hands. The width of the furrow with this plough is about six inches. The depth could not be fairly stated from the trial.

This plough might go through light soil previously worked without any difficulty.

The Cawnpore plough, in like manner, cutting a furrow of six inches in width by above four inches deep, was heavy in draught, and failed to invert the soil. The mould board was clogged all the time.

The plough from Etawah (Martin's) performed its worked efficiently. It shewed a light draught well within the power of the little Bengali bullocks; it turned the slice completely over, making a furrow of a depth of three inches, with a width of 4½ inches. This plough, whilst it resembles most nearly the native type in construction and cost, makes a close approach to the European plough in the mode in which the work is turned out. But there is the radical fault in this and other ploughs with fixed beams, that at the moment when the work is heaviest, the heel of the plough will be drawn up and the point depressed to such an extent as to tax severely the strength of the ploughman.

Resolved that copies of the above report be sent to the parties interested.

RHEEA FIBRE.

Submitted certain papers on the above forwarded by the Secretary to the Government of Bengal, with a sample of Rheea fibre referred to therein. Mr. Mackenzie adds: "that the Lieutenant-Governor would be glad if he could be favoured with the opinion of the Society as to the commercial value of the fibre and its suitability to the Indian and home markets."

From Messrs. Burrows, Thomson, and Mylne of the Jugdispore Estate, Beheea, dated 8th April 1880.—"In reference to the recent competitive trials at Saharunpore of machinery for extracting the fibre of the Rheea plant, it may be interesting to his Honor, the Lieutenant-Governor, to know that the fibre has been prepared many years ago at Bhagulpore by some families of the Dhanook caste for the silk-weavers there.

We were aware of this, and at the time of the recent competition sent to the President of the Government Committee, sample of Rheea fibre prepared by the Bhagulpore method, with a description of the process.

It was also suggested that this process might be beneficially carried out by the female members of poor Rajpoot and Brahmin families who are not allowed to appear in public or engage in field work. There are great numbers of such families whose women have literally nothing to do.

Clean Rheea fibre brings high prices in Europe and is valuable as compared to its bulk.

The plant is perennial, and the cultivation similar to that of sugarcane without the labor and expense of yearly planting. The roots properly attended to will give three or four cuttings yearly in this part of the country. If left in the open field cattles don't graze it. These are desirable qualities in the estimation of Rajpoot and Brahmin cultivators.

We have procured roots from the Saharunpore and Calcutta Government gardens, with the intention of doing what may be possible, to introduce a valuable industry among the Rajpoot and Brahmin families, resident in the villages of the Jugdispore Estate.

A small sample of Rheea fibre from plant grown here and prepared by the Bhagulpore process, is herewith enclosed for the inspection of his Honor the Lieutenant-Governor."

From the same, dated 19th September 1879, to the President of the Rheea Committee, Saharunpore. RHEEA FIBRE.—The method for obtaining this fibre, practised by certain natives of Bhagulpore of the Dhanook caste some eight or ten years, or still further back, is generally as follows:—

The site of the little factory is chosen, if possible, near a stream of soft water, as the process is one of slow boiling or simmering, and beating in combination with washing.

The factory plant is an earthern or other pan or boiler, and two notched boards, such as *dhobies* use.

The work-people—two men, two women, two boys.

The boiler is charged with water sufficient to cover the shoots proposed to be dealt with, and to it is added about 10 chittacks *sujjee-muttee* for a maund of plant placed in the boiler, the whole is then allowed to simmer or boil slowly for half or two hours.

The shoots are then taken by or handed to the nearest man with a notched board before him (the boards being placed near by or partially in the water *dhobi* fashion) in such portions as can be held firmly between his two hands; he continues to dash it against the board, washing it at the same time, thus clearing each end alternately of the wood and portions of the bark and gum. The handful is then passed on to the second man with a similar board who beats and washes it in the same way to free the filaments still farther from gum and bark.

After this it is taken by the boys back to the boiler to be again slowly boiled or simmered for about an hour. It is then again beaten and washed by the two men as before till the gum is removed and the filaments are free.

The two women now take charge of it to be dried, beaten, and drawn or carded till it is in the condition of the accompanying samp e, but much whiter.

A maund of shoots per hour can thus be easily worked off, which, its filament is in the plant in the proportion of 2½ per cent., will be one seer

of fibre fit for spinning by the native hand-method or for the carding machinery sent to Europe. If the percentage of filament in the plant is over 2½ per cent., the outturn will be increased in proportion, while no addition is made to the cost.

By adding half the original quantity of *sujjee-muttee* to the water in the boiler, it may be used again, afterwards the water should be changed.

We propose introducing the domestic cultivation of the Rheea plant and preparation of fibre to the people of the villages on the Jugdispore Estate in the hope that it may make a considerable addition to the family earnings especially to high caste families, whose women, as a rule *purda nashin*, and to whom it seems the preparation of the fibre would be a profitable means of passing time otherwise useless. The plant being perennial and hardy, would require little care from the men beyond perhaps loosening the surface and weeding every two months and giving some manure twice yearly.

Should any simple machine be required or found to be beneficial, we have reason to believe that the want will be met by two small rollers on the principle of the native *chirkee* or cotton gin roughed on the surface and working at different degrees of speed; this has been found to loosen and partially remove the bark, and to some extent freeing the filaments from the gum or gluten by the drawing or triturative motion of the rollers so adjusted to each other.

In addition to our memorandum on Rheea fibre, handed to you yesterday, we will be glad if an opportunity can be given during November and December next of testing on a reasonable large scale the Bhagulpore method of preparing Rheea fibre, at or near the Botanic Gardens, Calcutta, where, we believe, a considerable quantity of Rheea ...

Report by Mr. W. H. Cogswell.—I consider this sample of Rheea to be one of the best that has been submitted to me for a long time past, as regards its color, cleanliness, and soft silky fibre, and its comparative freedom from gum and mucilaginous matter. The fibre, has not been destroyed by chemicals, as is so frequently the case in many processes, and I think but very little injured or weakened in its strength under the simple method is said to have been adopted in its preparation. It is excessively short, owing, I think, to excessive hackling or combing, and a great waste must have been the consequence. Its value in consequence will be materially lessened. It is, however, admirably adapted for spinning, and I would recommend that in the absence of spinning and weaving steam machinery a sample of cloth be prepared by hand. It is beyond all doubt, of great commercial value in Europe, for blending with silk fabrics, and I advise that a good large sample be sent to England to be properly and carefully valued, which, I think, it is quite impossible to arrive at in this market.

Note by Mr. W. Stalkartt.—I quite agree with all Mr. Cogswell has written above.

Report by Mr. S. H. Robinson.—I agree with Mr. Cogswell's remarks; but before sending the sample to England for valuation in the home market, I think Messrs. Thomson, Burrows, and Mylne might be asked at what rate it is usually sold in the Bhagulpore district, and the rate quoted to the English dealers to whom it is proposed to send the sample.

HINGLI TOBACCO AND ALOE FIBRE.

Submitted certain specimens of the above, obligingly forwarded for the inspection of the Meeting, by Mr. H. H. Locke, Secretary to the Economic Museum, with the following note thereon :—

Here are the samples of—

1. Hingli tobacco.
2 and 3. Aloe fibre, combed and uncombed.
4. And matting made from the Aloe fibre,

which you thought your Society would like to see to-morrow.

I subjoin some short notes about these things :—

The Hingli tobacco was received from the Magistrate of Nuddea. It had been exhibited at the Ranaghat Exhibition in January last, and was sent to us at the end of April. On the 10th May it was thus reported on by a Calcutta expert :—

'A very good sample of Hingli tobacco. Sweet and well cured, comparatively free from stem, worth in Calcutta to-day (10th May) Rs. 9 to Rs. 9-8 per maund, or say Re 1 more than good ordinary Hingli.

'Owing to the weight of stem natural to this quality of tobacco, it is not suited for European markets.'

The Aloe fibre and Matting comes from the Hazareebagh Jail. Dr. Cobb the Superintendent, writes concerning the Matting that

'It is of very superior quality; is everlasting in wear, and looks well to the last. Is especially suited for passages, or the aisles of churches or public buildings; ship and steamer saloons, &c.'

Its price is Re. 1-4 a yard. Some excellent samples of lines and twines made from Aloe fibre, were also sent by Mr. Winter, the Jailor of the Hazareebagh Jail, for transmission to the Melbourne Exhibition. I am sorry I cannot send you samples of these, but the speci mens I received were too small to admit of portions being retained for permanent deposit in this Museum, and the original samples have been despatched to Melbourne.

SEED POTATOES FROM MELBOURNE.

The Secretary drew attention to ten cases of seed potatoes just received from Melbourne, through the kind intervention of Messrs. Anderson Wright & Co. These potatoes are in excellent sprouting condition, but having arrived too early in the season for Bengal, it was agreed to distribute them to residents at Darjeeling and other hill stations, and ask them to send down a portion of the produce for trial ... weather.

The best acknowledgments of the Society ... Anderson, Wright & Co., for their ...

PROPOSALS FOR THE DESTRUCTION OF ... PESTS IN ASSAM ...

The Secretary next read a letter from ... of India, Home, Revenue, and Agriculture ... as requested, certain papers connected ... The papers consist first of a memorial ... of tea properties in Cachar, parts of ... the serious extent to which the tea ... dung manure ... an insect ... fat ashes to the ... Before reaching the highlands ... valueless species, are met with ... next day our cascarillero ... some cinchonas in the distance, by the glistening ... brightly the vertical rays of the sun. ... This characteristic reflex of the foliage ... words the best means of discovery ... giants. The glossy le... In ... cinchona by a novice ... interest ... at a great distance ... years p... been ... regarding the great ... the tea bug but other in... suggested to the S... towards endeavouring ... recommending ... to engage the ... districts of Assam, Cachar and the ... the character and habits ... localities, and to be able ... practical nature ... For this purpose ... which could ... subscribe Rs. ... for every ... to each would thus have been ... ful. The Society, moreover, ... person and to publish, in due ... menting it with a *resumé* of the ... in their Proceedings and Journal ... Notwithstanding the Circulars issued ... application, this proposal did not ... enable the Society to take necessary ... interested were quite willing to support ... As however, many, though apparently w... definite understanding, the Society, as in ... were reluctantly compelled to abandon the ...

The Secretary added that he had afforded ... power, in the early part of the year, to the ... memorial to the Government of India.

Letters were also read—

From the Secretary, Royal Horticultural Society ... thanks for donation of seeds.

From the Secretary, Bijnor Agricultural Society ... thanks of the Committee "for the valuable supply ... Agri-Horticultural Society have given them by consenting ... Institute with copies of their publications and seeds ... of cost."

...ocess, then pure ores eventually a most ... em of iron making will ... ich are now being made ... *direct* process. ... is, first, to free the ore from ... le so obtained, and finally, ... ie blast furnace is thus iron ... arbon, called pig iron. The ... s object, on the contrary, the production of a metal free or ... ted the question will at once ... s are followed—why the reduced ... not melted down direct into iron ... fusing it with carbon, and then ... xpensive puddling or Bessemer process, ... difficult to melt down pure ... 300 to 500 ... to attain, both as ... The second cause ... impure state of iron ores, ... and sulphur. Opportunity and ... to these impurities, and this is done ... manipulating of the stuff in the so-called ... the reader will easily perceive that, in ... red iron ores, in which we have to deal ... inappreciable quantities of impurities, the ... iron or steel by a *direct* process is reduced ... ment to solve. It is a question, in fact, of ... grade of heat economically. The solution of ... coaching. The efforts of Siemens, Dupuis, and ... it they have not solved this problem, have ... to its solution. But it may be objected ... the largest quantities of them in Central ... there are no coals there; the reply to ... re is ample wood available. Again it may ... done a short time ago by a writer in ... contemporary, that making iron in India ... and has failed. It is well known, however, ... easily has been made in India, for centuries, ... who know anything of the iron trade, ... are made in Sweden and Styria, both ... port with vegetable fuel. It cannot be ... is an obstacle since it is about three ... as in India; neither can the failure ... charcoal making bad iron, for the ... The true cause is not far to seek; ... to ignorance or bad mechanical ... or dishonesty, and very likely ... *versus* mineral coal that the ... and, and in a future issue ... detail.—*Englishman.*

... ings near Shwegyeen ... gold is washed, were ... the late Superin... ... he result of that ... to be a gravelly ... minute flakes of ... of pebbles of ... few small ... two minute ... in small ... and a few ... together ... elded ... was ... for ... ld ... pre... ic ... ppper ... state of ... chiefly ... was careful ... red. The fine, ... was considered ... ood the fire well, and ... readily moulded. ... ieties ranging from dust of ... separated, to small nuggets, ... used at Shwegyeen" very well ... the gold in its Native State, ... other specimen showed that the general ... hese washings is in small rounded flakes ... ous sizes. This gold was proved to be of ... yielding on careful analysis 9,200 of gold and 80

MINERALOGY.

THE Board of Revenue draws the attention of all officers ... following orders regarding the right of Government ... and minerals, as laid down by the Government of India ... Secretary of State :—

Except in permanently settled estates, it is ... throughout India that, in the absence of any distinct ju... precedent or proof of established usage, the State has ... to minerals. The ruling that grantees of waste land ... or not the grants expressly comprise all produ... below the surface) are, in the absence of pro... trary, entitled to mines of gold and silver ... limited to grantees of waste land " in ... cordance with the rules framed ... in Sir Charles Wood's despatch ... waste land in fee simple are ... leases of waste lands ar... reservation of the full ri... and of right of ... working them ... Government. ...

Dr. King himself was able to give from Bombay by the P. and O. steamer visit to the Straits and Java. To Mr. Brough Smyth, who has been sum- Government are due. ondon to consult with the Directors of the
6. The garden sustained a serious loss which Mr. Smyth has been appointed of Mr. Biermann, an officer of much ebelieve that Mr. Brough Smyth's experi- also refers to the departure of Mr. J. in the Comany's land have been highly the Lieutenant-Governor has, since the to future operations. with regret of Mr. Scott's death in Euro with the garden for seventeen years, herbarium for a considerable period. Indian Gold Mining Company is in
7. The progress of the *Lloyd Botan* reflects much credit on the Curator, Mr. seedlings were raised and considerable quay *Gazette* an important discovery were received and distributed. tchell, Supervisor of the
8. The Lieutenant-Governor again tende the coal ... guments to Dr. King for the thorough efficiency displayed by him in the manage- ment of the ... and the difficulty is overcome ... harden on the surface. ... necessary to work ... this, it ... out

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday, the 22nd July 1880.

W. H. COGSWELL, ESQ., V. P., *in the chair.*

THE proceedings of the last Meeting were read and ... the election ... taken by ... academy, ... to take ... interest.

The following were elected members :—

Mrs. J. G. Macdonald, Messrs. A. Springer, W. F. S and Rajah Rajendro Narayan Roy.

The names of the following were submitted for Members ... San Francisco in

Secretary, Patna Municipality,—proposed by Mr. R. B ... Travancore and by the Secretary. ... is said to be

W. Mackenzie, Esq., Huttowrie, Belsspore, Tirhoot,— ... report on the G. Toomy, seconded by Mr. G. Swaine. ... this gentleman is

Mrs. A. J. Hughes, Mozufferpore,—proposed by Mr. ... has been a general seconded by the Secretary. without their mineral

Newton E. Jennings, Esq., Engineer, Kimedi Estate ... mies prove conclusively W. F. Grabame, seconded by Mr. H. J. Leitch. ... many carrying on active

Rejoined.—A. J. Farquharson, Esq., Tea Planter ... ore many months are over.

CONTRIBUTIONS. :—" Our neighbours in the

1. Proceedings of the Boston Society of Natural ... delirium of triumph over the and 4, and Vol. 20, Part 1, Memoirs of Ditto, V discoveries. Some especially From the Society. pon. Everybody is digging

2. Notes on Tea and Coffee Fertilizer, prepared ... o, or rather it is the Author. ... erever it in the very least inter-

3. Memoirs of the Geological Survey ... est ; and with the extraordinary of Ditto, Vol. 18, Part 2. Memoirs of Ditto ... Doubtable doubt on the subject of the Part 5. From the Superintendent. ... in very considerable quantities in

4. Journal of the Asiatic Society ... me, be at an end. A new era in the Vol. 49, Part 1, No. 1, and extra No. ... ng to us,—and with such incitement

5. Plants and seeds from the Nic ... le that energy will be lacking to carry

6. Seed of the yellow flower va ... ims so much of encouragement in its J. V. Sturt, Esq., V.P., Munic ... band of Cornish miners who arrived some Sturt remarks that it is a rare ... g grandly, and up to the present do not alongside of the common or sc ... d from the proverbially evil climate of

7. Seed of *Millettia ovalifo*

This is a handsome tree and

GOLD IN WASH-DIRT.

8. Seedlings of *Amherst*

From C. Ady, Esq. from Ballarat, received by the Australian mail, is in-

9. A quantity of Ma ... Early in June a lead of wash-dirt was struck which

10. Bulbs of *Eur* ... Hurdsfield, and a number of companies were formed to From L. Bernays, E ... pieces of ground in the neighbourhood, in the hope of ... n of wash-dirt. Several of these companies have already ... d it has proved extremely rich. On the 1st July, the East

A second report ... Company had 144 oz. of gold for the day's washing up. The W. H. Cogswell ... Hurdsfield Company was said to be washing equally well, and ploughs, was ... field Freehold Company had 223oz. from the one machine, and Your Co ... ul of dirt. On the next morning the latter company was said Meeting in ... obtained 130oz. from four candle-boxes of wash-dirt. On the ... Hurdsfield Company reported a yield of 583oz. "What when it was ... shes most people in Ballarat is the extent of this un- ploughs only ... rich field of wash-dirt, for though it cannot be expected to Accordi ... any great area, yet no limit has yet been proved ; and an impres- garden, ... is beginning to prevail, that the early diggers, who followed the deep

1. A ... of the golden gutters only, and who in those days knew nothing ... of washes, may have left immensely rich beds of high-lying wash- weighing ... and them, and that there is just a chance that a great deal of

2. A plough ... which the City of Ballarat now stands may again become wrought iron, wi ... the wild excitement of a quarter of a century ago. This, without any pressure ... ere conjecture, but it is taking so firm a hold of some making will not exceed it ... claims along the course of the Golden-point and ... old gutters are being taken up right into the

3. A plough from the ce ... beam, cost Rs. 15.

The land on which the trial was

DIAMOND PITS.

had never before been prepared for any ... parts short and close, nowhere long and ... apocryphal place that was visited by to render the ground soft and practicable for ... Baron ; but it is a fortress

The cattle employed were the ordinary village ... he capital of the Nizam's

With respect to the Benares plough (European ... ts diamonds, yet it in the absence of the beam,) it was found to be beyonds which are cut bullocks of the above description owing probably to a defect for that purpose the soil clogged at the shoulder of the mould board, increasing the Dominions, whilst the soil was not turned over ; when it was attempted to ...

and about sixteen miles south-west of Ellore in the Ganjam district. But there are six other places in the same locality where diamonds are, or have been found. The names of these places are Mallavelli, Alkur, Parthenipadu, Pra'alli, Wastapille, and Kodavetti Kall. Easwick relates that :—

"The hollow flat, where the diamond pits are, is a low, dry, gravelly plain, but which has the appearance of having once been a lake. Through this plain no steam flows ... the pools, in its lower part, dry up in March, ... excavation may be commenced, and not before. The pits ... in general excavated at the north end of the bank that surrounds ... hollow. The deepest are not more than 12 ft., and whatever the depth, a hard mass of rock is never reached. The strata penetrated are—first, a grey, clayey, vegetable mould, about a foot or two thick : below this an alluxium of the following pebbles, rounded by attrition : sandstone quartz, siliceous iron, hornstone, carbonate of iron, felspar, conglomerate sandstone, and a prodigious quantity of concretionary limestone. The diamond is never found imbedded, or in any way attached to any of the pebbles, but always loosely mixed with the other little stones. The detritus, forming the diamond stratum, must have proceeded from the hills to the North, the only hills, in fact, near the place. They are the continuation of the standstone range, which extends east from Banganapilli, Knodapilli, and Mallavelli, in all of which localities the matrix of the diamond is a conglomerate sandstone."

From this locality, the world has been supplied for centuries with ... of the purest ... Mr. The diamond which Mr. Pitt, the Governor of Madras, ... ather of the first Earl of Chatham) obtained, and which has been long known as the Pitt diamond, was found in Golcondah. It was taken by the Governor to Europe and sold to the Duke of Orleans for £130,000. It decorated the hilt of Napoleon's sword, was captured by the Prussians at Waterloo, and it now belongs to the King of Prussia. It wei hs in its cut state 136¾ carats, and is said to be unrivalled in its limpidness, and its form. The Kohinoor, the Mountain of Light, was found—according to Hindu legend—in a Golcondah mine. It originally weighed 900 carats, but has been reduced by cutting to 123 carats, and is now valued at £120,661. It is now the personal property of the Queen. There is fair reason to suppose that the wealth of the Carteal region has not been exhausted, and that the appliances of modern machinery directed by men of science may bring to light gems that have not been discovered by rude native processes of search. A rumour has reached us that a scheme is afloat for developing the diamond resources of the Golcondah locality. That it may be worth while to prospect for diamonds is shown by the remarkable facts that the value of Cape diamonds transmitted through the Post Office in the six years 1873-79 was no less than £16,409,417. Besides these gems a large number went to Europe in the custody of the owners, or as freight, and it is likely enough, making allowance for under-valuation that the total proceeds of the Cape mines approximated closely to twenty millions sterling in the seven years. The best Cape daimond is a slightly yellowish, and certainly, inferior gem to the best Indian diamond ; yet so great is the demand for the jewel that the world bought the inferior article to the above extent. This seems to indicate that gems of the first quality are scarce, and that if Golcondah should answer the expectations of some sanguine individuals, a great addition may be made to the exports of the country.—*Madras Mail.*

IRON ORES IN MADRAS.

WE quote the following from that interesting and useful book published by Government, "Standing Information regarding the Administration of the Madras Presidency," it will be seen that there are iron ores there, which only require enterprise to make them of great use to us :—

Some remarkable deposits of magnetic iron ores are found in the Salem district. The ores occur in large beds of from 50 to 100 feet in thickness, and the out-crop may be traced for miles. On "one hill, six miles from Salem, there are five bands of magnetic iron from 20 to 50 feet thick. In 1825, Mr. Heath of the Civil Service, obtained a Government advance and formed a company to establish iron works at Porto Novo near Cuddalore, at Palampatty near Salem, and at Beypore on the West Coast. At the last place the iron was to be obtained from the laterite. The Porto Novo works were begun in 1833, and those at Beypore some years later. The Government gave their aid, but the experiments failed. The causes assigned were the distance of the works from the source of supply, scarcity of charcoal, and various other practical difficulties. Several companies took up the matter, but with no final success. The information that is available regarding native working in iron will be found under the head of Manufactures. Though not of such extent or thickness, yet still of sufficient importance to be of considerable value in any further opening up of the country by rail or canal, are some great veins of iron-ore in the Kurnool district, which occur in the Gunnygull and other smaller ridges near Ramallakota some 12 miles south of Kurnool. The ore is the grey micaceous or specular iron oxide and is very rich. Old workings on pits are common all over the ranges, showing that much ore has been extracted, but only one or two furnaces appear to be worked now at intervals during the year. The great drawback to the evident richness of this iron field is the scarcity of fuel, which however might be obviated by the conservation of the jungle in the adjacent hill ranges.

We have also lead and copper ores, as will be seen from the following paragraphs which we extract from the same publication :—

Lead ore occurs in the Nallamullay range of the Cuddapah district where it was worked very largely in ancient times ; but although the indications of its extent and richness are fairly good, no continuous or, systematic attempt has been made by Europeans to re-open the mines. Mr. P. W. Wall, the Mineral Viewer to Government in 1858, explored these mines, but did not report very favourably of them, though he seemed to consider the percentage of silver large. The latest assay (1879, by Mr. Mallett of the Geological Survey of India) of a small specimen, gave 78 per cent. of lead, containing silver at the rate of 22oz. 7dwt. to the ton.

Copper ores are met with in the Cuddapah, Kurnool, and Nellore districts in old workings, the best indications being in the latter district, near Gunulpenta, where, some 40 years ago, they were important enough to attract European enterprise, but without any successful result. Within the last year, however, attempts are again being made by a Madras Mining Company, both in this region and in the Cuddapah district, to work these and the lead ores. The Nellore mines are considered by Mr. King, the Deputy Superintendent (for Madras) of the Geological Survey of India, not to have been adequately tried, the traces of ore being frequent and promising, while the old attempts have been carried on by incompetent men met by the usual temptations and insalubrity of the climate.

IRON ORES IN CENTRAL INDIA.

As a means of famine prevention, the devlopment of industrial enterprises is to be ranked with, if it should not take precedence of irrigation works and railways ; and among such enterprises none perhaps, holds out fairer prospects than that which ... so largely to British prosperity—iron manufacture.

Everybody knows that there is iron ore in many parts of India, but it is not generally known that in Central India there are ores of that metal of the best quality.

The Central India iron-ores are remarkable at once for their purity and their richness. They are chiefly red iron ores and magnetite, containing sometimes manganese, but there are also brown iron ores and siliceous hematite. As all these ores occur in enormous quantities on the surface of the ground, the erection of costly mining works, which is elsewhere necessary, is here not required. Owing to the difficult treatment required for the magnetites, the native iron-makers prefer the soft red iron-stones of a laminated texture, although the former contain a larger percentage of iron. The brown iron ores and the siliceous hematities are used by them only very exceptionally.

Before showing how the Indian iron ores may be utilised without prejudice to English interests, we will give an analysis of the iron ores of Central India, together with some other details.

The magnetites contain 71 per cent. of metalic iron (or 69 per cent. oxyde, and 29½ per cent. protoxyde of iron), the red iron ore from 65 per cent. to 69 per cent. of iron (or 91 to 98 per cent. of oxyde of iron), the brown iron ore 45 to 55 per cent. and the siliceous hematites 40 to 48 per cent. of metallic iron. The few impurities of these ores are small quantities of quartz, clay, and manganese and exceptionally some lime; of sulphur there are but few traces, of phosphorus none—at least none have been discovered in the red iron ores and in the magnetites.

So much has the exceptional purity of these ores struck observers that somebody, writing of them in a public paper, some time ago maintained that they were pure iron, which is incorrect ; the richest iron ores can never contain more than 72 per cent. of metallic iron. Iron always occurs in nature combined with oxygen, the lowest degree of oxydation being in magnetite. Pure iron might prehaps be said to occur in meteors, but here also it is combined with nickel from 3 to 8 per cent. We know of no ores in the world which are fully equal to those of Central India in purity, in richness, and quantity over a given area.

In general the European iron ores contain only from 30 to 35 per cent. of metallic iron, therefore half only that contained in the red iron ores and in the magnetites of Central India. How great a value is put on pure and rich ores by iron makers may be learned from the circumstance (which should be made widely known in India) that vast quantities of such ores are yearly imported into England, France, Germany, and Belgium, from the south of Europe and more distant countries.

The iron ores of Central India containing, as was said before, no phosphorus, and little manganese, are suitable for the production again only of bar iron but notably also of steel, and especially of Bessemer cast-steel for rails. It is well known that the amount of phosphorus in the ore determines its fitness for the Bessemer process; and if it exceeds ½ per cent., the steel cannot be converted into rails, which are now generally made of Bessemer steel. Again, ores containing manganese are known to be especially useful for the production of steel for cutting tools. Equally suitable are the pure red iron ores of Central India, containing manganese, for the production of "Spiegeleisen" (specular castiron) a kind of pig iron, which is added to the iron in the Bessemer process, and in cast steel crucibles. Great quantities of this article are exported from Germany and Austria, and the price of it is 60 per cent. higher than that of ordinary pig iron. The same is the case with an article called in the trade *acier sauvage* (wild steel), also a kind of pig iron, containing a very small quantity of carbon. This is exported at high prices, from Styria in Austria to England, France, and Belgium, for the manufacture of ductile iron for wire. Now "Spiegeleisen" and *acier sauvage* can only be obtained from the *purest* iron ores, and of these there are inexhaustible mines in Central India. Here we have then a most valuable raw material for exportation which would not interfere with England's commercial policy as regards India, which has hitherto consisted in the principle of taking India's raw produce and returning it to her in the shape of manufactured goods.

Should the art of iron making in the course of time be so far developed as to furnish us with an economical process of making ... or steel direct from the ore, that is to say, without the introduction of the blast furnace and fining process, then pure ores would greatly increase in value and become eventually a most important article of export from India.

The following explanation of the present system of iron making will show the importance of the exertions which are now being made towards the obtaining of iron by a *direct* process.

The object of the blast furnace process is, first, to free the ore from oxygen, then to induce carbon into the article so obtained, and finally, to melt this compound. The product of the blast furnace is thus iron with a greater or lesser percentage of carbon, called pig iron. The next, namely, the fining process, has for its object, on the contrary, the freeing of pig-iron from carbon or the production of a metal free or nearly free of carbon. To the uninitiated the question will at once present itself why these opposite processes are followed—why the reduced ore *i.e.*, the ore freed from oxygen, is not melted down direct into iron ... blast furnace instead of first infusing it with carbon, and then dung manure ... by the expensive puddling or Bessemer process, furnishes to the ... difficult to melt down pure Before reaching the highlands ... tain quantity ... 300° ... valueless species, are met with ... of some cinchonas in the distance ... 300 to 500 deg brightly the vertical rays of th... RESPONDE ... to attain, both as rega... This characteristic reflex o... faces. The second cause of the words the best means of d... the impure state of iron ores, especially ... giants. The glossy le... and sulphur. Opportunity and time fo... to these impurities, and this is done by the ... cinchona by a novice ... manipulating of the stuff in the so-called fining process, at a great dist...

From this ... the reader will easily perceive that, in the ... magnetite and red iron ores, in which we have to deal with either very small or inappreciable quantities of impurities, the question of producing pure iron or steel by a *direct* process is reduced to one for the science of heat to solve. It is a question, in fact, of producing 1,700° centigrade of heat economically. The solution of this question is approaching. The efforts of Siemens, Dupuis, and others in this ..., if they have not solved this problem, have at least paved the way to its solution. But it may be objected that the best iron ores and the largest quantities of them in Central India are of no avail, as there are no coals there ; the reply to this objection is that there is ample wood available. Again it may be objected, as was indeed done a short time ago by a writer in the columns of a daily contemporary, that making iron in India with charcoal has been tried and has failed. It is well known, however, that excellent iron has been made in India, for centuries, with charcoal. Those also who know anything of the iron trade, know that vast quantities of iron are made in Sweden and Styria, both for home consumption and for export with vegetable fuel. It cannot be that the price of charcoal in India is an obstacle since it is about three times as high in Styria, for instance, as in India; neither can the failure have been caused by the experience of charcoal making bad iron, for the reverse is well known to be the case. The true cause is not far to seek; it can have been due to nothing else than to ignorance or bad mechanical arrangements, or bad management, or dishonesty, and very likely to all these combined.

It is on the question of vegetable fuel *versus* mineral coal that the future iron industry of India will depend, and in a future issue we shall probably examine the question in detail.—*Englishman.*

BURMAH GOLD.

Some specimens of gold from the gold washings near Shwegyeen with parcels of the soil or sand from which gold is washed, were forwarded in 1853 for examination to Dr. Oldham, the late Superintendent of the Geological Survey of India. The result of that examination was as follows :—

One parcel, said to be the surface-soil, was found to be a gravelly sand, consisting principally of small grains of quartz, minute flakes of bright-colored mica, generally of a golden tint and of pebbles of various kinds of metamorphic and crystalline rocks. A few small crystalline pieces of topaz occurred in the sand, and one or two minute red garnets were also found. Mixed with this, sand was found in small quantities and in minute grains some magnetic iron sand and a few acicular crystals of schorl. The sand in this parcel did not altogether amount to the fifth part of a cubic foot. By simple washing, it yielded 0·75 of a grain of gold in minute flakes. The residue of the sand was then successfully agitated with mercury in order to obtain by amalgamation any particles of gold which might have been too minute for mechanical separation. By this process 0·20 more of a grain of gold was obtained. Consequently, from less than the fifth part of a cubic foot of soil 0·95 of a grain of gold was extracted.

The second parcel contained a yellowish ferruginous sandy clay, looking as if it were the result of the decomposition of the upper portion of the rock *in situ*. This clay was reduced to a fine state of division and carefully washed—the sandy portion, consisting chiefly of ferruginous quartz grains, being separated. The residue was carefully examined ; but no traces of gold were discovered. The fine, slightly sandy clay, which remained after washing, was considered well suited for the coarser kinds of pottery ; it stood the fire well, and it was sufficiently tenacious to admit of being readily moulded.

The specimens of gold consisted of varieties ranging from dust of the finest kind that could be mechanically separated, to small nuggets. Two specimens described as "purchased at Shwegyeen" very well illustrated the mode of occurrence of the gold in its Native State, imbedded in quartz, while the other specimen showed that the general form in which it is found in these washings is in small rounded flakes or flattened plates of various sizes. This gold was proved to be of considerable purity—yielding on careful analysis 9,200 of gold and 60 of silver in 100 parts.

This result, although tolerably accurate was to be taken only as approximative. It was, however, sufficient to show that the Shwegyeen gold was fully equal in value to the average quality of Australian gold.

The occurrence of gold of fair purity being undoubted, the question remains as to the quality in which it may occur, and the probability of its yielding a fair return. If the specimen of auriferous sand were to be taken as a fair average sample of the kind of soil and of the quantity of gold contained in it, it followed, according to Dr. Oldham, that, as nearly a grain of gold was procured from about the fifth part of a cubic foot of soil, a cubic yard of the same sand should afford about 135 grains of gold, or, if the portion obtained by amalgamation, namely, 0·20 of a grain, be excluded, the yield by washing alone should be 101·25, or say, on an average, 100 grains of gold for each cubic yard of the sand washed. This sand being surface soil, and, therefore, easily accessible without the labor of sinking pit or [illegible] cost of keeping such pits open, two men could with gr[illegible] wash a cubic yard of soil, daily obtaining fo[illegible] grains of gold between [illegible] [illegible]ugments to [illegible] the [illegible] displayed by him in the manage- 100 [illegible] day's [illegible] and the difficulty is overcome [illegible] each man [illegible] barden on the surface. per diem—a ro[illegible] necessary to work [illegible] utterly insufficient to [illegible] this, it [illegible] Oldham, however, qualified [illegible] out yield of the auriferous soil would [illegible] in character and in richness according [illegible] the deposits may have been formed. The [illegible] ever, of the greater part of the Malayan [illegible] Arakan northward, so far as known, indicat[illegible] of auriferous deposits throughout the whole [illegible] of the central ranges of high ground. The ascertai[illegible]d existence [illegible] in more than one locality in Shwegyeen and other par[illegible] of the Tenasserim as well as the association in these l[illegible]calities of magnetic iron sand with the gold (a mineral so constant an accompaniment of gold as to have earned among miners the nam[illegible] of the "mother of gold") appeared to Dr. Oldham to confirm this reasoning from analogy. The auriferous deposits he had referred [illegible], he was convinced, occur at intervals throughout the whole r[illegible]ge, and that locality then would prove to be very rich.

Judging from the rude manner in which the gold wa[illegible] washed by the people, Dr. Oldham thought that fully one-half [illegible] the entire amount of gold contained in the sand was in a[illegible] probability irretrievably lost. In his opinion it was extremely desirab[illegible] that some more efficient, yet simple, apparatus for separating the go[illegible] by washing and also for amalgamating it with mercury might be in[illegible]roduced into the district, when the greatly increased quantity of gold [illegible]hich would be obtained by the use of such improved appliances, would quickly lead to their general adoption. The gold washings are, however, still conducted in the same rude manner as before.

We have been induced to reproduce the above, written during a late agitation on the subject as it bears upon what is now being talked of about the gold capabilites of this province, the "Aurea Regio" of Ptolemy, and the *Survarna Bhumi* of old.—*Eurasian* (*Rangoon*).

[illegible] TICULTURAL [illegible] A. [illegible] *on Thursday, the 22nd* [illegible] at th[illegible] [illegible] *Chair.*

FORESTRY.

A FOREST Conference was held, on Saturday 31st July, at Poona in the Council Hall. There were present the Governor of Bombay in Council, the Revenue Commissioners, and Mr. A. F. Shuttle-worth, of the Forest Department. No definite policy was decided upon. Sir James Fergusson is said to be well versed in forest matters.

WE learn that the Wynaad Planters' memorial to Government for the construction of a line of Railway from Beypore to Mysore has received the cordial support of Government, as both the Chief Commissioner and the Consulting Engineer for Railways consider the line would yield a fair revenue, and would tap the forest resources of Mysore.

REBOISEMENT.

THE Forest Commissioners of France addressing the Chamber of Peers in 1827, thus expressed themselves:—"The denudation of the hills excites everywhere universal complaints. Their sterility through the carrying away of the vegetable earth which was retained by the trees, the diminution of springs, the augmentation of superficial water, the formation of torrents which overwhelm properties situate below these elevated places, these are the consequences of the wood-cuttings made there, and it will be against these denudations that the administration will arm itself with severity." Accordingly laws were enacted to remedy the danger which had been created by the denudation of mountain ranges, hill, and drainage slopes. And the forest administration have with great success conducted operations more especially under the laws of 20th July 1860, and 8th June 1864, for the reclothing with vegetation of the high-lands upon which the great rivers of France—the Loire, the Garonne, and their several important affluents have their sources. Thus under the able and energetic working of a staff of accomplished officers supported by an enlightened Government, the re-afforestation of French Alps, the Pyrenees, the Cevennes, the mountains of Auvergne, and other water-sheds of the country has become a reality in some cases surpassing all expectation. So successfully indeed, has the reboisement of several of the mountain ranges been accomplished that in the Paris Exhibition of 1878, the Government exhibited models, photographic views, maps, drawings, and plans, illustrating the effects of the forest denudation, the different kinds and classes of works adopted for defence against torrents and for eventual reboisement, and finally the beneficial results of these measures. This collection attracted great notice and created profound interest. One set of photographs illustrate the general aspect of the mountains above what was once, and not so very long ago, one of the most fertile valleys of *la belle* France, and they show how the torrents have scoured and cut up the mountain sides, have deprived them of their protecting vegetation, have swept away the soil, and have carried the soil into the valley to cover fields and smother cultivation, and to fill tanks and reservoirs and wells; how the torrents rush down-ward in uncontrolled fury from the rock exposed slopes to interrupt comm[illegible] in like [illegible] destroying bridges, roads, railways, &c., thus converting [illegible] civilization into waste, prosperity into desolation, to endanger life [illegible] filling rivers and streams with sudden and fierce floods which sweep away homesteads and farms, and even inundate and destroy towns. The map of Embrunais shows the public road covered with blocks of stones brought by the torrent from the overhanging slopes. A second set of maps and designs illustrates the different kinds of defence works adopted to fight against torrents and provide for the introduction of reboisement. Those works consist of masonry dams across torrent beds, *barrages* or weirs—*contro-barrages* or buttresses—living weirs of stakes wattled with willow branches, dams of earth, dams of dry stone, and many other similar contrivances designed with great skill and ingenuity. Some of these defence works cost a great deal of money; for instance, in the plan of the torrent of Bourget we see a solid stone wall built with hydraulic current about 10[illegible] feet long, 25 feet above the torrent bed, having 15 feet of under-ground foundation and 8 to 9 feet thick, at a cost of £650. Other sets of views, maps, and sketches [illegible] changes which have followed the establishment [illegible] works, how vegetation has gradually resumed its place, how torrents have gradually disappeared, and finally, how forests begin to cover the mountain slopes. Views of Jabouret show how in less than thirteen years a perfect revolution has taken place. Formerly there were great slopes of blackish marl always slipping away; now they are all covered with trees and with a dense growth of herbage suitable for fodder. Numerous small ravines, once forming so many channels to swell the floods in the main torrent, are now filled up, and the whole basin of the torrent is completely restocked with trees, and this once renowned torrent is now a permanent and harmless stream. The maps confirm what other evidence has established:—*First*, that forests protect the soil so that torrents cannot form and erode it. *Second*, that the removal of the forest renders the soil subject to torrent action. *Third*, that the destruction of forests has entailed and does entail barrenness and aridity in parts of the country affected, and which were renowned for their fertility. *Fourth*, that along with woods, springs, and rivulets disappear and cease to water the parched land *Fifth*, that the actual temperature of a country is by the destruction of its forests very sensibly increased. *Sixth*, that the rain gradually washing away the vegetable earth from the sides of denuded hills condemns them to sterility, while these latter, no longer able to retain and regulate the flow of water that falls in their slopes, are scored by deep gullies formed by impetuous torrents, while the beds of rivers are at one time dry, and at another filled by sudden and short lived floods. *Seventh*, that even while torrents are in existence, planting, and restoring vegetations to the slopes moderate, the violent action of the torrent and ultimately extinguish it. *Eighth* that when torrents have been extinguished, the renewed destruction of the forest may re-awaken them into dangerous activity. Thus it will be seen that the importance of placing all the hills, mountains, and drainage slopes of a country under strict forest protection, cannot be exaggerated. Nature clearly intended that her reservoirs for the storage of water for supply to and for the irrigation of the cultivable lands in the valleys and plains should be placed upon the higher levels of the country, and where these natural reservoirs have been thoughtlessly and wantonly destroyed by man, there has Nature always exacted a terrible revenge But forests and trees upon the plains, also, more especially in a tropical climate, exercise equally important influences on the condition of countries, and well may it then be said that not only the prosperity, but the very safety of a country is dependent upon the proper conservation of its forests. So great value and importance does Austria attach to her forests that they are called the sources of the nation's wealth; while in Germany it is the natural belief that as trees are rooted in the soil, so is the welfare of the German people with its roots bound up in a perfect system of forestry.—*Bombay Gazette.*

GARDEN.

LARGE trees, especially tall poplars, placed near a house may serve as very efficient lightning conductors, but always on the indispensable condition that there is no well or running water on the opposite side of the house, for in that case the electric fluid if it struck the tree might pass through the building on its way to the water. In 1884 a house at Lancy, almost in contact with a poplar on one side and a marsh on the other, was set on fire by lightning, and the path of the electric fluid from the point at which it left the tree across the roof of the building to the marsh could be distinctly traced. Hence, in erecting lightning conductors, it is desirable that their lower extremities should terminate in a stream, a well, or a piece of damp ground.

A FERTILIZER FOR STRAWBERRIES.

AN experiment made last year by myself may not come amiss at this time with those who grow strawberries. I procured a half hogshead, filled it with rain water, and put into it one-quarter pound ammonia, and one-quarter pound common nitre. When the strawberry plants were blooming out, I gave them a sprinkling of the solution at evening, twice a week, until the fruit was nearly full size. The result was double [illegible] on those plants the liquid was applied to, than was obtained from those right alongside where none of the liquid was applied. Let all give it a trial.—*Selected.*

FERNS IN THE NEIGHBOURHOOD OF BOMBAY.

THE messman at Khandalla Travellers' Bungalow writes to me, under date of July 19, "that for the last three days there have been very few showers, that the rain when it falls is not heavy, only drizzling. The fog occasionally spreads over the place but does not last each time more than fifteen minutes." He concludes his letter as follows :—"The weather is clear and pleasing for the visitors of Sunday passers." I hope the meaning of this sentence will be clear to your readers : it is rather vague to me. I passed through Lanowlee the other day on my way up the line. I bought a magnificent bunch of growing maiden hair, silver, and hard ferns for four annas. The collectors of these [illegible] should be encouraged. They have to trudge away [illegible] or three miles off, and take their chance of a stray customer. They sell the ferns with plenty of root, so that they are sure to grow when potted.

Though the Khandalla hills are very prolific of ferns, yet the variety is not so great as at Matheran, where one year I collected more than twenty kinds. The most beautiful and rarest of these is the climbing fern, which can only grow as a creeper up the stalk of a friendly sapling. The leaves of this fern are of a most unusual shape, being very much in appearance and size like the human hand. I have only found it in Elphinstone valley in the thick jungle below Hart Point, and even there it is rare and difficult to find. I am told it has been seen growing on Sion Hill near Bombay, and one year I found it growing in profusion in the Tulsi valley near the new masonry dam. This was during an expedition some day made to the Kennery Caves, which are just below the Tulsi valley. This fern grows only on red soil, and thrives well in Bombay. The pot should be suspended in the verandah or hung under a mango tree ; the fern climbs the strings and hangs over in festoons. A strong plant will climb as high as nine feet, and as the leaves keep green all through the year, it is very pretty. If any of your readers feel inclined to prospect for this fern the monsoon is the time, when a visit to Tulsi and Kennery is most enjoyable. In cloudy weather one keeps cool, and the chance of a smart shower adds zest to the expedition. I have found the fern *above* the masonry dam on the south side, and *below* the dam on the north side. The roots can only be got out with an iron tool.—*Cor., Times of India.*

TEA.

THE imports of tea to Great Britain in June and in the first half of this year exceeded those of the same periods of last year by 2,435,636lb., and 16,794,067lb. respectively. The figures were 4,728,237lb. against 2,292,601lb., and 54.424,937lb. against 37,630,870lb. A comparison of the deliveries for home consumption shows an increase of 4,872,736lb. for the month, but a decrease of 8,701 832lb. for the six months. In the former case the quantities were 12,226,451lb. against 7,353,715lb., and in the latter 78,224,094lb. against 86,925,926lb. For the month, the exports show a considerable improvement, and were 4,101 960lb. against 2,421,271lb. For the half-year, they were 17,346,200lb. against 17,[illegible]491lb. The stock in the bonded warehouses was 61,332,811lb. against 49,092,387lb.,—a surplus of 12,240,424lb. instead of as was predicted in October last by some of the trade a still larger deficit.

THE prospect of war between Russia and China has raised the question how such a war would affect the tea industry in India, if indeed it would affect it at all, and we observe a letter on this subject from the London correspondent of a contemporary whose energies are entirely devoted to tea, in which this question is discussed to the exclusion of every other. The writer is apparently either entirely ignorant of, or has quite forgotten, the existence of certain Treaty ports. He takes for granted that the great European Powers will not be able to prevent Russia from blockading the whole sea coast of China if she can, and that there will thus be a chance for Indian tea. We ourselves think there would be a chance for Indian tea if the war broke out, but for a very different reason. We do not think that Russia would do much in the way of blockading, because she is totally unfit to provide a sufficient number of vessels for such an immense sea-board, and because she has no control over the Treaty ports. Hence her efforts at sea would be devoted towards intercepting the arrival of military stores, and such tea as is made in China would find its way out in the usual manner, but we do not anticipate that so large a quantity would be made. The people's attention would be distracted, and trade relations generally dislocated, and industry never prospers simultaneously with war in any country. The customary advances would not be made by the hongs in the several shipping ports, at least they would not be made so freely, and thus the entire industry would suffer. In this way we fancy the tea industry of India would have a chance, and no doubt the various tea companies would be eager to avail themselves of the opportunity. This we are afraid they would not be able to do, because of the present system of manufacture. Any deficiency that might arise in connection with the China tea crop would consist of the finer qualities. These require considerable trouble and cost in production, and the general disorganisation of the interior would tend to everything [illegible] a hurried and perfunctory manner. The necessary [illegible] not be bestowed on the manufacture of [illegible] deficient in quantity, [illegible] that [illegible] that Indian teas are [illegible], and are not adapted for [illegible] who is in the habit of continua[illegible] at all hours of the day and night, may [illegible] we know the majority of planters do, but [illegible] general public, not having been thus educated, [illegible] The tea is made with a view to the development [illegible] rather than delicacy of flavour, and the ordinary [illegible] prefers the latter.

Why do Darjeeling teas sell so well? Simply because they are made with a view to their being drunk pure and unmixed.

When an article is produced in greater quantity than the demand warrants, stocks rise and prices fall, and we naturally look to find that particular variety of the article which offers the smallest intrinsic value to the public suffering the most. This is not the case with Indian tea, which is vastly superior to the China article, even after making allowance for the increased price it realizes in open markets, but the artificial way in which the whole business is conducted leads to the abnormal result of the rubbish being sold and the good article lying in stock. This state of affairs will not be put to rights till Indian teas are sold pure and unmixed, at their fair market value of course, and manufactured with that view. Then we may look for a healthy trade, and something like a return of the palmy days of tea in India.

COMPLAINTS still continue to be received of the adulteration of China teas. "Highly faced with Prussian blue and turmeric, foreign leaves present, sand, magnetic oxide of iron, clay, withered leaves, faced nutshells, redbole, and sulphate of lime,"—such, according to the *Melbourne Argus*, are a few of the ingredients contained in China importations intended for Australian stomachs. We hope our friends relish the mixture. But it seems that there is a limit to the colonists' power of endurance, and we are told that so far from the Victorians drinking the above mixture themselves, it is re-exported from Victoria to tea-drinkers with "less money or less discrimination." Who the ultimate consumers of this stuff are we should be curious to know. They must have stomachs like ostriches. And yet the *Melbourne Argus* asserts that tea imported from China is on the whole "well worth drinking, and well worth the money." We are afraid our contemporary gets a little confused when writing on the subject of tea. We pointed out the other day, the strange incoherency of some remarks this paper made on the Australian wants as regards tea. "Indian teas" said the *Argus*, "which have hitherto come to Melbourne, have, as a rule, been dearer by 5*d.* or 6*d.* per lb., than the teas ordinarily consumed here ; cheaper kinds than these will of course be sent, for it seems to be now understood, by the persons interested, that *there is no demand for the high priced kinds in Australia.*" A little further on, in the same article, the *Argus* adds :—"*Pekoe Souchongs and Pekoes would be the best varieties to send. The common Souchongs and Congous are too rough to suit the Australian market.*"

Here is another specimen of ignorance taken from the *Daily Bulletin*, a New York commercial organ, from which we should have expected better things. "The Indian teas though lacking the mild flavour of the Chinese plant, have decided merits ; they are one-third stronger, can be sold cheaper, and are unadulterated." Now in the first place we are curious to know what sort of a flavour the *Bulletin* refers to. It must be, we should think, the flavour produced by the Prussian blue, &c., &c., as enumerated above. In the course of the comparison it institutes between the products of the two countries, the *Bulletin* says that Indian tea "*can be sold cheaper.*" If this were so, we should very soon see Indian tea assert its proper place in the markets of the world. But it is not the case, although it is now being sold at prices that are ruinous to the growers. It is generally well-known—indeed it is perhaps the chief obstacle that hinders the largely extended consumption of Indian tea—that we cannot sell as cheaply, quality for quality, as the Chinese can, and principally for the reason that our system of classing is so different. But, for all that, we look hopefully forward to the time when Indian tea will have a fair trial everywhere and be judged on its own merits, which it can very well afford to be. Meanwhile, this very practice of adulteration

of tea in China, will doubtless hasten the time when Indian tea will supplant it. The Heathen Chinee may take the warning, however, which our Government have more than once impressed upon him in connection with this subject. It was not so long ago that 7,000 chests of dust-filings and maloo mixture, miscalled tea, were burnt by order of the English authorities. Such measures as this must, no doubt, have a salutary influence on Chinese tea merchants, and they may, therefore, abandon these malpractices as they see people's eyes opening to their impostures, and the trade in consequence slipping, past them.

It is said that some of the great co-operative stores in London are beginning to practice the sublime mystery of "mixing." A correspondent of a contemporary writes :—"I lately [illegible] them what pretended to [illegible] in the manage- [illegible] difficulty is overcome ; much [illegible] harden on the surface. of China [illegible] necessary to work [illegible] ones before. [illegible] this, it [illegible] tion in which Indian [illegible] out. [illegible] nouncements one sees in [illegible] Souchong ' 'genuine Assam Pekoe [illegible] Not that these goods are really on han[illegible] ders, quickly recognising the public de[illegible] endeavour to pass off their celestial atroci[illegible] [illegible] e."

WE give prominence to the following extract from [illegible] Indian teas by Messrs. Gow and Wilson dated London, 3rd August :—

"As there is every prospect of a large increase in the yield of Indian tea, it becomes a matter of serious consideration to all interested that the demand should, in like proportion, increase also. In our opinion there is but one way [illegible] which this end is to be obtained, namely, by producing an article which can be consumed pure, and unmixed with its China rival. A gradual but entire change seems to have come over the style of manufacture, of late years, and it is now a difficult matter to find a tea which bears the "Old fashioned Assam Tea" character. The main object appears to be to convert the leaf as quickly as possible into dry tea, without regard to the fact that in the process of manufacture certain chemical changes must be allowed to take place in the leaf, if the bright ruby liquor and a full and good flavor is to be obtained. We know that in some gardens insufficiently withered leaf has been rolled and fired off in a very short space of time, without any regard to what used to be called "coloring" or "fermentation ;" it is then as expeditiously sorted, refined, and packed, and the result is that a quantity of the tea that comes to the market, though pungent, is thin and uncured. This we may say is scarcely the description of tea that can be drunk pure and unmixed. We do not advocate the manufacture of teas without pungency, but we must have thicker and richer tea than is now sent. More time and pains ought to be bestowed on manufacture, especially, on the withering and final firing, which latter operation used to take eight or even ten hours, but is now performed in about thirty minutes."

OUR American cousins appear to be going ahead in the production of tea. The *Home and Colonial News* tells us that four samples of exceedingly well made teas of American growth have been received in Mincing-lane, for examination and report on behalf of the American Department of Agriculture. The teas were made by Mr. Jackson, formerly of Assam, on his estate in Georgia. The Pekoe and Pekoe Souchong are reported on as being remarkably fine in liquor as well as in leaf, and in a good market would command a long price ; while the Souchong and Congu are reported on as being very inferior to the others in liquor, being weak and tasteless. We doubt whether tea manufacture on a large scale could ever pay in America, as labor, in the Southern State especially, is difficult to obtain and very costly.

TEA ADULTERATION.

THE Melbourne *Argus* publishes a long article on this subject from which we make the following extract :—

A few weeks ago a discussion was carried on in our columns by means of letters, touching the quality of the tea supplied to Victorian consumers. Letters from correspondents well acquainted with the tea market of the city showed that while there is an extensive manufacture of villainous compounds in China, to be exported as tea, there is at the same time a vast export of really good genuine tea from that country. Also that of the adulterated tea sent out, very little comes here, and when it does come, it does not go into consumption, but is re-exported to countries where the tea drinker has less money or less discrimination. Further, we find that the great bulk of the tea sold here is good, pure, wholesome, and cheap—that if we do not get the best, we get what is good value for the price paid for it, and could only get better by paying a higher price.

As to the comparative merits of Chinese and Indian teas that is not a question easily settled. There are excellent teas produced in both countries, but the Indian teas are dearer, and are new to the palate of English and Australian people, while with good Chinese tea we are well acquainted and have got accustomed to the familiar thing. The pure, strong, pungent; Indian teas appear to be most valuable for mixing with weaker teas so as to enrich and fortify them, and it is most desirable that they should continue to be imported into the colony. But the consumer will not be forced to buy what he does not relish, and of course the importer, the middleman and the grocer, prefer to supply what is in demand instead of exhausting their efforts in a vain attempt to educate the public taste. As a matter of fact, the importation of Indian teas has steadily declined. In 1873-74 it amounted to 77,000 packages, while in 1878-79 it was only 22,000 packages.

In 1877 a series of analyses were conducted in the Technological Museum Laboratory by Mr. [illegible], assisted by Mr. Frederic Dunn, to test the quality and genuineness of the tea then sold in Melbourne, and from the recorded results we shall now give a few extracts as a contribution to the tea controversy, premising that the authorities lay it down that :—

"Genuine tea contains between 5 and 7 per cent. of mineral matter, 3 per cent of which consists of soluble salts.

"And that in its ordinary air dried condition pure tea yields an extract equal to 32 per cent., while some choice samples have been found to yield so much as 50 per cent." Accepting this as a standard of quality, we now give a few of the determinations made at the laboratory, beginning with samples of green tea :—

No. 1, classed as "very bad" (2s. 6d. per lb.), was found to contain, in 100gr., 16·50gr. mineral matter, 23·75gr. extract, 2·00gr. soluble salts, with the following remarks added :—"Highly faced with Prussian blue and turmeric, foreign leaves present ; sand, magnetic oxide of iron, clay, withered leaves, faced nutshells, redbole, and sulphate of lime were found."

No. 2, classed as "bad," 2s. 9d. per lb. Mineral matter 12·90gr. extract 26·43gr. [illegible] ·86gr. Highly faced with Prussian blue and turmeric, foreign leaves, sand, clay, and magnetic oxide of iron were found."

No. 3, classed as "inferior" 3s. per lb. Mineral matter 13·69gr. ; extract, 30·95gr. ; soluble salts 2·96gr. "Faced with Prussian blue and turmeric ; sand, clay, magnetic oxide of iron, and sulphate of lime found."

No. 4, classed as "good," 2s. 9d. per lb. Mineral matter, 6·89gr. ; extract, 31·93gr. : soluble salts, 3·80gr. "Faced with Prussian blue and a large amount of turmeric ; genuine leaves, much broken."

No. 5, classed "very good," 2s. per lb. Mineral matter, 6·5gr. ; extract 41·23gr. ; soluble salts, 3·34gr. "No Prussian blue, nor turmeric detected ; leaves genuine."

Now for the black teas.

No. 1, "bad," 2s. per lb. Mineral matter, 5 60gr. ; extract, 19·57gr. soluble salts, 2·49gr. "Large quantity of stalks and exhausted leaves ; small particles of Prussian blue and turmeric."

No. 2, "good," 2s. 7d. per lb. Mineral matter, 3·70gr. ; extract, 305gr. soluble salts, 4·90gr. "Leaves genuine and in fair condition."

No. 3, "very good," 3s. 6d, per lb. Mineral matter 5·12gr. ; extract, 45·77gr. ; soluble salts, 3·57. "Leaves genuine, no Prussian blue or turmeric."

For comparison with the standard, and with the analysis of Melbourne teas (presumably chiefly Chinese) already given, we add the results of an examination of Indian teas, which has been made by Mr. F. Dunn at the laboratory at our request :—

A—A green tea, about 2s. per lb.—Mineral matter. 6·57gr. ; extract 41·23 4gr. ; soluble salts. 3·34gr. "Very good. Free from adulteration of any kind, and from colouring matter."

B—A green tea, about 1s. 9d. per lb.—Mineral matter 6·25gr. ; extract 41 23gr. ; soluble salts. 2·56gr. "Fair quality; soluble salts rather low ; leaves genuine, but very large. Free from colouring matter

C—A black tea, about 3s. per lb.—Mineral matter. 5·86gr. ; extract. 32·97gr. ; soluble salts, 2·72gr. "Leaves genuine and of good quality."

The practical value of the laboratory tea analysis, of which we have given a few samples, would be greater if we know to what extent the samples examined were representative of the bulk of the tea imported into the colony. In the absence of the information obtained from them is more curious than useful, for while some of the teas found to be of the highest quality may be largely used in the colony, and the worst only to a very inconsiderable extent ; still the direct contrary may be the [illegible] state of the case. Still the determinations are useful as well as interesting. Of 33 samples of tea examined, 10 were found to yield higher than the standard percentage of extract, viz., 32 per cent , while a few came nearly on to the 50 per cent. only to be found in choice samples. The Indian samples to be seen stand high in this respect, the best containing 41·28 per cent., and the other two respectively 32·16 and 32·97. But several of China teas gave higher per centages, ranging between the standard and 45·7.

It is in their percentage of mineral matters that the Indian teas show best. The standard of genuine tea being between 5 and 7 per cent., the three samples of Indian examined showed respectively 6·57, 6·25 and 5·28 per cent., being as nearly as possible what they should contain to be pure. Some of the Melbourne teas showed very badly in this repect, ranging up to 24 and 27 per cent. of mineral matters. On the other hand some samples had less than 4 and several less than 5 per cent. Where the very large percentage of mineral matters appears, it is due to the presence of sand, clay, magnetic oxide of iron, sulphate of lime, &c. It is to be observed that some of the samples examined at the laboratory in 1877 may have been Indian tea, but there are not likely to have been many of those, seeing how scarce Indian tea was in the Melbourne shops as compared with China tea.

COFFEE.

COFFEE planting in Ceylon is not just now a flourishing industry. The crops of the season 1880-81 will be very short, and a local paper, which has been going into calculations, observes that taking the three main sources of the world's supply together, it looks as though there would be at any rate more coffee in the next twelve months than in the preceding year, and if there be any force left in statistics, we are unwillingly driven to the conclusion that there is but little prospect of better prices being obtained for the bulk of Ceylon coffee in 1881 than in 1880.

THIS year's Java coffee crop the *Straits Times* tells us is estimated at 731,390 piculs. The spread of leaf disease in Java has led the N. I. Agricultural Society to propose to coffee planters there to subscribe to a fund amounting to 250,000 guilders as a reward to whomsoever shall invent a satisfactory remedy for the disease. The managing committee of the Society acknowledges that there is not much hope of finding this remedy which had been unsuccessfully sought for in Ceylon during the last ten years, but holds that some method of extirpating the fungus hitherto not thought of in Ceylon might be discovered in Java. The Merchants' Association at Samarang has taken steps to call a meeting of coffee planters there to discuss the subject and devise measures to check the disease. The Chief Inspector of Government Cultures in an official report on the coffee leaf disease declares that the latter has long been known in Java, its wider prevalence now being due to the long continuance of wet weather. As remedies for the disease he recommends better and deeper cultivation of the soil, especially heavier manuring, to enable the sickly trees to be strong enough to throw off the disease. The Batavia *Handelsblad* calls attention to this plan having been tried and having failed in Ceylon.

LIBERIAN COFFEE.

I.

AS the cultivation of this product nearly resembles that of the coffee of the hills, any remarks as to its culture, &c., may at first strike the reader as superfluous in a country where coffee has been grown so long and so successfully as in Ceylon. But there is as much visionary expectation on the one hand, as there is unreasonable prejudice on the other, for and against it, so that a few remarks, made after a practical study of its cultivation, may be of use in dispelling both. Thanks to Messrs. Cruwell, Agar, and Smyth who ventured on to the unhealthy West Coast, selected and introduced,—in one case at a considerable loss,—Liberian seed in large quantities into Ceylon, there is now no difficulty in procuring seed, each cherry costing not more than one cent., or Rs. 10 per 1,000. There is little to say about the nurseries; provided the seed is fresh, it will germinate readily; be careful to have no drip, plenty of light under the shading, have the beds well dug up, see that the seed is thoroughly soaked, and is sown very shallowly flat side down, and the nursery will be a success. The beds should be kept only damp until the cotyledon is developed; the seedlings should be pricked out into baskets or bamboo pots until they are large enough to plant out, when they should be carefully and cleanly turned out of the basket, or 'split' out of the bamboo, so that the plant with the earth in which it has grown is undisturbed. The holes should be quite twenty inches, and be carefully filled in, ramming down the earth well. As regards the distance which the plants are to be put apart in the field, it will depend partly upon the seed used, and the climate, in our remarks on cacao we said that *with* cacao, Liberian should be planted 15 feet by 15 feet; planted by itself, with the ordinary seed in a non-forcing climate, we think 9 feet by 9 feet the right distance, although with the giant variety, such as *Hooper's crab apple*, we expect 12 feet by 12 feet would not be found too far. Taking 9 feet by 9 feet as the distance apart or 6,000 trees to the acre, the cost of opening one acre will be as under.

Rs. 30	... ...	for Plants
3	... ...	,, Lining
10		Holing
15		Felling
8		Filling in
8		Planting
Rs. 74	total	

The plant having once started, the growth of the tree is most encouraging: we know of trees ten feet high in two years; and recently saw a considerable acreage of Liberian, topped at five feet, bearing quite seven cwts. an acre and not more than three years old, the clusters growing where they grew last picking,—a distinct peculiarity of this coffee—and numbering from forty to sixty berries each, one large cluster having as many as 110 berries upon it. The best land for Liberian should be flat, or gently undulating, and well drained, the rainfall should be moderate only, and no shade should be allowed. The seed should be taken from as old a tree as practicable, the bean should be short and round, and the skin comparatively thin. Leaf disease, although shewing itself in the mottled appearance of the smaller branches and some times on the stem, has no appreciable bad effect on the vigour of the tree, or apparently on its bearing, and the crop ripens steadily if slowly.

Regarding the "extreme pungency," of the liquid, so commonly talked about, we maintain it is a mistake, the flavour, though a distinct, is an agreeable one, and, after having become accustomed to it, we can quite conceive people preferring it to the ordinary coffee; the oft repeated assertion that it is not fit to drink, is only one of many prejudices that exist against this product, which will however rise superior to all such attacks; there is no reason why every low country hut should not be shadowed by its beautiful foliage, or why it should not usurp the place of thousands of acres of tangled jungle, affording a sure livelihood to the native, if he has only the common industry to plant it; and to the planter, who is willing to brave the monotony and heat of the plains, it offers, as recent prices will shew, every prospect of fortune.—*Ceylon Times.*

II.

PRACTICAL HINTS ON GROWING IT.

THE greatest care should be used in selecting the seed, which should be dung manure ... and of long and full-bodied shape, with a thin fur...ishes to the ... through a half inch ring; fresh Before reaching the highlands, ...tain quantity ... valueless species, are met with. ... are the date in some cinchonas in the distance ... with parchment (brightly the vertical rays of th... RESPONDE ... appear for a long time at This characteristic reflex o... ...ry is risky), the small seed- ...ts, and when nine inches high, or abo...st giants. The glossy le... planted in the clearing. The young plants ... made to enable them to withstand the first shock o... cinchona by a novice ... it ten per centum of failures may be expected ...igh, at great dist... on readily; the holes need not be more than 18 inches ... must be ... carefully filled in; planting by turning the plant ... e basket with the earth adhering to the roots may be safe ... a most ... 8 × 8 feet is sufficiently wide apart for the tree ... which case, at two years, 3 cwt. to 4 cwt. per acre may be expected. The crop will not all ripen, the larger clusters will necessarily diminish as the fruit increases in size by being 'pushed out,' and in dry weather many of the cherries will get dried up and light; about 44,000 beans parchment ... to a bushel, and say, fifteen bushels of cherry to 1 cwt. coffee. The fruit takes quite one year to fully ripen. Leaf-disease will invariably attack the nursery, but will gradually lose its ill-effects as the tree grows older; when it also will much better resist the effects of drought; well grown trees should be fully six feet high at two years old.

We imagine the most suitable climate for Liberian coffee is that with a mean temperature of 78° to 80°, and a rainfall of 80 to 100 inches in the year; it adapts itself to almost any soil, but on account of its long tap root, prefers a deep black one; in damp soil, it sometimes suffers from bug. It is one of the most beautiful of trees, and yields both crop and blossom on its generous branches at the same time.—*Ceylon Times.*

COFFEE CULTURE IN JAMAICA.

THE following is an extract from an interesting letter of Mr. D. Morris, late of Peradeniya, to the *Ceylon Observer*.

I have been trying to find out why the Blue Mountain coffee of Jamaica is always so good, and how it is that it obtains such high prices as compared with the fine and highly cultivated coffee of Ceylon. Is the coffee grown here a peculiar variety of *C. arabica?* or is there something in the soil and climate, which promotes the larger formation of the essential oils and secretions in the fragrant bean? Whatever it is, it cannot be in the superior cultivation, the more rational treatment of the crop, or the greater care in the curing. The only cultivation which the estates here receive consists in a rough "hoe-weeding," once or twice a year, with no pruning, except what the hoe does, no system of drainage, no terracing, and, as I mentioned before, no manuring! It is true that on one or two estates, such as Radnor, a higher style of cultivation is being inaugurated, but, as a rule, coffee cultivation in Jamaica cannot compare, at all, with what is being done in Ceylon. I say this without the slightest disparagment to the planters of Jamaica; they have had to pass through so many crisis, and to fight against so many adverse circumstances, that, at last, they have been obliged to submit to the inevitable and especially as regards labour, and manage as best they may. It may seem strange to a Ceylon planter, but all the work of pulping, curing, and preparing the coffee, is done here on the estates by the superintendent or overseer, and when the coffee is sent down to Kingston, it is ready for shipment and immediately put in barrels. The system and the absence of large coffee curing establishments must necessarily increase the cost of curing, &c., but it appears to have been pursued here from time immemorial, and planters appear to like it.

Owing to the large areas nominally included under one estate, the different "coffee fields" are sometimes two or three miles away from the works, lying in "bosoms" of the hills, and only visited for the occasional "hoeing" and picking of crop. Out of a nominal acreage of 1,000 acres, often there are only 160 to 200 acres, and sometimes only about 60 or 80 acres under cultivation. The other parts are in "reccinate" (jungle) or so steep that owing to "breakaways" and rocks it is impossible to cultivate them. This gives a Jamaica coffee estate a very patchy appearance, and as cinchona has not yet been taken up generally by planters, the uncultivated areas greatly exceed those cultivated. Much more might be done with the suitable coffee lands, if a regular system of nurseries was established, and plants put out with greater care. At present new lands are planted up with "suckers" (or rather seedlings) found under the trees. These are pulled up with little or no care, even when they have 6 or 8 primaries, and after being carried in bundles on heads exposed to the full rays of the sun, are put in holes, and allowed to take their chance without shade or shelter. It is strange to hear such plants called "suckers" but that

is the orthodox term for them here, and it is on such plants that Jamaica planters entirely depend for their supplies and for planting up. I was much puzzled the other day with a remark made me by a planter respecting these, said "suckers." I asked why these self-sown plants were called "suckers," when evidently they were nothing of the kind. I suggested "seedlings" as an appropriate term, I was told, "No, no, they are not seedlings: a sucker does not become a seedling till it is crowned." This was still worse, and I had to give it up.

With regard to the absence of nurseries and the planting up of land by weekly sown "seedlings," it seems a pity that so much valuable land and so much time should be lost, when the remedy is so simple. The plants thus put in are often 2 feet high, and with several primaries (i. e. crowned, as I found afterwards). Their rootlets are torn and lacerated and the check they thus receive in transplanting, and [illegible] out from shade and [illegible] in the manage- [illegible] is overcome [illegible] two or [illegible] on the surface.

But still, as they [illegible] to work [illegible] they do, they produce [illegible] it [illegible]

In colour, the best Jamaica co[illegible] and the beans smaller. Whether the [illegible] oil I know not, but the sample appears to [illegible] according to colour. The sample sent re[illegible] beans, of Mocha coffee, only the beans of the [illegible] yellow colour. Nearly all West Indian and [Brazilian] [illegible] or greenish grey.

The colour of the bean must depend in some measure on the manner of pulping and drying, but so far as I have noticed, the processes in Jamaica are much the same as in Ceylon, except that possibly, here the cherry is allowed to stand longer before it is pulped.

But to return to the question of high prices—Why does Jamaica coffee command such high prices? This subject, and especially in connection with Mocha coffee, must have occupied the attention of coffee planters, ever since coffee planting began, but so far, it appears not to have received a satisfactory solution. Is it temperature, atmospheric pressure, natural fertility, humidity of soil or air, amount of sunlight and excessive stimulation which produces the perfect elaboration of those subtle principles upon which the aroma and active qualities of coffee depend?

With regard to Mocha and Jamaica coffee, there must evidently be a combination of very favourable conditions for the production of beans possessing such salutary and agreeable qualities; but from the subtlety and delicacy of the law of vegetable assimilation, I fear it is almost impossible so to analyse and trace these conditions as to produce their parallel in other coffee-producing countries.

For Ceylon planters there is, however, one lesson which Jamaica coffee may fitly yield. It is a subject of frequent remark in Ceylon, that there was no leaf disease before artificial manures were used, and many good planters believe that if the use of artificial manures had not actually introduced the destructive fungus, it had at least prepared the plant for its attacks, so that it became an easy prey.

I know that the fact that the disease first appeared in a comparatively new district where artificial manures had not been used, considerably weakens this theory, but there can be no doubt that by forcing a plant artificially you introduce new conditions of life which may ultimately prove disastrous. The soil of Jamaica is naturally much richer and stronger than that of Ceylon, and the underlying rocks, composed as they are, of loose and easily disintegrated materials, replace soil lost by waste, with great rapidity; but if the system of *tillage* now pursued in Ceylon had been in existence there generally, fifty years ago, and the rich surface soil had been preserved by drains and terracing, it is quite certain leaf disease would never have been so fatal to the old estates, and with a careful husbanding and manipulation of the natural soil manuring would have been unnecessary, and the coffee trees would have been more hardy—and less prolific possibly—but better able to fight against the attacks of fungoid and other diseases. As far as I have noticed, there is little disease on any of the cultivated plants of Jamaica. With the exception of the *Cemiostoma coffeeilum*, a little leaf miner similar to the *Gracilaria coffeefoliella* (NIETNER) of Ceylon, which cause the silvery tortuous markings and blotches on coffee leaves, Jamaica coffee appears to be very free from disease. Our old friend the black bug is here, but it does not give annoyance except, some times, to badly cultivated and young coffee.

The "Bourbon" sugarcane, which cannot be cultivated in Mauritius, on account of its liability to disease, is here a most productive cane, and similarly with oranges, limes, ginger, and pimento. Jamaica cannot be accused of having forced any of her products by manures, artificial or otherwise, and it may be —but I would not like to commit myself to the conclusion—owing to this, that the plants here are so free from the common maladies of cultivated plants.

Now that the immigration scheme is working so satisfactorily, Jamaica's great want, an adequate labour supply, is becoming less felt. At the Government cinchona plantations creole labour is both abundant and good. By entering into an agreement and paying regular *weekly* wages, we are able to secure a certain number of regular hands: others are taken on only when they are wanted. There are several thousand acres of valuable land on the Blue Mountains admirably adapted for coffee or cinchona, and they only require men of energy and capital to ensure their successful cultivation. I do not desire to appear as an advocate for general emigration to Jamaica, but for young men with some capital and determination, I believe the splendid climate and cheap lands of Jamaica require only to be known to attract numbers who now go farther and fare worse.

In connection with the high prices obtained by Blue Mountain coffee, it would under present circumstances be very interesting to test its value under cultivation in Ceylon. As far as I am able to judge the trees themselves do not differ much in habit, size, character of foliage, or in floral organs, from those cultivated in Ceylon, but the plants here, in consequence of good soil and no disease, are undoubtedly hardier, and must possess a stronger constitution than trees which have been subject for many years to the [illegible] disease. I believe the experiment worthy of serious trial on a large scale, and it would give me great pleasure to [illegible] any of your enterprising proprietors, who may be anxious to procure a supply of seed from Jamaica, and plant up some 50 or 100 acres in Ceylon for this purpose. The seed has the merit certainly of being thoroughly sound and good, and if in addition it will keep its superior qualities in Ceylon, it would prove a most valuable acquisition. I know that the small lots of Mocha and Java coffee that have been already tried in Ceylon have been severely attacked by leaf disease, but I have not heard whether the produce has ever been tested, or whether Mocha coffee grown in Ceylon is in any way superior to the plantation coffee. To test the matter thoroughly, it would be necessary to plant up a large area with nothing but the imported coffee, so as to be able to ship an appreciable amount at one time. Plants of Mocha coffee being naturally very delicate, they would consequently be very easily affected by the *Hemileia*: but if, as I believe, the Jamaica Blue Mountain coffee is hardier even than your [plantation] coffee, while at the same time its produce obtains a much higher price [illegible] possess special advantages at this juncture. I offer the suggestion as a contribution to the present discussion on coffee cultivation in Ceylon, and in the hope that by the introduction of "new blood" the *Hemileia* may receive a material check in the higher and more recently opened estates.

The experience gained in the case of the vine disease goes to prove that new and hardier varieties of plants have been able to hold their own, and to thrive in spite of the prevalency of such diseases as the ubiquitous *Oidium*, and it is to this that we owe the revival of grape cultivation in Madeira and other places, where after the dreadful attacks of 1848-52, viticulture had been almost exterminated.

CINCHONA.

MR. MURRAY, the publisher, will shortly issue a book by Mr. Clements Markham on a subject he has made peculiarly his own: "A Popular Account of the Introduction of Peruvian Bark into British India and Ceylon," and he will give particulars of the progress and extent of its cultivation.

A HOME paper states that cinchona red bark, grown in Jamaica, realised encouraging prices, being, in some cases, double those fetched by Indian *C. Succirubra*. Ten thousand pounds of dry, bark were obtained from 2,490 trees, being at the rate of four pounds per tree. A single harvest realised 17*s*. per tree—a result highly satisfactory.

IT appears that the question of a supply of quinine for India, will not be entirely confined to the alkaloid derived from *Cinchona Calysaya* as we have on our table a very fine sample of sulphate of quinine manufactured at Rungbee by Mr. Gammie, from *Cinchona Succirubra*, which is quite as pure as any we have seen of Howard's. We do not think we are over-sanguine when (judging from present results) we predict that the time is by no means far off when India will be able to produce all the quinine required for the public service of the country, and will thus be quite independent of England.

Now that cinchona cultivation is becoming very general and sites for plantations are being eagerly sought after, it is interesting to note every anomaly connected with the growth of this tree. Mr. Hughes, speaking of Ceylon, lays it down, as a general rule, that stiff and tenacious soils should be avoided for cinchona, which flourishes in the island only in rich, friable, or gravelly soils. Elevation also is reckoned important, both there and on the Nilgiris. Elsewhere, however, cinchona appears to thrive under exactly opposite conditions of soil and altitude. In Jamaica, for instance, where the soil is clayey and stiff, *C. succirubra* has been most successfully cultivated, and the recent exportations of bark have obtained high prices. The elevation of plantations there is 2,000 feet above sea-level, an altitude at which our planters would believe it folly to risk the [illegible]. The prejudicial effects of the stiff and impervious soil of Jamaica are supposed to be counterbalanced by the peculiar geological formation of the subsoil, which consists of a porous lime-stone, full of sink—holes, which convey the surface moisture to subterrean rivers. Thus no hard and fast rule can be followed, and the rejection of a site for some accepted disqualification, either on the score of soil or climate may prove a mistake.

We are not aware that the present condition of the Dodabetta Cinchona Plantation has attracted the attention of Government; if it has not yet done so, it ought to do so at a very early date. To a private proprietor the state of affairs would be a source of anxiety, if not of alarm. The whole plantation is overrun with that stringy moss which augurs decay, every bough and twig is covered with it, and the lower ones already form dead wood. The upper boughs have a mere tuft of green leaves, towards which decay is fast travelling. The whole estate is thus overrun. Whether the moss has its origin in unsuitability of soil or in exposure, or whether it has been propagated by the remnants of the old forest left, here and there, scattered over [illegible] it is not easy to tell. The condition of the plantation has attracted attention, and those who have invested their capital in cinchona, would wish to be informed whether such a state of things can be disregarded, [illegible] whether it means ruin and loss, sooner or later. The absence of information from Government, scientific or practical, on cinchona culture has been very marked of late. State property of this sort has proved remunerative we know, but beyond this, the public has gathered nothing from official papers worth knowing, and Government has even shown itself not posted in, some of the processes which private owners have learnt and practised.

Cinchona cultivation is now the great rage in Ceylon. The coffee planters, what with leaf disease and other drawbacks, were well nigh driven to despair, when cinchona came as a redeeming angel. But there seems some danger of the new horse being ridden to death. The following extracts from a letter, written by a Ceylon planter to a friend in England, contain some interesting information regarding this cultivation :—"I [illegible] no cultivation has been so widely taken up and rapidly developed [illegible] cinchona in Ceylon. It is certainly a most bountiful tree, and has changed the aspect of many declining coffee estates to increasingly valuable properties, and in some cases, notably two, where it has attained too, *regular* growth has brought great wealth to the owners. One local newspaper has given itself almost entirely up to its cultivation, and you commonly hear statistics given, and instances quoted, showing how a hundred acres of four-year old cinchona must be worth £40,000. In fact, the fever is now at its hottest stage. The small leafed variety *Officinalis* I have planted 4,840 to the acre. Say 1,613 trees mature, which at 6 oz. to a tree is equal to about lb. 600 bark, which should be worth say Rs. 900, in four years' time, which means, at an expenditure of Rs. 60, an annual profit of 12 per cent. This is my own estimate. Of course if you are fortunate enough to get fine land with a gravelly subsoil and good natural drainage at an elevation of say 4,000 to 5,000 ft., I know no reason why those enormous profits that have certainly fallen to some, should not also be yours, but it is a venture and in most instances, a terribly disappointing one. To sum up what I have endeavoured to say, I would not advise you with no knowledge of the subject to go into cinchona, but should recommend you to stick to coffee, which to my mind is much safer and generally more remunerative than cinchona, and provided you got into a good district, will give you nearer 20 per cent. than 12 per cent. At the same time I must tell you that the land in which my cinchona is growing is poor, high and exposed, in fact, will grow nothing else, and yet I expect 12 per cent. on the outlay."

A correspondent writes :—"I find no mention made any where of an interesting experiment that has for some time been carried out on Mr. Money's Deva Shola Estate. The bark on a portion of the estate was scraped off the entire stem. Although the dry weather succeeded, the trees thus treated showed no symptoms of injury. The entire removal of the bark from the stem is viewed ordinarily, as an operation so opposed to the accepted theory of vegetable life, that the survival of a tree after it is somewhat of a phenomenon, but in the case under notice, thousands of trees have been so treated without any apparent injury as yet. The foliage of the head is green and fresh, and the bark has renewed with wonderful rapidity. Mr. Barlow, the late Commissioner, spent some time on the estate to ascertain the conditions under which the experiment was being carried out, and the mode of operation. These were duly reported, I believe, to Government, but nothing has yet been made public. Surely there is no more important subject to the cinchona planter than the method of harvesting the bark. Government is apparently unconcerned, but Mr. Money, I should think, might oblige by telling us all about the matter."

THE CINCHONA FORESTS OF SOUTH AMERICA.

At the last meeting of the American Pharmaceutical Association, Mr. Henry S. Wellcome gave a long account of his recent visit to the cinchona regions of the South. Mr. Wellcome expresses much sympathy for the Indian collectors of the bark, describing the climate as deadly, the land as dangerously precipitous and treacherous, and the pay miserably small ; he concludes his remarks by saying that continual wars and revolutions render all investments hazardous, and stagnate all enterprise ; even, when the bark is collected ready for shipment, the roads and ports are often blockaded for months, entailing heavy losses upon the dealers. From his rather copious notes we have extracted the following, he says :—"I shall speak more particularly of the cinchona forests of Ecuador, once the only source of bark and still yielding large quantities. The bark territory, is divided into the districts known as Bosque de (forest of) Guaranda and Bosque de Loja.

The Bosque de Guaranda is a vast forest, extending from about 1° N. to 2° S., and covers the western slopes of Chimborazo and the outlying range of the Cordilleras to more than 10,000 feet above the sealevel. The district is the source of most of the barks exported from Guayaquil, and has never yet been fully explored. Guayaquil, the main shipping port of Ecuador, is a city of 30,000 inhabitants, situated on the Guayaquil River, 60 miles from its mouth. The river is navigable to this point by large ocean steamers.

The elder cinchona district, Bosque de Loja, was the source of the first barks taken to Europe. It extends from 2° S. to 5° S., the boundary line of Peru, and covers the western slope of the Cordilleras. The district has [illegible] constantly for over 200 years, and the quantity of bark [illegible] furnishes to the [illegible] market has fallen off during the past few years. Before reaching the highlands, [illegible] quantity [illegible] magnifolia, a valueless species, are met with. [illegible] descried some cinchonas in the distance [illegible] which reflected brightly the vertical rays of the [illegible]

This characteristic reflex [illegible] with the bright roseate flower, affords the best means of [illegible] the cinchonas among the mass of forest giants. The glossy le[illegible] of the India-rubber tree is easily mistaken for the cinchona by a novice but skilled cascarilleros are usually able to distinguish, at a great distance, varieties, by the colour of the flowers and general [illegible].

[illegible] of the ravine we followed a small stream, till suddenly our guide shouted "cascarilla," and we were gladdened by the sight of several fair-sized trees of cinchona succirubra.

The cinchonas seek the most secluded and inaccessible depth of the forest. They are distributed through in more or less irregular scattered patches, sometimes singly. The older trees are really very grand and handsome, 40 to 80 feet height, trunk straight, branches regular, leaves evergreen, 6 to 10 inches long, of a dark green colour, sometimes tinged with crimson, the upper surface of an almost waxy lustre, flowers in terminal panicles of bright rose tint, and diffusing a pleasing fragrance. The bark of the large trees is usually completely covered with mosses of the most delicate lace-like texture, interspersed with the lustrous variegated lichens and diminutive trailing ferns. Vegetable growths develop with wonderful luxuriance beneath the interlacing branches, which permit but the faintest rays of sunlight to filter through them. Everything is saturated and dripping with moisture ; the very air we breathed seemed a clammy vapour. The atmospheric changes are continuous and very abrupt, drifting banks of gloomy clouds are followed by glaring sunshine, and then tempestuous showers, all in rapid succession. The temperature is more even, averaging about 65° F., seldom exceeding 80° F., falling below 45° F. ; altitude about 6,000 feet.

The season for bark gathering begins about August 1 (in some forests as early as June), and lasts till October or November ; during these months the bark cleaves most readily, and on account of the smaller rainfall, the forest is more accessible. It is almost impossible to enter it during the wet season. The trees are first decorticated from the ground up as far as can be reached and then, after felling and removing the clinging vines and mosses, the rough outer bark is beaten off with a club or mallet. The bark is then cut round the trunk in sections of 2 feet to 3 feet, and longitudinally in strips of 6 inches to 8 inches in width, then removed with the blade of a machete. The root-bark is obtained by digging away the earth and cleaving with a machete—a large heavy knife.

When first taken from the tree the inner surface of cinchona bark shows a handsome cream tint (with juice of the same colour), but on exposure to the atmosphere rapidly darkens to a dirty red. The barks are usually taken to the main camp for drying and storage. The thick bark of the trunk requires great care in drying because of the excessive dampness of the atmosphere which sometimes necessitates the use of artificial heat to prevent moulding ; it is piled up in tiers with sticks between the layers to allow free circulation of air, and weights are placed on top to flatten it. The thin bark from the young trees and small limbs dries more readily and rolls itself up into quills.

One of the greatest difficulties connected with the gathering of cinchona bark is that of transporting it to the coast at the end of the season. It is roughly sorted, according to the part of the tree from which it is obtained, and packed in bales of about 150 lbs. each ; the Indians carry these bales on their backs a distance of sometimes several hundred miles to a transfer warehouse, from whence it can be transported by mules to the nearest seaport.*

The final sorting and classifying of barks is done at the main storehouses at the coast† where it is packed in coroons of cow-hide‡, or bales of heavy sacking ; there it is that most of the adulteration and sophistication is done. The admixture of inferior barks with higher grades is not so much the result of ignorance, as has been supposed by many, for the bark dealers are very expert in determining the different varieties and

* The worn appearance of most cinchona barks seen in the market, is produced by the rough handling it gets during transportation to the coast.

† In Bolivia the sorting and packing is usually done before transporting to the coast.

‡ The coroon consists of a closely-packed bale sewed up in cow-hide (hair side out). The hide having first been rendered soft and elastic by soaking in water, on drying it shrinks and forms a very strong and firm package.

estimating the values of barks; but, strange to say, very few bark merchants ever become wealthy.

All barks enter the market bearing certain brands, such as "J. P." or "T. B." These brands gain a reputation according to the quality of bark they represent, but it is sometimes the case that, as soon as a brand has established a good name, the dealer sophisticates with the inferior grades§. No large buyers of Europe or America purchase cinchona barks without first making careful essays; but, even with this precaution, they are sometimes deceived, on account of the adroit manner in which the barks are mixed.

As regards the prospects for future supplies of cinchona barks from the native forests of South America the outlook is exceedingly discouraging, the greatly increased use of cinchona alkaloids during the past few years, with the consequent demand for a larger supp[illegible] very thorough working of the old [illegible] energetic seeking for new ones. [illegible] is overcome; [illegible] becoming more and more rare every year, [illegible] to work [illegible] at greater distances from the shipping ports, and [illegible] this, it [illegible].

The tract of country yielding [illegible] is not so unlimited as some writers would lead us to believe, nor [illegible] inexhaustible; it is a fact recognised by natives and dealers who [illegible] well informed about the extent and resources of the cinchona-bearing districts, that if the present ruinous system of destroying the trees is continued, and no effort made to propagate new growths, they will, before [illegible] years, be practically exterminated from their native soil.

With the abundance of seeds yielded by the cinchonas one would naturally expect young plants to spring up in great numbers, but such is not the case, the light-winged seeds mostly fall [illegible] and adhere to the ever-moist foliage, where they quickly germinate and decay; or if, perchance, they fall to the earth, it is almost impossible to gain a rooting, as the soil is covered to the depth of 10 to 20 inches with loose decaying leaves. Beyond all doubt the cinchonas might be successfully cultivated in their native country, especially in the localities of the exhausted forests, but the natives show no enterprise, and foreigners receive no encouragement from the Government to attempt it. Two Germans have made a venture at cultivating cinchonas near the city of La Paz, Bolivia, but as yet the plants are not sufficiently developed to determine the results.

§ I was told of one merchant who, thinking his brand sufficiently well-established, made a very large shipment of high-grade bark, with which he mixed about one-third of inferior quality; but the trick was detected in the foreign market, and his entire lot could only be sold as inferior grade, causing a heavy loss and serving him a very just punishment.

SERICULTURE.

THE new silk crop in China promises favourable results, and according to the newspapers received from Japan, the crop there also holds out good prospects. The production is expected to be large and of good quality. These facts, coupled with the prospect of a good crop in Europe, tend to show that prices must rule low during the present season.

SILKWORM rearing, to which so much attention and encouragement are now being giving in the Punjab and North-West Provinces, is precisely the sort of industry suited to the Indian *ryot*. No capital is necessary beyond that needed to purchase eggs, &c.; the methods of rearing are simple and easily understood; the food for the caterpillars is never difficult to obtain in this country; there is, and always will be, a demand for the silk, and a fair, if not high, profit may be reasonably expected. The rearing of silkworm may be undertaken by any one without its interfering with his regular occupation. His wife or children can do all that is necessary.

TOBACCO.

EFFORTS have been made, but not with very great success, to cultivate tobacco of superior quality in parts of Arracan in British Burmah. The soil there is said to be as good as the soil in the Phillipine islands, but the Burmese are too conservative to adopt any new-fangled schemes. It is said that if the Government would take the entire scheme in hand, tobacco cultivation might be successfully carried on, and a decided improvement would be apparent in the quality of the leaf.

THE cultivation of tobacco is being vigourously pushed on in parts of Ceylon, and especially in Jaffna where the crop this year has turned out well, and the Colombo market has received large supplies of the leaf. The quantity in store is very large, and we read of shipments being sent to India. The cultivation of tobacco, it has often been pointed out, is one of the most important industries that can be undertaken. In the southern districts of this presidency, particularly in Madura and Trichinopoly, tobacco is extensively grown, and of late years increased attention is given to its cultivation. The cigar manufacturing trade is assuming some proportions, and shipments of cigars are now made steadily to Burmah, the Straits Settlements, and Australia. In connection with the cultivation of tobacco, Dr. Bidie states in the catalogue which he recently published of the specimens sent to the Melbourne Exhibition, that vigorous efforts have been made to effect improvements in the native methods of culture, curing of the leaf, and manufacture of cigars. The Trichinopoly and Dindigul tobaccos are much alike in appearance and quality, but the Lunkah tobacco, grown in the delta of the Godavery, differs materially from both these varieties. As a rule, the Trichinopoly and Dindigul cigars have a stronger taste and flavour than the Lunkah, but the latter although tasting milder, has a more marked effect on the nervous system, and probably contains more nicotine. The exports of tobacco from the Madras Presidency have increased; in 1878-79 the exports were 5,223,829lbs. valued at about eleven lakhs of rupees. European firms have started cigar manufactories, and have produced very good cigars which are used extensively in the presidency, and efforts have been made to send supplies to foreign countries

TOBACCO.

BELIEVING that many of those who have applied for land in the plains, especially in the Eastern Province, may purpose planting tobacco, and also that the industry will become an important and remunerative one in Ceylon, as it has already become in India, we have prepared the following remarks on this subject, bearing on its cultivation here. From the data in the Madras Government papers on the subject, it appears that the three best varieties to be planted are *N. Macrophylia cor data* heart-shaped Maryland tobacco, which produces a very fine leaf the fine Turkish leaves being probably the produce of it. *N. augustafolia pandurata* stalkless Virginian tobacco, leaves fiddle-shaped, three times as long as broad, this furnishes good leaves for smoking, produces heavily, and is much grown in Germany, *N. Rustica ovata* small-[illegible] tobacco, leaves small, egg-shaped, and smooth, his variety furnishes fine aromatic leaves for smoking, but the yield s low; and *Nicotiana crispa*, furnishing the leaves of the celebrated igars of the Levant, stem very much branched and covered with white hairs, leaves small, stalkless and clasping the stem, flowers red; this species is much cultivated in Central Asia, and we should suspect is a variety that should be introduced in Ceylon.

The tobacco plant has so many species, and sub-species, some being valueless, that we recommend all care to be used in procuring seed. In 1875 the Northern Province alone exported over 55,514 cwts. (returns of which were made) which at Rs. 25 per cent. represent a value of Rs. 1,387,850; the value of the tobacco grown in the Northern Province is not more than 22 cents. per lb. while in India where the cultivation has been well studied, it is worth 44 cents., being just double. The higher class of tobacco (as *N. crispa*) is worth as much more again, however, some Sumatra tobacco having lately sold for the equivalent of 90 cents. a lb. This great difference in price will suffice to shew how much will depend upon the seed procured.

We should imagine that the climate of the Eastern Provinces is most suitable for tobacco, damp weather even during the harvesting is fatal to the leaf, though it is necessary that a certain amount of rain should fall on the plant after being first put out. It is also necessary that the soil be a very light and friable one. A sandy soil containing an average amount of organic matter, well-drained, is the *beau-ideal* of a tobacco soil. Of course the richer a soil is, the thicker and heavier the leaf and the greater the outturn, but this is by no means the object to be attained. The more clay a soil contains, the less will be the aroma, and the coarser the leaf; still even in a clay soil, by proper tillage and digging a good ordinary smoking tobacco can be produced, and if great attention is paid to the selection of the variety, &c., leaf for cigar wrappers even may be produced. Tobacco will not stand any wind, and if planted in new land, so as to avoid it as much as possible, we should strongly advise opening up small plots, well-sheltered, and the result should be a very much larger, percentage of first quality leaf. In a rich alluvial soil little or no manure will be required, but as the tobacco plant draws from the soil the inorganic matter with which it is rich, if the same soil is to be used again, a large quantity of nitrogenous manure must be supplied; as much as twenty-five tons of well rotted cattle manure is applied in Holland, whereas in Sumatra the land once cropped is abandoned as useless. The best manure to produce a quickly burning leaf of fine aroma is potash, which can be supplied by applying 200lbs. of good saltpetre to the acre. We have before said that should the same land be used again it would be necessary in Ceylon to manure it very heavily indeed (this is not the necessity in America, where the soil is rich in plant food, or in Hungary and Holland), but we imagine that inorganic matter such as potash and lime taken out of the soil might be supplied by planting in rotation. Indian hemp is said to thrive particularly well after tobacco, and no doubt Indian corn, Helianthus or any cereal or pulse is well adapted for cultivation in the course of rotation.

We would impress upon the cultivator, that though he may introduce a fine species direct from Sumatra or Manilla, he must be prepared for deterioration; it is unlikely that the new *habitat* will supply the thinness and silkiness of leaf and the aroma, unless, climate, soil, and especially treatment are identical. Now supposing that the object to be attained is a wrapper leaf, then the leaf must be broad, smooth, thin, and elastic, and dried to a golden color, while fine aroma is not indispensable. The variety that most approaches these characteristics is the heart-shaped Maryland tobacco, grown in Germany, and already largely introduced into India. While for a hardy variety the short leafed Maryland tobacco might be introduced, it is a vigorous grower and a good smoking tobacco; but the tobacco that grows commonly and well in tropical countries is the *N. Rustica* growing in Brazil, Turkey, and Asia generally, and furnishing a large leaf, suitable for wrappers, being worth, approximately, 30 cents. a lb. We do not see, however, why with careful cultivation of a small well-sheltered plot, the higher priced tobaccos of Manilla, Cuba, and Havannah should not be cultivated, and made to thrive in the rich soil of the Eastern Province where irrigation is practicable. We purpose devoting a second article to the drying and curing of this product later on.—*Ceylon Times.*

Registered No. 182.

THE INDIAN AGRICULTURIST.

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.
Proprietor.

Calcutta, 1st Feb. 1876.

CONTENTS.

NOTICES TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of annonymous letters.

CORRESPONDENCE.

REJECTED COMMUNICATIONS.

E. A. C.—LUNGBA... [illegible] ...henticated.—We shall keep the manuscripts by us ... short time, to give our correspondents the opportunity of complying with our rules, in which case we shall reply to their queries in our next issue.—ED., *I. A.*

WEEDS IN GRAVEL ROADS.

TO THE EDITOR.

SIR,—Can you or any of your readers inform me of any means of keeping down grass and weeds in gravel roads?

GARDENER.

NOTE.—The use of certain strong chemicals has been recommended. We prefer the *koorpee*, as chemicals are apt to destroy any adjoining flower-beds.—ED., *I. A.*

TUSSER SILK.

TO THE EDITOR.

SIR,—Will any of your readers kindly inform me in what district Tusser cocoons are most abundant, and at what price they can be purchased? Any information on this point will greatly oblige.

A SUBSCRIBER.

Ghatal, 6th September 1880.

NOTE.—The Tusser cocoons are plentiful in the Santhal Pergunnahs and Chota Nagpore, as also in the hilly parts of the North-Eastern districts of India. Some information on the subject of Tusser silk will be found in another column. As regards the value of the cocoon we would refer A SUBSCRIBER to the correspondence column in our last number.—ED., *I. A.*

RICE MILLS.

TO THE EDITOR.

SIR,—In the last number of the *Indian Agriculturist*, I see mentioned that new rice mills are being introduced into Rangoon. Rice mills, is what I have been looking out for, for long, but have been very unsuccessful in gaining any information about them.

I shall be very much obliged if you can give me any information regarding these mills, or tell me where I am likely to get such information? What I want is a description of the machinery and working of the mills.

A SUBSCRIBER.

Birdpore, Gorakhpur, 21st September 1880.

NOTE.—We shall see what we can do in this matter, but, meantime, perhaps some of our readers can supply the information wanted. —ED., *I. A.*

CITY REFUSE AS MANURE.

TO THE EDITOR.

SIR,—I have read with much interest an extract from the *Deccan Herald*, in your last issue, on "City Refuse as Manure." To show your readers that this question is receiving attention elsewhere, I would refer them to a report of the conservancy arrangements of the city of Amritsur, which was published in the Supplement to the *Gazette of India* of 19th May 1877. I have reason to believe that the Amritsur system is being gradually introduced into the other Municipalities of the Punjab and probably in other provinces.

PUNJAB.

NOTE.—We shall probably have something to say about the conservancy arrangements of Amritsur, in our next issue.—ED., *I. A.*

VEGETABLE IVORY.

TO THE EDITOR.

SIR,—In reference to the article on vegetable ivory, which you have put in from *Hatters' Gazette*, in your last issue, will you kindly inform your Indian readers where the ivory nut can be procured, if one wishes to plant it. The description given shows that the tree is a palm-kind, very much resembling the cocoanut. I believe it will grow well in the Concan in the Western Presidency, where palms of all sorts grow in luxuriance. If the annual import of the nut into England be of the value of ten lakhs of rupees, then it surely is an article ... worthy cultivating in India.

VINAYAN J. KIRTUNE.

Baroda, ... September 1880.

NOTE.—We are ... aware that the tree has ever been tried, or that seeds are available, in this ... respondent is intent on making the experiment, we would re... ... apply to Kew Gardens, England.—ED., *I. A.*

THE "SOPARI" NUT.

TO THE EDITOR.

SIR,—Can you tell me—

1. What price "Sopari" or "Goar" nuts fetch per maund, wholesale, in Calcutta, both dry and green?

2. What is the average yield, per hundred trees of both dry and green nuts?

3. What age the trees are in full bearing, and what age they begin to bear?

4. What soil is most suitable for the "Sopari" tree, what manure, cultivation, &c., is required?

5. And anything in the planting of the trees, preparing the nuts &c. that it is necessary to know?

Any information on the subject will greatly oblige.

SOPARI.

NOTE—1. It is quite out of our way to know the constantly fluctuating market value of produce generally. The information may be had from any broker or bazaar *dalal*.

2. After the tree arrives at maturity, it may be calculated to give about 100 nuts per annum.

3. Begin to bear at 5 years, but are not in full bearing till 7 years old.

4. Almost any soil will do, and it requires little manure or attention of any kind; we may add it thrives best in a tropical climate

5. There is nothing particular in the planting of the trees, but cattle should be kept from the plants while young. The nuts are prepared for the market by drying in the sun in order to separate the nut from the outer husk—ED., *I. A.*

A SUBSTITUTE FOR THE POPPY.

TO THE EDITOR.

SIR,—I am advised to address you upon the following subject which is claiming attention in this country, *viz*, the necessity or advisability of providing some crops to replace the poppy where it is given up being cultivated, and induce others to replace the poppy by more useful products.

The demand at the present time for material for the manufacture of paper is a growing one on the part of the paper-makers, and the value of the fibre of the "Tree Mallow," for the purpose, has been ascertained and certified to by most of the leading paper-makers here who have offered £10 per ton for it, and who have expressed their readiness to make use of it, could they obtain it in sufficient quantity. Could this plant, which grows easily and luxuriantly in this country, be raised in the vacated fields, in India, so as to form a useful and profitable article of commerce? I enclose a few seeds for trial.

Devonshire, 31st August. A. HAY.

NOTE.—We do not quite understand what our correspondent means by the cultivation of the poppy being given up. We are certainly under the impression it is being pretty largely increased.

The packet of seeds referred to was duly received, and we shall be happy to hand a few to any of our subscribers who care to make the experiment and will report upon it to us.—ED., *I. A.*

VEGETABLE MOULD AND MANURES.

TO THE EDITOR.

SIR,—I feel rather surprised that in a large city like Calcutta, where there are so many plant fanciers and amateur gardeners, some experienced person has not thought proper to attempt the preparation and sale of vegetable mould and special manures on a large scale, as I have not the least doubt of this proving a very profitable business in Calcutta, and a considerable source of comfort and convenience to amateur gardeners. Seedsmen and nursery gardens have recently sprung up by dozens in and about town, and if what I have suggested above is only added to these institutions, the success and anticipations of amateur gardeners, and indeed of our annual horticultural shows, will have been secured, as the want of facilities in procuring manures, the inexperience of amateurs in preparing them, has been the cause of endless failures generally in raising a fine show of pot herbs and flowering plants.

I wonder that such manures as are adapted to horticulture, &c., are not kept and sold at the Society's garden at Alipore, in conjunction with the sale of plants—where it ought certainly to prove a profitable source of income.

A. C———TTE.

Calcutta, September ...

PAPER FROM MULBERRY BARK.

TO THE EDITOR.

SIR,—Will you permit me through your columns to draw attention to the bark of the black mulberry as yielding a large and valuable stock for paper making.

The mulberries grow extensively and luxuriantly in every part of Bengal, and in fact India, and the one I allude to, the *Morus Mauritiana* (of millid) is no exception to it.

In three years time a tree about 10 to 15 feet high can be grown without any care or trouble, and every inch of the bark can be turned into paper.

Instead of people fighting over the bamboo for a cheap paper stock, could this mulberry not be taken in hand and worked up? A plantation of mulberry requires no care, and the propagation is more simple and certain than that of almost any other sort of plant. My remarks are based on some paper made by me out of the bark of one of these mulberry tree branches. The branch I took was about half-an-inch in diameter, and about four feet long, and out of it I got two sheets of coarse paper about 6″×4″ each in size. I never was in the paper-making business, and my knowledge of it was got out of books; nevertheless I succeeded marvellously well, and I conclude from the ease with which I worked out the stock, and the quickness with which it set, (without the use of starch or any gunny material) that the fibre is a very fine strong one, every way fitted to be worked up into paper of great excellence. Another great advantage possessed by this mulberry bark is that it will require scarcely any bleaching.

I send you a piece of the paper* I made out of the bark in question, for the inspection of those who take an interest in the matter.

J. DENBRIA.

* We shall be happy to show the same to any of our correspondents who call.—ED., *I. A.*

TIMBER: INFORMATION WANTED.

TO THE EDITOR.

SIR,—Can any of your readers give me information about a tree which is growing at the lower part of my estate near a swamp? It is a large tree with dark green foliage, and bore a great quantity of seed or fruit this year.

The seeds grow in clusters like a bunch of grapes, and are of a pale yellowish green colour, about the size and shape of a small olive, and each seed pod contains four bright scarlet colored seeds.

A few days before the 'Onam' feast, the Mopahs were very busy collecting the bunches of seeds, and came for this purpose from all parts of Moopenaad. They appear to use the seed for catching birds.

The *modus operandi* is as follows:—A small tree is selected and all the leaves, young shoots, and ends of branches are cut off, leaving only a bare branching stem. The Mopah then provides himself with a quantity of thin bamboo spines about 18 inches long, and coated with a strong gum or bird-lime, and, starting from the end of one of the branches of the tree, commences binding with strips of bark, a row of the seed bunches at intervals of about 9 inches, and so on, until the whole tree is covered. He then takes the gummed bamboo spines, and sticks them in the bark, one over each bunch of seeds, with a slant outward and upwards, and the work is then completed. But although I watched several of the trees narrowly, I never saw how the birds were caught.

From what I could understand from the Mopah's description, the birds settle on the branches and eat some of the seeds, which have a stupefying effect on them, and the birds are held under the lower end of the bamboo spines by the gum, and are taken off by the Mopahs who are watching. These men brought me several parrots and *minas* as presents, which they said had been caught in this manner, but all the birds died within a week after I received them: this may or may not have been the effect of the seeds.

The Mopahs call the tree "Chemboo Maram," which, I suppose, is the Malayalam name, and they say the wood is excellent building-timber. I have been some 17 years in this district, but never saw any bird-snaring done in this way.

I have also lately come across several trees which are excellent building-timber, and do not think they are generally known. One is the

"Navilay Maram," which bears bunches of small blue plums, eaten by Coorumbers and other natives, and the wood is close grained, compact, and hard, durable under water and in damp places, and strong. Another is called the "Carray Maram;" the wood is of a bright reddish yellow, close grained, and easily worked.

Now that gold-mining is likely to increase in Wynaad, timber of all descriptions will become of value, and it is well to know that there is good timber to be had besides the well-known varieties.

F. P. HUGHES, C.E.

Kadalab, Moopenaad, Wynaad, 30th August 1880.

NOTE.—We have not heard of this tree under the name given it by our correspondent, but it seems to be the same that is common on the Kumaon hills under the name of Kurruk. The timber is used for the interior work of houses, and the birds feed freely on the berries.—ED., *I. A.*

VILLAGE ARBORESCENT PLANTATIONS.

TO THE EDITOR.

SIR,—For many years, both orally and by pen, I have advocated the partial reboisement of India by means of the village communities, but I do not think that my meaning has been realized by the gods of the Forest Department, as, up to the present time, they do not seem to have made any attempt with the experiment.

There is now a very good chance for such an experiment to be made. Just outside the old civil station at Phillour, a small but valuable fuel plantation is growing up under the fostering care of the Punjab Forest Department. It was commenced about fourteen years ago, and the generality of the trees, where open to the sun and air, are looking very strong and healthy, and are from 6 inches to 12 inches in diameter There is plenty of grass for grazing purposes under the shade of the trees.

My suggestion with regard to this plantation is as follows :—Allow the villagers to graze their cattle and cut wood for home consumption only, and not for sale, in it—of course, under certain regulations not to wilfully destroy any part of the plantation, and only to fell the trees for firewood where marked by the Government Ranger (who should be a European) in charge of the plantation.

Charge a small fee for each axe used in cutting this wood (*for home consumption only*) in the plantation ; such fuel only to be removed by licensed coolies, who should have a numbered ticket describing why the permission is granted to them ; the ticket to be printed in English on one side and the local language on the other. Also, let the axes be of a certain shape and numbered with large figures, the number of each axe to be entered in a book, and opposite the name and address of the owner.

Of course when large fellings for public sales occur, then the ordinary arrangements for working the trees and removing the wood would ensue, and need not interfere with the—so to say—private fellings of the villagers. In fact the branches from these large fellings would make capital fuel for the villagers.

In exchange for the above-mentioned benefits (because benefits they are when one recollects the distance the villagers now have to go for their wood, and to graze their cattle) let the villagers make over to the Government, an area of waste land now denuded of its trees and grass, equal to double the area of the arborescent tract transferred to them, They have the land at the back of the town, it is now lying waste and useless, and it would be a great advantage for many reasons to have it planted with trees. Let the Government set to work and plant that area with trees, and in about a dozen years' time the villagers would be able to use this new plantation as a grazing ground and for their supply of wood, and then allow the first plantation to have some rest ; or they could be used in turn so as to allow each a rest.

When the second plantation had reached its twelfth year, a third plantation could be started, which would most likely carry it out of the Phillour township into some adjoining village ; no matter, the benefit from the extension of these arborescent plantations is all the same to all parties concerned.

In this manner the villages of India would gradually obtain a large supply of fuel, and so release their cowdung for agricultural purposes, and thus benefit all parties, and in time a large revenue would be derived from these village plantations, though the initial expenses must be borne by Government.

The present plantation at Phillour requires thinning out to the extent of leaving a distance of 16 times their diameter between the trees, *i.e.*, a tree of one foot in diameter would have none nearer to it than 16 feet, the intervening ones being cut away ; one of 6 inches would be 8 feet from its neighbours—in this way light and air would penetrate the plantation and allow the trees to grow up strong, whereas now there are several spots where they are killing each other from overcrowding.

G. P. P.

August 27th, 1880.

MANURE FOR TEA-BUSHES.

TO THE EDITOR.

SIR,—May I trespass on your kindness and seek information as regards the application of fowls' dung to tea bushes. I have a large poultry yard of Brahma Dorkings and half breeds which yields me together with the geese and ducks, about half a bushel of manure per day, and I have some 100 cubic feet of dung collected. To make and apply liquid manure, would take more vessels and labor than I could afford, so I have thought to mix a bushel of fowls' dung with say 9 bushels of ordinary earth, open out the roots after the usual method adopted here in applying the ordinary horse and cow dung manures, and giving each bush say ¼ peck of the poultry dung mixture,—would this be too much ? Would it be better to top-dress under each bush with a certain quantity just after the rains begin? I suspect it would, and would result in throwing out spe[illegible] the[illegible].

A tea *garden* is not a garden but a *field*, that is, [illegible] can afford the manure to bring up the plots to garden[illegible], nor the time to prune each bush as it should be pruned, or get a herd of a couple of hundred daily-wage coolies to pluck with due regard to the next flush. Manuring must be done within a given time, or it will interfere with other work. Pruning to a certain extent must be "scamped" so as to get through it by the end of February. And as for plucking, it must be rushed at and overcome, not only to get in the leaf before it begins to harden, but to prevent the bush becoming dormant if left unplucked. I might, manage to top-dress and "lightly hoe in" the poultry yard manure between the August and September big flushes, but I do not know how much to allow per acre. Were I to apply too much and heavy rain follow, little harm would, I opine, accrue from its over-heating properties, but if little rain ensues, damage might follow. Books on manuring are all very well for ornamental shrubberies where due attention can be given to each individual plant, but what I desire to know is, what to do in plantation work, for between these is as great a difference as in "private practice" and a "field-hospital" during an engagement.

Pardon me for trespassing on your time, but help, if you can with your advice.

P. L. L.

Bhawarua, 31st August 1880.

NOTE.—Bird dung is fatal to tea bushes if applied undiluted, It would be useful and highly stimulating if applied say in the proportion of one to twenty of cow-dung, the whole thoroughly mixed, and applied, at the rate of say 8 seers per bush. If mixed with earth, that from the bottom of a tank or *jheel* would be best ; it might be mixed 1 to 10, and applied one-and-a-half seers to a bush. The best time for pruning is to commence the moment the sap is done, say one week after all growth is observed to cease, and get through with it as quickly as possible ; it should all be out of hand long before the end of February. We prefer pruning to be over by 15th January. Immediately the pruning is over, give the garden a deep and thorough hoeing and apply the manure. Rain would not cause heating with this manure, if applied diluted as we suggest. If our correspondent sees his way to applying this manure every year, we would recommend only two-thirds of the quantities per bush, which we have named.—ED., *I. A.*

COFFEE MANURING.

TO THE EDITOR.

SIR,—In a pamphlet by Mr. Eugene C. Schrottky, entitled "Tea-planting and Manuring," it is written :—

"It is a grievous mistake to defer the manuring of an estate to "the time when the plants, by disease, blight, and reduced yield "per acre, give evidence that the nourishment in the soil is not "sufficient to keep them in health and vigour. . . . .

. . . .

How dangerous it is for planters to wait till the very last moment, before using manure, we have ample proof by the ruin of many coffee plantations in Ceylon and Southern India. . . . .

. . . . "Borer and leaf disease ruined many a fine "coffee estate, and at one time, it may be said, that the coffee "industry of Ceylon was on the brink of ruin, low prices and diseased "estates being the principal causes of it. However, it recovered, "and it recovered by *a systematic use of manure*."

This pamphlet is stated to be a reprint from the *Indian Agriculturist*.

In the last number of this journal, I find an "extract from an "interesting letter of Mr. D. Morris" which compares coffee in Ceylon with coffee in Jamaica, and greatly to the disadvantage of the former. "For Ceylon planters there is, however, one lesson which "Jamaica coffee may fitly yield. It is a subject of frequent remark "in Ceylon, that there was no leaf disease before artificial manures "were used, and many good planters believe that if the use of "artificial manures had not actually introduced the destructive fungus, "it had at least prepared the plant for its attacks, so that it "became an easy prey. . . . . . . there can be no doubt that "by forcing a plant artificially, you introduce new conditions of life "which may ultimately prove disastrous. The soil of Jamaica is

"naturally much richer and stronger than that of Ceylon, and the "underlying rocks . . . . replace soil lost by waste, with "great rapidity, but if the system of *tillage* now pursued in Ceylon, "had been in existence there generally, fifty years ago, and the "rich surface soil had been preserved by drains and terracing, it is "quite certain leaf disease would never have been so fatal to the old "estates."

Now here be contradictions, and I should like to *know* who is right.

For myself I should vote for Mr. Schrottky as his theory is well reasoned out and seems like science and common-sense. I cannot quite follow Mr. Morris when he says "By forcing a plant artificially, "you introduce new conditions of life,"—so I dare say, you do but it strikes me that Mr. Morris by these words means that by giving a plant manure you artificially *force* it, while to my mind it seems that you *artificially force* a plant when you make repeated and repeated calls upon it, that, in a state purely natural it would not receive; are that by manuring it you artificially *feed* it, a well-fed plant with proper care being able besides to do a good deal more than a plant in a state of nature

Again, if the Jamaica soil is replaced with "great rapidity, that would put another complexion on the question—a new lease of life indeed! Lastly, will tillage in Ceylon or any where else do away with the practice of artificially feeding plants that you expect a good deal from, or, for that matter, *soils* that you expect a good deal from?

I believe that one Jethro Tull, who lived many a long day ago, found that pulverization pure and simple did not pay after a time, and at Lois-Weedon I believe that the Rev. Mr. Smith had to artificially feed the wheat on his *lighter* soils I think that a letter such as Mr. Morris' should not pass through the portals of an agricultural *rendezvous* without challenge nor be presented to the *habitués* as in this case, entirely without comment.

7th September 1880. F.

P. S—What is "forcing" a coffee plant? The answer that I think most correct is the act of making it bear berries prematurely. If to *manure* a plant, whether with 'artificial manures or others be to *force* it, and if this word be used in an adverse sense, the *whole question* of manuring is brought into dispute Liebig and Lawes would alike be liable to the charge of 'forcing

NOTE.—Applying manure judiciously is not "forcing Giving strong doses of hot artificial manures might be so-called Mr Schrottky appears to us to be right, as we regard the so-called coffee leaf disease as one entirely caused by want of nourishment to the plants which we have denuded in every way by pruning, plucking, &c And although the tea blight manifests itself somewhat differently we imagine it to be caused in exactly the same way. True pulverizing alone will only do good for a time, unless new soil from below is turned up to the pulverizing process As cultivation is generally pursued, by the ryots, only the top layer is so presented to atmospheric influences—ED., *I. A.*

UNANIMITY AMONGST TEA-PLANTERS.

TO THE EDITOR.

SIR,—Your issue of the 1st September has been received some days ago, but I have only to-day looked into it, and in doing so, have come across your article headed "Unanimity Amongst Tea-planters

I happened to be the Chairman at the meeting held in Silchar, to which you refer, and the proceedings of which have seemingly moved you to write the article

I do not intend to enter fully here into such a lengthy question as the amendment of the Coolie Act, but as it appears to me your strictures on the action of that meeting are wrong and not borne out by facts, and that you are mistaken in some points, both in reference to the proceedings of the meeting and the way in which Act VII. of 1873 should be amended, I will ask your indulgence for space in your valuable paper for this letter.

Instead of, as you say, the meeting being wanting in unanimity, the reverse was the case for out of eleven proposals passed, only on one of these was there any real difference of opinion, and that was in reference to the term of agreement You imply that nothing was done at the meeting, and of course there may be differences of opinion regarding this. But I am perfectly satisfied that if the Coolie Act were amended in accordance with the eleven proposals which were passed, the tea districts to which the Act applies, would be very generally benefited.

As for the meeting being, as you say, "for the purpose of emphasizing the memorial' of the Home 'Indian Tea Districts Association," I must beg to tell you that it was for nothing of the kind. Government asked a certain number of planters to give their opinion as to how they thought Act VII of 1873 could be amended. And had I thought that I was supposed to give my vote in favour of the five years' term of contract, just because that Association said it was right, I should not have attended the meeting at all; for ten times rather would I have the present Act than a new Act altered in the way you seem to advocate, and which includes the five years' term. If the Home Association want their resolutions "emphasized" by tea-planters out here, before passing such resolutions, they surely ought to ascertain first if the planters will do so. If they want us to say "hear, hear" to all they advise they must have their party properly educated!

I emphatically think the extension of the term of agreement to five years would be going backward Instead of being a reform, it would simply be going in direct opposition to what I believe amendment to be. What is wanted far above all other points is, not an extension of contract, but facilities for opening up the country and allowing a free flow of labour into it. A five years' term would therefore be an obstruction and not a facility We want to be able to land coolies on our gardens at a fair cost, and that need not be, for Cachar gardens at least, more than from Rs 15 to 20 per adult, whereas we have now to pay four times these sums, and the coolies, instead of getting the benefit, actually lose by the expensive system. If the country were opened up to let labour flow in freely, bonuses would very soon disappear from our monthly statements, which I think are the only items on tea gardens that coolies should not have

My opinion has always been and it is stronger now, that the Coolie Act is a mistake, and if I had my will I would throw it into the fire and make an end of it at once. This opinion I have sent up to Government, and had I thought they would have entertained such a proposal, I should have brought forward a motion to that effect at the meeting at Silchar. For I think the common law of the land is quite sufficient to protect both coolie and planter, and we would be all better off without the special law

And further, I beg leave to say, Sir, that you have taken one or two unfortunate instances to support your argument that the Act bears heavy on tea-planters, but I shall merely allude to that one about rice In the tea districts I believe the law is judiciously administered, and we have no just grounds of complaint against it in its working here, the sanitary conditions the proper care of the sick, and the comfortable housing of the coolies, are conditions which every right thinking man would consider himself bound to carry out without any legal compulsion And, barring the money paid for getting coolies to re-engage I do not see it possible to give our coolies less for their labour It is therefore not so much in the sections referring to the tea districts that the law needs amendment but while the law does exist, there should be a maximum limit for rice, though, instead of Rs 3, I think it might very well be made Rs 3 8, which a coolie might be able to pay even in extreme times. No one wants to starve his coolies, and tea or any industry should be able to afford wages to keep a man, his wife, and family in a comfortable state, at the very least, so far as food and clothing are concerned. If a garden cannot do that, much better shut it up, and not allow it to continue dragging a lingering existence with the savings which are justly owing to the coolie There are few gardens I doubt, if any where the men all over earn an average pay of Rs. 5 per mensem, it is therefore perfectly impossible, if coolies are to be kept in health, that they can pay famine rates for their rice, such as Rs 4 or Rs 5 per maund Even a single strong healthy man cannot pay this without loss of vigour, for he must then eat less, what then must be the case of a married man with a wife and two or three young children who are unable to earn anything? In Cachar, at least, I know there is no need to charge the coolies famine rates In my own case all my coolies, without regard to Act VII., re engaged or non-agreement,—all alike,—get rice in the dearest times at Rs 3 per maund, and I do not actually lose by doing this, for in ordinary and cheap times the loss is recouped. My coolies are always eager to take the garden godown rice, in dear or cheap times, and yet we are surrounded by a large village population and extensive rice fields, and there is perfect liberty to the coolie to go and buy his rice anywhere. I buy large quantities of rice at a time, and therefore I get it at a price which enables me to sell it to the coolies at an advance of from four to eight annas per pound, and yet not be charging above bazaar retail rates. And, unless there is a very large local village supply, it is better that the garden should provide rice for the coolies, in any case it would be much better for the newly imported coolies, for when they get their whole wages into their hand they are most likely to go and spend a great proportion of them at once on worthless and injurious bazaar stuff, and there is not sufficient left for their rice and other necessaries.

And now, Sir, in conclusion, I beg to say that I think you should powerfully advocate the free flow of labour into the tea districts from all India, so that they will eventually become rice exporting, instead of rice importing countries, and then the special law and the cruel planter will disappear and tea will bloom and flourish and make our fortunes.

WM. AITCHISON,

Doloo, Cachar, 17th September 1880.

NOTE.—Does our correspondent not see that his letter only adds force to our argument regarding the want of unanimity amongst proprietors of Tea Gardens.—ED., *I. A.*

TEA-MAKING.

(To the Editor of the Ceylon Times.)

SIR,—It is commonly understood that the chief reason for the preference of tea over coffee is the facility with which the former is made as compared with the preparation of a cup of coffee. According to popular idea, we have only to put some tea in the tea-pot, pour the water on it, and there you have the tea ready for use. This is perfectly true as regards the way in which tea is usually made, but this the fact that to produce a really good cup of tea, attention to a few essential points is absolutely necessary, which said points I believe to be rarely if ever attended to. In the first place the tea-pot should be heated by means of a little scalding water before attempting to make tea in it; in the next place, the greatest care should be taken that the water, is not merely what is popularly termed 'boiling hot,' but it should actually boil at the moment of being used. These points being attended to another and equally important one has to be considered which is, that the water should be allowed to stand on the tea for a very short time, three or four minutes being sufficient to extract all their aroma from the leaves, any longer infusion only serving to extract the tannin from the leaf, thereby imparting to the liquor an unpleasant astringent taste.

I have often heard the complaint made of the very astringent flavor of Ceylon tea: you may rely upon it that this unpleasant taste is mainly caused by the length of time which tea is generally allowed to stand before being used. Of course, to adopt the system I have mentioned, and which is invariably used in China, you will have to make a liberal use of the leaf, but unless this is done it is impossible to obtain a pleasant cup of tea. I suspect that medical men will tell us that the constant use of strongly astringent tea, especially if taken early in the morning is very apt to prove injurious to the digestion, but apart from this question it is far more satisfactory to sip a cup of mild pleasant-favoured tea, than to swallow a liquor in which the true aroma of the leaf is overpowered by the bitter astringency of the tannin principle.

OLD CHINA.

August 26.

PEABERRY COFFEE.

(To the Editor of the Ceylon Times.)

SIR,—I notice in the bi-weekly *Messenger* the following statement in regard to peaberry coffee as noticed by the Melbourne Commissioner. Who is right? the *Messenger* or the "Commissioner"—or is the former only pulling the leg of the latter? "Peaberry coffee is not formed of "two beans coalesced" as the *Observer* says it is, but by the abortion of one bean and the filling of the space usually occupied by two beans by the other one. In the fruit of the kittul palm there are usually two seeds with their flat sides together, but sometimes the two seeds grow together and form a single round one. The same thing happens with tea seeds. In either of these cases it would be correct to say that the round seeds were formed of two ordinary ones coalesced, but in peaberry coffee the abortive bean is always present by the side of the round one."

Who is right? The Commissioner who has been appointed on account of his great experience, or the editor of the little paper.

I should like to submit another question. What is the cause of the formation of what are known as elephant beans? Are they simply abortions and imperfections, or are they also two beans coalesced? Some of them, as regards size, might be, for the matter of that, Cerberus coffee,—three rolled into one!

MOCHA.

September 1.

AFRICAN PALM-NUT SEED.

(To the Editor of the Ceylon Observer.)

SIR,—As there are many people now desirous of trying the cultivation of this palm, it will be just as well to mention that if they meet with disappointment, it will be simply the result of bad seed.

The palm *kernels* and *husked palm nuts* are both exported to Europe: neither of these are fit for seed. The outer covering or husk should not be removed, for the same result will follow as when cocoanuts are deprived of their husk and put out in a nursery—rapid growth and short existence. Intending growers should take care to get the seeds in their *natural* state—that is, with their husks or covering—and in a fresh state: they should not be oily to the touch, for then they are old. Immense sums of money were expended on rubbish called Liberian coffee *seed*. The Colony cannot afford in these times to waste money in buying seeds which are unfit for growing; and besides, the bad results serve as a check instead of an encouragement to those who have the funds and energy and pluck to try new products.

TRUE BLUE.

AVERAGE YIELD OF COCOANUT PALMS.

(To the Editor of the Ceylon Observer.)

SIR,—The Commissioner of the Melbourne Exhibition, in his note on the staple products of the Colony, as published in the *Observer*, has fallen into a slight error on the average yield of cocoanut estates. Only on well-kept estates, where anything like cultivation is carried on, does the average yield per tree per annum reach 40 nuts. Where estates are kept clean and not manured, the average yield per tree ranges between 25 to 30 nuts per annum, and in native holdings the average seldom exceeds 20 nuts per annum. There are some trees in favourable localities which yield 150 or 200 nuts. A tree on the estate of a well-known Ekella planter-proprietor lately bore two bunches, the nuts in each bunch exceeding 150! The natives of the adjoining villages flocked to see these extraordinary bunches of cocoanuts. They would have been sent to the Exhibition, but for being too large and cumbersome, and for all the nuts dropping from the bunch by the time they were landed in Melbourne.—Truly yours,

Colombo, 24th August 1880. B.

[An average of 40 nuts per tree was adduced as a high one. We are well aware that for all cocoanut cultivation in Ceylon 25 to 30 would be nearer the mark.—ED., *C. O.*]

THE GOVERNMENT AND THE COAL TRADE.

(To the Editor of the Englishman.)

SIR,—Are you aware that Government have turned coal merchants? At least the E. I. Railway Company, now a Government concern, not satisfied with the powers they obtained for raising coal for their own purposes, are selling coal in the open market in competition with colliery proprietors and, I may say, importers, while, at the same time, certain facilities formally granted to the coal trade have been withdrawn or curtailed by the Railway authorities. This looks very much like a device to fetter private enterprise, and to usurp, under the shelter of a Government guarantee, a class of business which does not fall legitimately within the province of Government to undertake.

I am sure the gentlemen in charge of the affairs of the E. I. Railway Company, are, in what they are doing, greatly over-stepping their powers, and I am equally certain that it is only necessary to point out their transgression in order to obtain relief. I do not for a moment wish to insinuate that Government has any knowledge of what is going on, or that, as a Government, it is conniving at it, but its duty is clear, viz., to put an immediate stop to these illegal proceedings.

Calcutta, September 1, 1880. MERCATOR.

CROCODILE OIL.

(To the Editor of the Delhi Gazette.)

SIR,—I see by your columns that the Agri-Horticultural Society wish for information on the above subject. Mr. Purcell who, I believe, is now in Hyderabad, Deccan, may have had means of procuring it, and might be addressed through Mrs. Purcell who is in Mussoorie I hear, but I don't think it is procurable in any large quantity in the N.-W. Provinces, though it is pretty largely manufactured by the Sanif tribe in the Punjab. who eat the crocodile, and the Glasgow firm who are anxious to procure it. I would be happy to assist in procuring it if they will communicate with me, care of your journal, as they think it invaluable in the tanning of leather by some new process, it could also no doubt be manufactured in large quantities in Rajpootana where the crocodiles abound in all tanks. I think a factory could be started for its manufacture in Rajpootana, by having a Central Depôt and offering inducements to the natives to manufacturing it, and purchasing it from them.

PHILO.

WHITE ANTS.

(To the Editor of the Times of India.)

SIR,—Will you or any of your readers be good enough to inform me what are the best means for preserving the roots of flowers and other shrubs from the attacks of white ants? I have nowhere seen these insects in larger numbers than in Guzerat, and unless I succeed in keeping them away from my plants, a whole month's labour in trying to raise a garden here will have been lost.

Ahmedabad, July 28. HORTUS.

ANTIDOTE FOR WHITE ANTS.

(To the Editor of the Indian Daily News.)

SIR,—Permit me a corner in your journal to insert the following recipe for the information of inquirer "Anxious":—

Ol. Petroleum	...	...	... 1 part.
Refined Pitch	...	...	... 3 parts.
Crude Acid, Carbolic	...	...	... 2 parts.

Mix.—Painted on the sides of beams, &c., it will effectually destroy "white ants."

September 18th, 1880. G. B. B.

AGRICULTURAL REFORM.

(To the Editor of the Indian Daily News.)

SIR,—We have social reformers, religious reformers, law reformers, and last though not least, agricultural reformers. In no country of the world so many reformers abound as in India. Of course the land is wide enough to contain so many. But we purpose to deal with the last; the rest have become too hackneyed to form the subjects for discussion.

Mr. Buck, of the North-West Government Farm, has found fault with the Indian farmers, and concludes that the native mode of cultivation is defective for the following reasons:—

1. That the natives do not use the English-made plough, and are accustomed to shallow ploughing.

2. That they are ignorant of manuring.

To remedy the first, he suggests the use of the American plough, which is not unwieldy, and is almost of the same value as the native one. We must thank Mr. Buck for this benevolent suggestion, though we cannot say that deep ploughing would bring in a greater quantity of harvests in a country like Lower Bengal. For though his suggestions are not theoretical, yet the geographical situation of the place of his trial does not satisfy us that the same result would follow were the experiment made elsewhere.

With regard to manuring, he has, perhaps, said too much or too little, and to our simple apprehension, to no purpose. To think that the natives are ignorant of the benefits of manuring, is a mistake as much as or greater than to suppose they have no religion, nor society. But perhaps Mr. Buck is not aware of the condition of land in Lower Bengal, and its principal staples of production.

The land in Bengal may be comprised as high and low, hot and sandy, cold and clayey; and the principal staples of production are paddy tobacco, sugar-canes, and pulses.

Of paddy there are two crops—cold and autumnal. The former, which may be called *palustrine*, is obtained from lands which are considered as most unfertile. Deep ploughing of such lands would hardly be advantageous, as the roots of plants will be beyond the reach of air, while manure will be of very little service. The other crop is reaped from either hot and sandy, or half marshy, lands, and for reasons above, it does not admit of deep ploughing, while manure would be only productive of larger stalks with less of corn.

Of the rest of the staples, tobacco and sugar-cane are the productions of high lands, and of naturally rich soil, and if any descriptions of land require manuring and deep ploughing, it is these. But they bear a proportion, it may be said, of about 10 per cent. to the arable land. And although the native mode of ploughing may be defective, yet it cannot be said that they are ignorant of the sort of manure which these lands require.

The manures which the natives use for these lands are marl and cow-dung, and these are found by experience to be the *only* manures which hot and sandy lands require, if the other manures, such as bones, &c., have never been tried.

The only defect, which may be found in Indian agriculture, is the want of a barometer to guide the farmer as to the best season for sowing and mowing.

If our Government take this subject into consideration and supply the Indian farmers with this instrument, we shall feel very thankful. Of course, we mean that every village headman or *mondol* be furnished with it, together with instructions for its use in the vernacular—Yours, &c.,

Sheebarnapur, August 11th, 1880. K.

SERICULTURE IN THE DUN.

(To the Editor of the Pioneer.)

SIR,—I have had sent to me a copy of a portion of your issue of the 18th June, in which there is a very interesting article, by a correspondent, on silk cultivation in the Dun, and which is concluded from the *Pioneer* of the 27th of May. Before I go further, will you kindly permit me to refer to the old adage, that "a fool and his money are soon parted" and after that also to observe that in this sublunary sphere there are people born to waste money, and such people readily find, if they only talk loud enough and print sufficiently, other people and Government officials too, who believe in them, and accept them, as workers of wonders and miracles. A case in point is this monomania for rearing silk worms in the Dun. A man has come out all the way from England at great cost, with a large store of money at his command to cultivate silk in the Dun. He is working with a zeal and energy worthy of a Goliath, he is spending money by the "shovel full," the officials of the Dun are giving him extraordinary assistance, and he believes he is on the right way to a silken "Bonanza," instead of which, from the man's own figures, I predict a general collapse of his business, loss of money, and a grand failure to be placed on record. I leave out all the pretty scenes and romance of your correspondent's letter, beginning with his fine waler and the trap in which he drove down; I leave the French statistics too, and I start on the para. in which Mr. Lepper states that an acre of mulberry will yield 12 maunds of green cocoons, fetching Rs. 30 per maund or "Rs. 360 per acre!" Wha! Wha! how fine! What a fortune! Hurrah for Mr. Lepper! Now, I am a business-man, who can claim about 22 years' experience of raw silk, both tusser and the one being dealt with by Mr. Lepper; and I believe the waler horse, trap, and 1,300,000 mulberry plants will all have to turn insolvent at the rate at which Mr. Lepper purposes to work. Dealing with the 12 maunds of best cocoons, we shall have at most from them 36 seer of best silk, and consequently the silk will stand us Rs. 10 per seers for cocoons only. Say the reeling off of the silk, the establishment, the fuel, &c., costs Rs. 4 per seer—and it will not cost less, unless large quantities are manufactured; add to it transit and packing charges, agency charges, exchange, insurance, &c.; and the sum total for each seer of Dun silk delivered in the Europe markets will not stand under Rs. 16 to 18 per seer. The best Surdahs in ordinary season seldom fetch over 30*s*. per lb., and generally sell at 24*s*. to 26*s*, per lb. Now, will you kindly take 26*s*. from Rs. 16, and let me know what Mr. Lepper is going to earn? It is simply absurd to attempt to grow mulberry and rear cocoons, when, in Bengal, about 200 square miles of country grow mulberry and rear cocoons, and the manufacturers cannot make it pay. I have simply dealt with the weight of cocoons and their yield. Mr. Lepper has probably yet to learn that cocoons which spin in cloudy and "muggy" weather yield very bad silk, still worse produce, and a host of other things. The *Bombyx chori* is doomed as the silk of the future. Cheapness is the all-absorbing question of the present end of the century, and cheapness cannot be procured out of the Bombyoidæ—they are the aristocratic cocoons and cost heavily. They are delicate gentlemen, and the least thing lessens their goodness. They must be worked off without delay, and therefore unsuitable to Indian manufacturers. The silk of the future is the tusser. The *antheria paphia* and its congeners—coarse plebeians who feed out in the open air on the terminalias,—do not care for wind or rain, can be kept a year or two years, and reeled off into silk that could be laid down in Europe at 16*s*. a lb. or even less; all expenses paid. Let Mr. Lepper drop all his Bombyces and take to tusser. He will find tens of millions of asân trees—terminalia—wherever the laterite soil exists on which to feed worms; his maund cocoons will cost about Rs. 30, but the yield from them will, on an average, be about 12 seers of silk, which, at the moderate figure of Rs. 10 per seer, will yield Rs. 120, leaving a balance of Rs. 60, at least, after paying all charges. Let him set about this, and the fortune of his principals is secure.

"THE PUNDIT."

The Indian Agriculturist.

CALCUTTA, OCTOBER 1, 1880.

IRRIGATION IN THE PUNJAB.

WE have reviewed the results of irrigation in the widely dissimilar provinces of Bengal and Sindh. The report on irrigation in the Punjab for the past year relates to a province occupying, as it were, a position midway between these two. In some parts of the Punjab, canals are as much a necessity as in Sindh; in other districts, they are more or less a luxury. The Punjab canal system is divisible into four branches,—the Western Jumna canal, watering the districts of Umballa, Karnal, Rohtak, Hissar, and Delhi; the Bari Doab canal, which protects Lahore, Gurdaspur, and Amritsar; the Sutlej canals, extending to Lahore, Montgomery, and Multan; and the inundation canals of Shahpur and the Derajat. Taking all four together, the capital sunk in canals is about $4\frac{1}{2}$ millions sterling, but only $2\frac{1}{4}$ millions of this represent the outlay on canals actually in operation. It is upon this latter sum, of course, that calculations of profit or loss must be made; and in this respect it appears that the net return, after deducting working expenses, comes to nearly 3 per cent.; while if the land revenue dependent on canals be reckoned in, the return rises as high as seven per

cent. By the first method of calculation, canals would seem to be a losing speculation, for the capital sunk in them has been borrowed at 4 and 4½ per cent.; but by the second method not only is this interest paid off, but a clear profit of nearly 3 per cent. remains over and above. It therefore becomes a question of some nicety, how far the inclusion of land revenue returns is legitimate. Hitherto, in the case of most canals, the estimates have been more or less vague and approximate; a certain share of the assessments has been assumed as dependent on irrigation, but it has never appeared in the shape of a water-cess, nor has it been directly and demonstrably connected with the benefits of canal water. Several years have elapsed since the first attempt was made to separate the water-revenue from the land-revenue in the districts of the Amritsar division. The principle found favour in 1865, when the settlement of those districts was under revision, but it turned out rather badly in its practical development. Briefly explained, the procedure adopted was to rate the dry soil at a low all-round valuation of eight to twelve annas the acre, and then to add special rates for irrigated lands. Canal-watered lands would thus be assessed, for instance, at ten annas per acre "on their dry aspect," as the phrase went, and at twelve annas per acre on their irrigated aspect; total, one rupee six annas per acre. Lands watered from wells were differently treated. To the all-round dry rate was added a rate on wells, distributed over the area watered; thus a well would be rated at Rs. 20 and a village containing (say) three such wells would pay eight annas per acre on the dry aspect of its cultivated lands, and Rs. 60 for the three wells. This method of well-assessment involved a considerable sacrifice of revenue, and has since been condemned. But the method of canal assessment has proved a success, and in the revision of assessment now going on throughout the Punjab, this method has been or will be adopted. This will introduce accuracy into the accounts of the Canal Department, by enabling them to show, on grounds capable of proof, how much of the land revenue of the province is due to canals. Meanwhile the actual estimate may be accepted as approximately correct, and we can safely assume that the Punjab canals are more than paying their way.

The oldest canal is that of the Western Jumna. It shews a clear profit of no less than 13¼ per cent., *exclusive* of the land-revenue returns. If the latter be added, the profit rises to more than 15 per cent. No doubt the land-revenue due to the canal is at present inadequately represented, and one result of the new arrangements now in progress will be to enhance the profitable appearance of the canal. These favourable results, however, are largely due to the comparatively small outlay of capital upon this canal. A part of the work was done in the days of Moghal rule; the name of Ali Mardan Khan is inseparably connected with it, and the boon conferred by him upon Delhi is still commemorated in the songs of Hindoo women, praising Delhi as a pleasant city, with its water raising gold—*Dilli shahr suhágan, kanchan barsat nir.* Thus the Jumna canal is hardly a fair example of remunerativeness; though, on the other hand, it is to be noted that the year was not a propitious one for profits, the area of irrigation having been materially diminished by the fever which prostrated the agricultural population. The returns for the Bari Doab canal are not nearly so encouraging: indeed, the canal is apparently worked at a loss, for the profits, including land-revenue, amount to little more than 3 per cent. on capital outlay, thus leaving a dead charge of one per cent. for interest. But the loss is only in appearance, and can easily be explained. The assessment of land and water separately, first tried about 1865, did not escape the errors incidental to first attempts. It has already been shown that the well-rate proved a failure; and the separate rates for canal irrigation, though highly successful in principle, were pitched much lower than those realised in subsequent assessments elsewhere. It is calculated that at the rates commonly prevailing in other districts, the land-revenue dependent on the Bari Doab canal is really sufficient to raise the profits nearly a lakh and a quarter in excess of interest charges; in other words, the canal really pays its way. The settlement in some of these Doab districts is about to come under revision, and we may expect, among other results, a large addition to the amount of land-revenue credited to the canal. In some respects the Bari Doab canal is an exceptional work. It furnishes the first instance of a regularly built weir across the boulder bed of a river in Northern India. The fall is no less than 32 feet per mile, and the rapid volume of water rolls along a broad shallow channel, covered with boulders of all sizes. No other stone is procurable, and the weir had to be built of boulders set in mortar. The escape channel has twice been severely damaged, and probably the work will prove a constant source of anxiety and expense. With every freshet, the river reasserts its tendency to turn bodily into the escape channel, and strike out a new course, quitting its old bed, which has been defiled by the boulder-built weir.

The remaining classes of canals, *viz.*, those of the Sutlej and those of the Indus, are inundation canals, filled only during the annual floods of the rivers from which they are drawn. The Sutlej canals shew an enormous profit, for the simple reason, that the land-revenue is almost wholly dependent upon them. In the Indus districts, the canals have to contend with overbearing floods, and uncontrollable hill torrents, both of which annually contrive to work much damage, and, as a financial speculation, these canals do not appear to be remunerative. But the truth is, that the canal accounts do not and cannot include all the profit derived by the country from the works. The value of the crops raised on canal-irrigated lands in the Punjab is estimated to exceed five millions sterling; and if only half of this be assumed as creditable to water, such an addition to the wealth and resources of the country would justify even a much larger expenditure than the capital actually invested. Calculations of return on capital may be to a certain extent delusive; they certainly are delusive in the case of the Western Jumna canal, which redeems the whole of the Punjab canals as a financial speculation. But there can be no mistake about the increased productiveness and the protection against famine which are the results of canal irrigation. In the Punjab, at least, these vast public works are amply justified by the benefits they have secured; and it is not unreasonable to hope that the sphere of their usefulness will go on extending year by year.

PERSIAN OPIUM IN CHINA.

SOME papers lately received from the Press Commissioner contain interesting information regarding the extent and development of the trade in Persian opium in China. From the statistics that are given, it would appear that though Persian opium has long been known in some districts, it has been imported only in trifling quantities until within the last two or three years. In 1878 in the consular district of Chinkiang alone, the import of Persian opium suddenly increased to twenty times what it had been before. The following year showed a still further increase in the imports, which amounted to 721 piculs (1 picul being equal to 133⅓lbs. avoirdupois). This increase seems to have taken place at the expense of the Malwa drug; for while both Benares and Patna opium show a very satisfactory increase, the imports of Malwa have steadily declined since 1876 in this district. It is, therefore, evident that Persian opium is not taking the place of Patna or Benares. But there can be little doubt that the Malwa manufacture is better than any of the others. The great rise, however, that has taken place within the last two years in the price of Malwa, has militated against its extended consumption, and in fact so long as Malwa maintains its present high price, there must continue to be a demand for Persian opium. The Chinese do not seem to really like the Persian opium, and only use it for mixing with other kinds (Malwa chiefly), thereby effecting a saving in price.

Mr. Giles, Acting Consul at Amoy, tells us that the Chinese in that part of the empire are decidedly averse to the Persian drug. They say it leaves a rank, frouzy taste in the mouth of the smoker, and causes hot risings in the throat. It consequently finds little favour with the people, unless perhaps when the price of other kinds may happen to be exceptionally high, in which case a mixture of Persian and Indian opium can be procured at a lower rate. Mr. Bulloch, Acting Consul at Chinkiang, is of opinion that the demand for Persian opium will depend on two things: *first*, and chiefly, on the manufacturer's bestowing sufficient care on its preparation; *secondly*, on Malwa's retaining its present high price. As the best Persian

opium, Mr. Bulloch adds, can be mixed with Malwa in equal proportions, it is possible that it may interfere with the demand for the latter to a very serious extent. But it seems that there is no possibility of its ever taking the place of Malwa for separate smoking, unless the Chinese get used to the burning taste in it of which they complain. Such a thing of course is not impossible, but there are no signs whatever of it at the present moment. Chinkiang is by no means the only district where the consumption of Persian opium has suddenly exhibited so great proportions. A glance at a comparative table of the Trade Returns of Kiukiang shews an enormous rise, within the last two years, in the imports of Persian opium. Although the drug has been known in this market since 1865, it has never attracted any notice to speak of, until two years ago, in 1878, when a sudden and unexpected demand arose for it. Mr. Scott, Acting Consul in this district, says the only explanation he can obtain of this abrupt increase in the consumption of Persian opium is, that it was not until 1878 that even the poorest class of opium-smokers would knowingly tolerate any adulteration of the Malwa opium used by them. But in that year they found that the loss of strength and flavour resulting to the latter drug, from an admixture of the former, was sufficiently compensated for, in their reduced circumstances, by the reduction in the price. The debased taste thus forced upon them in their poverty has continued; but it is possible that returning prosperity may again cause them to revert to their former demand for pure Malwa opium. Mr. Scott is of opinion, however, that the ratio of increase in the use of Persian opium for the last two years, will not be maintained; on the contrary, he believes that a decrease will take place. In fact, Mr. Scott attributes the consumption of Persian opium in his district entirely to its cheapness as compared with the Indian drug. The proportion of Persian opium to Malwa, when the two are used together, is, we are told, about one or one and-a-half parts to five. In Kiukiang the well-to-do still smoke nothing but pure Malwa, the other kinds of Indian opium being practically unknown in that market. From what Mr. Scott says, we should think Persian opium will soon find a formidable rival in the native manufactured drug. The former "appears to possess no recommendation other than its cheapness; in strength and flavour it is declared to be greatly inferior to the Indian drug, and it would seem that it owes its prominence in this market, as compared with native opium, to accident; for if it is true that Persian and native opium are, as is asserted, on a par as regards quality and flavour, the latter drug, being only 7-11ths of the price of the former, must, if they come into competition, have the advantage."

Much of the Persian opium that is shipped from Bushire comes from Yezd. Mr. Bulloch tells us it is sent to Hong-Kong on commission, nearly a moiety being consigned to Messrs. D. Sassoon, Sons & Co. The Sassoon firms say that chest for chest their dealings in Persian opium pay them better than those in Indian opium, the loss of interest on the capital invested in the latter being so heavy. With Persian opium, on the other hand, there is no risk; advances are remitted on its arrival at Hong-Kong, but account sales are, of course, only rendered on the chests finding purchasers. This is doubtless a consideration that must tell in favour of Persian opium. But, notwithstanding that Malwa is thus somewhat heavily handicapped, we have little fear that it will be able to hold its own against the Persian product, unless the latter is susceptible of very great improvement both in its growth and manufacture, while at the same time its comparatively low price is retained.

THE NAGPORE MODEL FARM.

We have been favoured with a copy of the Report on the Nagpore Model Farm for the half-year ending 31st May last. This Report is, as it were, a continuation of, and a supplement to, the Report for the previous half-year. It records the subsequent history of the various crops of which details were given when they were in the ground, at the time the former Report was issued, and in short it sums up generally the results of the year's work. The first thing to which our attention is drawn is, that no rainfall was registered during the whole period of the six months now more particularly under review, whereas in the former Report it was shown that the monsoon rains had been heavier than usual, and that their ill-distribution had tended to increase their bad effect on certain crops and soils The Report deals separately with each of the following crop. —*viz.*, jowari, cotton, thur, linseed, wheat, gram, lucerne, guinea grass, castor, ginger, turmeric, and onions—some of which we shall briefly notice.

Jowari.—The difficulties consequent upon the heavy rainfals of last year prevented a successful crop on any but the best drained soils. Although, owing to the rich nature of the soil around Nagpore, the season was not on the whole unfavourable to the growth of jowari, yet in deep, well cultivated lands, the excessive wet caused these usually favourable conditions to be a source of injury to the crops. But notwithstanding the difficulties encountered with jowari in the past season, it is satisfactory to find an outturn recorded of 300lbs. to the acre over an area of eight acres, some of which is covered with little or no soil; while at the same time, as Mr. Hooper (the Superintendent) tells us, "the compensating high price of *karbi* fodder enabled us to show some return for the labour expended on the crop." For it appears that, unlike that of the grain, the price of the fodder is determined locally, from which Mr. Hooper seems to think that jowari, in ordinary years, is, commercially speaking, as much, if not more, of a fodder than a cereal crop. During the present season, we are told, "the cultivation of jowari will be carried out with the same special objects as during the past year, *viz.*, to determine the relative expediency of thin and thick sowing, and the effect of thorough cultivation of the soil, by ploughing and other means, previous to putting in the seed."

Cotton.—The expectations previously formed as to the outturn, were not realised. The unfavourable state of the weather,—cold and cloudy—towards the end of last year, seems to have done serious injury to the crop, and it was not until three months later when, in the middle of February, a sudden rise in the temperature took place, that the plants revived. Fresh heads then began to appear, which developed into bolls of fairly good cotton, and these "we continued to pick until the month of May." Mr. Hooper is not at all sure, however, that the weather was altogether to blame for the crop. He says, "it was discovered that the small fruit was on too weak a peduncle which dropped from its base along with the young boll and the bracts." Then again, the land on which the crop was grown was heavily manured with poudrette, which Mr. Hooper suggests might be a reason for the abnormal development of leaf, at the expense of flower and fruit, which took place. But against this must be put the fact that on an unmanured field the same cessation of fruiting was observed. On the average about 33lbs. of clean cotton, valued at from Rs. 8½ to 9, was the outturn per acre, but this calculation does not take into consideration the space occupied by several rows of wide spreading thur bushes, which were planted alongside of the cotton, the reasons of which we shall give further on. Though the season was unfavourable, commercially speaking, yet we are told it "was profitable in so far that it gave an opportunity of studying the various effects upon the Hingunghat cotton plants of sudden changes of temperature." This is going rather far in search of an excuse for minimising an evil. We must say there seems to us to be a touch of the comic about this pretended "profitable" result.

Thur.—Some interesting and important information is given under this head. Like jowari, thur suffered from the constant rain and cloudy weather. Insects also, and root fungus which attacked the plant, operated against the crop. It is, therefore, not surprising that the yield was not heavy. Some experiments were conducted in which a mixed growth of jowari and cotton was attempted; and the results obtained were very successful, the return in grain from the bushes grown among the cotton being highly satisfactory. Thur bushes were planted in every fourteenth line, in lieu of cotton, over the whole field of 25 acres. Although this would represent a space of only one-fourteenth of 25 acres, yet, owing to their spreading, the thur bushes actually

covered a much larger area. But, allowing even that the bushes occupied one-fifth (5 acres) of the whole field, the result shows an outturn of 3,600lbs. of grain, or over 700lbs. to the acre. This, we are told, is a yield "more than double what we have registered for our pure thur crops." It should be remembered, however, that the land was well cultivated and manured. Another important result that this experiment of mixed growth brought under notice was the comparatively small damage done by insects to the crop. This was very marked, and Mr. Hooper attributes it "simply to the difficulty the insects had to circulate, except on the line they started from, owing to the cotton plants." But in attempting experiments of this kind it is highly desirable that plants requiring different elements for their support and seeking their food at different depths should be grown together. Of course it will easily be seen that it would not be profitable to select indiscriminately any two plants for a mixed crop. In the case of different grains that ripen at the same time, the difficulty in separating the two (unless the crop had been most carefully harvested), would, at the time of sale, cause serious depreciation in the value of each. For this reason cotton is peculiarly adapted for growing with almost any other crop. The experiment of interspersing it with thur was, as we have shown, quite successful, the only drawback, perhaps, being that both are widespreading bushes. But even this would not be the case, we learn from Mr. Hooper, with a *kharif* grain crop, such as jowari, which "would grow without at all interfering with the cotton, which in turn would not affect it." Attention is promised to this subject in current operations.

Linseed.—Of all the crops on the farm the season was on the whole most favorable to linseed. In fact for this crop the season was almost a perfect one. Much of the large area under linseed was but poor soil, and the average outturn is therefore not considered a "very low one." As far as we can gather, it was 300lbs. to the acre over a field of 6 acres treated in the ordinary way, while over a small area subjected to careful and deep cultivation, and where the seed had been well selected, the average outturn was 624lbs. to the acre—an enormous difference. In some fields—one particularly—the outturn was very poor; the cause assigned for this is the liming given to the soil in 1877 before taking off a crop of sugarcane which was followed by wheat. It seems that the only variety cultivated was the "Gaurani" or "Nagpore," which "contains a large admixture of white among the dark grains, and is on this account richer in oil than the pure dark red variety which is grown extensively in the eastern districts." The whole crop was sent to the Central Jail to feed the oil mills, and it was declared to be superior to any previous lot, "the percentage of oil being higher in direct proportion with the quantity of white seed in the mixture." The pure white seed is undoubtedly the more valuable, and sufficient has been collected to sow a large area with, during this present season. The results of some chemical experiments and analyses are given, but these we need not go into, as they reveal nothing new.

Wheat.—The crop of wheat was on the whole a success. In some fields the average outturn was low, owing to the poverty of the soil, but in others again it was very good. It seems, however, that some sowings were unavoidably late. Could the seed have been put in earlier, the outturn would have been much larger than is recorded. The quality of the Haura and Pissi, *i.e.*, the hard and soft white varieties, was equally good, and the outturn of each almost identical. The demand in the local market runs chiefly on the hard grain, which in consequence commands a better price than the soft white kinds. Irrigation and good preparation of the soil exerted a marked influence over the production of some of the fields. But the good outturn of wheat is attributed chiefly to the manure given. Poudrette, we learn, was largely used, as well as liquid manure. The system of drilling poudrette into the soil (in lines 6 inches apart, on this occasion) before putting in the seed, and afterwards, at the time of the plants coming into ear, the application of a fresh liquid manuring, seems to have had very favourable results, and is specially well calculated to afford immediate results. This system might often with advantage be adopted in garden farming, we should think, wherever water is available.

EDITORIAL NOTES.

DURING the latter half of September, the fall of rain throughout India has been sufficient to dispel the fears which were entertained as to the prospects of the crops in some of the districts which had not received the average rainfall. This was particularly the case in the Deccan, where a deficient rainfall is rapidly followed by scarcity or famine. An official paper has been published on the condition of the crops throughout the Bombay Presidency. No fears are now entertained of scarcity in any part of the presidency, and, regarding the Deccan, we are told that "in Sholapur the rainfall has been abundant everywhere, and the outlook is most promising. The *kharif* crops have recovered, *rabi* sowings have commenced, and the Collector reports that no relief works are anywhere required. From all parts of the Satara district the latest advices are hopeful and re-assuring. Rain has fallen steadily throughout that collectorate, and the crops are everywhere reviving. A *kharif* crop, averaging eleven annas, is now anticipated. Prices have not risen, and are easy as compared with those obtaining last year. The condition of the people is stated to be good, and they are said never to have lost hope. Any special relief-works are unneeded, as the ordinary local fund works will provide sufficient occupation for any persons who may seek labour."

AGRICULTURAL prospects over the country generally are more re-assuring. Until quite recently great fears were entertained of a scarcity on the western side of India, especially in the Deccan. But the latest news from those parts is calculated to allay anxiety, and the Bombay papers assure us that nothing short of some extraordinary caprice on the part of the weather during the present month can prevent the coming agricultural season on that side of India from being an excellent one. The very heavy rain of the past fortnight has removed all ground for apprehension in the Concan, where the rice may be expected to turn out a full average crop. In the Southern Mahratta Country, where anxiety was for some time entertained, there has been a general, a plentiful, and a thoroughly beneficial fall, and even from the hardly-tried districts of the Deccan we hear now that the *kharif* generally has been saved and the prospects for the *rabi* are good. In Sindh, too, there has been heavy rain and the river is rising.

THE Governor-General in Council has exempted raw caoutchouc from the customs duties to which it is liable under the Indian Tariff Act, 1875.

WE are asked to announce that the Directors of the Crystal Palace Company have intimated to the Bengal Chamber of Commerce their intention to hold an International Exhibition next year (June to October 1881) of wools, woollen manufactures, and allied industries. The Company's prospectus and regulations may be seen at the office of the Bengal Chamber.

A LARGE number of articles have been sent to the Melbourne Exhibition from the North-Western Provinces, including glass, pottery, carpets, mattings, stone-ware, silk, embroidery, jewellery, fibres, oils, and leather manufactures.

THE report of the Royal Botanical Garden, Calcutta, for 1879-80, is more than ordinarily interesting, considerable attention having during the year been bestowed on paper-making materials. This is a subject which must command increasing attention. The demand for paper is steadily increasing in a much faster ratio than is the supply of material for paper stock. This cannot fail to raise the price of paper, and we do not think that the public will willingly submit to an increase on the price of its literature. Hitherto, several astonishing improvements in machinery have equalised the increase in the price of rags and grasses used for paper-making. There is, however, a limit to this, and a time must soon arrive when the price of paper must rise, or the cost of making it fall. There are doubtless many materials from which paper stock could be made, none in our opinion superior to bamboo, about which we have already had something to say.

The plants experimented upon at the Botanical Garden, were principally confined to several varieties of coarse grasses common, on the Orissa coast, as compared with Esparto. The best were those named respectively *Tiansi* and *Ranikharia*, and it is proposed to obtain samples in sufficient quantity for transmission to England for the purpose of further and more exact experiment. The cultivation of *rhea* resulted in failure. The crops raised were not by

any means good, and it was decided that the climate of Lower Bengal was unsuitable. This plant grows to perfection in the North-Western Provinces, and some very fine crops have been raised in Debra Doon. The Gangetic delta, too, has been found fatal to the *Eucalypti*; several varieties having been tried, and all turning out manifest failures. The pará rubber (*Hevea Brasiliensis*) and the ceara rubber (*Manihot Glaziovii*) were both tried, the latter with success while the former proved a failure. As we have remarked previously, there does not seem much good in struggling with these exotic rubber plants, when we have the common India-rubber (*Ficus Elastica*) with us. It is a hardy plant, and yields a good rubber, which would perhaps fetch as high a price as the Brazilian varieties, if the rascally native collectors would not adulterate it with mud and pebbles. The experiments made with the several trees containing an excess of tanning material served to bring prominently forward the virtues of the Diri Divix (*Cæsalpinia Coriaria*). This tree yields a large weight of pods annually, and those contain a heavy percentage of tannin.

A vast amount of good must be done by the distribution of plants from these gardens. Last year the total number distributed aggregated 19,447, and, as a large number of these may be presumed to have lived and flourished, we have a fair idea of the good work done. Besides these, 6,457 packets of seeds were distributed.

The same report gives some account of the various coarse grasses from the Orissa coast, which are said to be suitable for the manufacture of paper. It seems that after boiling, washing, and exposing to the air in the usual way, the grasses gave the following percentages of clean material, 43·79, 39·0, 46·1, 47·4, 37·1, 39·0. Of these *Ranikharia*, yielding 46·1 per cent., and *Tiansi* yielding 39·0 per cent. are the best. Out of 25 experiments with *Esparto*, it was found that the highest yield was 47·2 and the lowest 39·5 per cent., and Mr. George King, the Superintendent, is of opinion that if the two grasses above-mentioned can be obtained in large quantities and at the same price as *Esparto*, it is worth while conducting experiments with them on an extensive scale.

Mr. St. George Tucker, writing to the *Times* about the Famine Commission Report, says he believes it will be admitted that Government has at present no idea of the stores of corn in India, of the amount of stocks of food in each districts. Its first duty he says, is to ascertain and to publish to the world information on this subject. Corn is not an article which can be secreted like gold or jewellery. District officers in India have never found any difficulty in ascertaining the stocks of corn when their inquiries have been conducted with judgment and discretion. Of late years Government has discouraged the publication of information regarding food stores, partly by octroi taxes and partly by its unaccountable love of secrecy. Honest traders cannot be expected to lay up stores of corn in towns unless they be freed from octroi taxation, and be assisted by Government with true information on the subject of the corn trade. They have of late years been making the most of their profits by exporting corn. The report of the Famine Commissioners teems with remarks regarding the prolonged duration of high prices caused by the exportation of food. In paragraph 184 the Commissioners have stated their opinion that 1½lb. per diem of the meal of the common, coarser, grain suffices for an ordinary adult male who is made to work. As the lowest wages of an unskilled labourer are 4lbs. of corn a day, Government would be driving a hard bargain to expect to obtain a day's work for 1½lb. Mr. Tucker, with all submission, urges that able-bodied labourers on relief works should receive 4lbs. of corn for a day's work, and that they should be paid in corn, and not in coppers. What is the use, he asks, of giving pennies to men who must go to the shops of forestallers, who have bought up the local stores and sell at three times the usual price?

The *Times*, discussing the future of India, urges that the best chance for the material progress of the country is that she should attract capital, and it is argued that Indian tea and Indian wheat might be exported in much larger quantities if the capital employed were in any sort of relation to the productive power of the soil. In the face of the recent heavy losses sustained by those who have invested capital in the development of the agricultural resources of India, these observations lose much of their practical value. Nevertheless, most people will agree with the writer in the *Times* when he says:—"To what extent India can become a manufacturing country remains yet to be seen, but there is no doubt whatever as to the almost infinite fruitfulness of her soil. She can produce for the whole world, and she can produce well-nigh everything. Mr. Bright has declared that Indian Government does not favour the investment of private capital in the country. If there is any truth in the remark—and it is certainly not borne out by any instance he has given in proof of it—it will be for the Government of which he is a member to make sure that so mischievous a policy is no longer persisted in. We have had proof lately of the confidence which French capitalists have begun to feel in the future of India. That an Indian loan should have been taken up firm in France is an encouraging fact as far as it goes. But much more welcome would be a sign that France was looking to India herself, and not to the Indian Government, for the employment of her surplus capital in search of an investment. . . . The real thing to be done is to give the world confidence in India, so that money will flow into the country and find its own investment there. This will be a safer and more effective stimulus than any encouragement by the Government of one form of industry or another, or that any increased expenditure on these 'reproductive public works' to which, largely aided by a lavish military expenditure, the present indebtedness of India is in no small degree due."

With reference to the operations of the Nagpore Farm, which we review elsewhere, and regarding the advantages of mixed crops, we find the following in the *Englishman*:—

"This reminds us of a singular circumstance brought to our notice some years ago, and which we know to be reliable. A resident in Rohilkund, passing on horseback by a wheat field, caught sight of a rather diminutive plant on the outskirts of the border. Striking it with his whip, a quantity of milky juice spurted over his face. Being of an inquiring turn of mind, he examined the plant closely, and found it to be laden with small seed, from which, by a slight pressure, a considerable quantity of oily matter exuded. He questioned the cultivators about the plant, and was informed that it always made its appearance in their wheat fields, and that all attempts at eradication had failed; in fact they regarded it as a most troublesome, worthless weed. At his request the villagers collected a large quantity of the seed for a trifle; he had it crushed as well as the appliances at hand admitted, and sent it down to Calcutta, where it realised a sum sufficiently large, as a paint oil, not only to repay all cost, but to leave a good margin for profit. Encouraged by this first attempt, he rented in the following season a large piece of ground, which was most carefully tilled, and on this he sowed the seed closely. Not one germinated; whilst in the neighbouring wheat fields it came up, as usual most thickly! He was warned by the people against any attempt to grow this "weed" alone. He put no faith in their assertion, but the result proved its correctness. The weed in fact exhibited such a wonderful sympathy, so to speak, with wheat, that it would not grow without it! This is a bare narration of facts. Perhaps some of our readers may be able to corroborate the facts from their experience, and offer some explanation of them. The weed in question is known to botanists as *Euphorbia Dracunculoides*."

The necessity of giving sound instruction in the science of agriculture to the natives of this country is demonstrated by the *Bombay Samachar*. It is of opinion that the exhaustion of the soil owing to the ignorance of the Indian agriculturist is a calamity more dangerous to this country than famines, and believes that a widespread substantial movement to trained native youths in agriculture is the only means of bringing about a better state of things. The Madras School, the opening of small classes in the Bombay Presidency, and the founding of an insignificant number of scholarships as recently done by the Bengal Government cannot be expected to meet the great requirements of this country as regards the general improvement of its agricultural pursuits and conditions, and the *Samachar* ardently wishes to see a broad scheme in this direction inaugurated.

One of the most important commercial questions of the day in which the Punjab has considerable interest, is the condition of the wheat trade. This year the importations of American wheat into the United Kingdom will certainly be much larger than in any previous year, but latest reports of the prospects of the harvest in England are very favorable, with the result that prices have fallen and American wheat cannot be sold at the prices asked. As, again, English farmers are all in want of money, they will force their wheat on the markets as soon as it is gathered, and a further fall in prices is anticipated. Under these circumstances the prospects of realising good prices for Indian wheat diminish considerably.

In an article upon the Kurrachee harbour, the *Civil and Military Gazette* remarks that it is frequently argued that Bombay must

always be the principal seaport on that side of India, but the real question is whether there is room for both. It seems to be assumed, says our contemporary, that Kurrachee can only thrive by diverting trade from other quarters, so there will be no advantage, as far as the country at large is concerned, in the partial substitution of one seaport for another. We put the plain question—has the trade of Bombay been any the worse for the fact that the trade of Kurrachee has been multiplied almost a thousandfold since 1840 ? The diversion that will take place will be for the advantage of the country, in so far as it will mean a cheaper and speedier route. But that diversion can only proceed to a certain point, and for the rest, the chief function of Kurrachee will be to afford an outlet for a large and progressive traffic, for which hitherto there has been no opening. The Candahar province possesses great commercial capabilities. So does the Herat district—"The Granary of the East,"—as historians have called it.

THE *American Agriculturist* thus gives the development of the resources of the United States during the last twenty years :—

		1860	1880
Corn produced, bushels	...	838,792,740	1,450,000,000
Wheat produced, bushels	...	173 104,924	440,000,000
Wool produced, pounds	...	60,264 913	232,500,000
Cotton produced, bales	...	4 823,770	5,675 000
Hogs packed, number	...	2,350 822	6,950,451
Iron produced, tons ...	...	919,770	3,070,875
Petroleum produced, bbls.	...	500,000	19,741,661
Gold and Silver produced	...	$46,150,000	$79,711,990
Wheat exported, bush ...	...	4.155 153	175,000,000
Corn exported, bush. ...	...	3 314,305	100 000,000
Butter exported, pounds	...	7,640,914	38 248 016
Cheese exported, pounds	...	15,515,799	141,664,474
Merchandise exported ...	...	$316,242,423	$835,000,000

IN his review of the maritime trade of British India with other countries for the official year 1879-80, Mr. Conor remarks that "whisky has replaced brandy to a great extent among Anglo-Indians." Beer too, he says, is gradually giving way to whisky. India last year imported 301,000 gallons of whisky and gin, this amount being mostly whisky. The average importation used to be 185,000 gallons. The beer trade both in imported and Indian-brewed beer, is showing signs of a decline ; though, with the hill beer, this was chiefly due to so many of the troops being in Afghanistan. The trade in wine is also declining.

THE Department of Finance and Commerce has just issued its first review of the External Land Trade of British India, covering the Import and Export Frontier commerce from Sindh to Burmah. When it is remembered that the frontier of British India extends over upwards of 5,300 miles, there will be no difficulty in assuming that the report is necessarily voluminous. In future, however, a quarterly, and eventually a monthly issue is promised, which will bring the facts much more within the scope of careful examination and the service they are so well calculated to render to the commerce of this country. The review is elaborate, almost in the extreme. We must therefore, for the present be content to reproduce only those statistics which have reference to our more immediate neighbours. From the Hubb river, near Kurrachee, the frontier extends in a northerly direction for about 1,800 miles, separating Sind from Beluchistan, Khelat, and Afghanistan. Pursuing its tortuous deviations, it divides the Punjab from Cashmere and a part of Thibet. The frontier of the North-Western Provinces and Oudh divides those provinces from a portion of Thibet and Nepal. Thence follow the frontiers of Bengal, Assam, and British Burmah. Notwithstanding the great difficulties by which it is attended, the amount of trade between Sind, Northern and Southern Beluchistan, and Candahar is considerable, and may be expected to increase when it shall become possible to discard the Bolan Pass for the new railway. The following figures will show the depressing effect that warfare has had upon trade. From this, however, we may hope that it will in time recover. The total amount of Imports and Exports in the past year with Beluchistan was only Rs. 16,45,943, whilst in the previous year of 1877-78, it sums up to Rs. 22,90,768. With Afghanistan also, the amount fell in the past year, though not so seriously. Against a total of Rs. 1,85,00,717 in 1877-78, the amount in the past year was but Rs. 1,49,88,783. The total of this trans-frontier trade for the years 1877-78 and 1878-79 is Rs. 3,35,09,807 and 8,85,37,193 respectively. In the former years the excess of imports over exports was nearly 29 lakhs, and the latter year, nearly 80 lakhs.

MR. WILLIAM HOEY, C.S., has lately published "A Monograph on trade and Manufactures in Northern India," and of it the Lahore paper observes, "a pamphlet more replete with the most valuable information on the subjects of its treatment, it would be impossible to produce."

BOTH Messrs. Moran and Messrs. Thomas & Co. adhere to their former estimate of 22,000 maunds as the outturn of indigo in Lower Bengal this season. As regards Behar, the former gentlemen tell us "the weather on the whole has not been altogether favourable, the rainfall having been again heavy, and, in addition, the plant has been attacked by caterpillars in great numbers, and a good deal of fine *khontee* plant has been destroyed by them ; our last advices are somewhat better, the weather having cleared, a little and produce showing some improvement. Most factories are now at work with their second cuttings, and in another fortnight we should be able to form some idea of what the total outturn is likely to be." Messrs. Thomas & Co., say that "accounts from the Benares Provinces are generally less favourable, and we fear the result of the season will be under planters' expectations. As regards the Doab, the complaints of drought have been general. There are reports by telegram of showers having fallen, but they appear to have been more or less partial and light, and more rain is anxiously looked for. Produce so far has been decidedly good, but it is impossible to form any idea as to what the outturn may be."

THE last issue of the *Moniteur Official* of Pondicherry contains a letter from Mr. C. Poulain, taking Mr. King, of the Geological Survey, to task for some alleged errors committed by him in his report on the Artesian Wells at Pondicherry. Monsieur Poulain claims to have given his attention to the boring of the first Artesian well in India, not for the purpose of feeding the boilers of the steam engines used at the Savana Spinning and Weaving Mills at Pondicherry, but for the purpose of irrigating paddy fields. So far back as the 28th November 1876 he applied to the Pondicherry Government for a grant-in-aid ; and in the petition that he then presented, this object is clearly set out. It was not at random that he proceeded ; nor is his success to be attributed to a fluke. From a minute scrutiny of the papers published by the Geological Survey, he made sure that water bearing strata existed, which dip eastward from the higher levels lying west of Pondicherry. He concludes by thanking the Duke of Buckingham and Chandos for having taken up the subject of Artesian Wells, and he considers that the enlightened interest evinced in this cause by Monsieur Laugier, Governor of Pondicherry, entitles him to rank among the benefactors of that city.

THERE is no disputing the fact, says the *Englishman*, that by one plea or another the Government of India has of late years exhibited an increasing tendency to enter into competition with private capital and private manufacturing and commercial enterprise. On all sides the operation of the same vicious and anti-economic spirit, which seems to have received a sudden stimulus from the new railway policy of the Government, is visible. Educational institutions are perverted from their legitimate limits and purpose into mere nuclei for gigantic manufactories, the shadow of which acts as a blight upon private enterprise The jails of the country from being penal institutions, have been converted into great industrial centres, the inmates of which are comfortably provided for in return for a tale of work which would not support them outside, and the outturn of which, being produced by labourers whom, in any case, the Government must feed, can be put on the market at prices which defy private competition. In the Postal Department it is not above collecting tradesmen's bills for a consideration ; on the plea of encouraging poor people to accumulate small savings, it has covered the country with State Banks, which angle for the accumulated savings of the well-to-do and the working balances of traders, by offering higher rates of interest than the private banker can afford to pay. Our Chambers of Commerce and Trades Associations have been content to look on in absolute and apparently unconcerned silence, till the scandal has become one which affects their reputations hardly less than that of the Government itself.

A SHORT time back it was brought to the notice of the local Government of the existence of a new plough, tried very successfully at the Cawnpore farm, which it would be very advantageous to introduce into Mysore, with a view of practically shewing

the ryots its superiority over the present country plough, as its characteristics and capabilities stamp it as the one to supersede all others now in use, American or English. The Mysore Government have thought so well of the plough (the "Kaiser") which is extremely simple in design and construction, that two have been ordered from the Cawnpore farm.

THE Burmah rice trade this season has hitherto been, and gives promise of continuing, in a flourishing state. The customs duties from the various ports of the province during August, under the head of exports, have exceeded, by over a lakh, similar duties in the same month of 1879, and the increase is due in the main to unusually large shipments of rice to foreign countries from the three ports of Akyab, Bassein and Rangoon.

AMONG the reports received from the British Consuls in China with reference to the consumption of Persian opium in the various consular districts, is one from the British Consul at Taiwan, who states that the careless way in which Persian opium is prepared and packed, has already seriously interfered with its sale. For this reason great risk attends all dealings in the article; no two chests are alike in quality, and frequently two or three descriptions of drug are found in the same chest. Dealers are, therefore, suspicious, and examine every chest carefully, and money, it appears is often lost on the sale.

THE Persian correspondent of a contemporary says that Persian opium from the crops of 1880 is being brought daily into Bushire for shipment. The S.S. *Bengal* carried away 113 chests, principally for London. The S.S. *Calder* left on the 25th instant, with 805 chests, of which 743 chests were for China, and the residue for London. The *Calder* proceeded direct to Galle, where her cargo will be transferred to the P. and O. steamers. It is given out that the Indian Government are making arrangements for the levy of a duty of Rs. 100 per chest by the Ceylon Government, similar to that stipulated for Bombay, Kurrachee, and Aden. If this measure be adopted, the Persian merchant will have to arrange for direct steam carriage to China to enable him to compete with the Indian opium.

IT is stated in a recent proclamation of the Governor of Chekiang (China) that there are enormous areas of land left uncultivated in his district, and that, although 17 years have elapsed since the last war which so terribly ravaged the country, a large extent of land has never been able to pay the taxes, and has consequently been left untilled. This is particularly observable in the departments of Chinhoua, Chuchow, and Yen-show, in which upwards of 1,600,000 acres are idle; while in those of Hang-show, Ka-shing, and Hu-chow, there are 6,000,000 in the same predicament. Some of the land is too poor even to return much for labour and capital bestowed upon it, but there are at least 5,500,000 acres of really rich and fertile soil at present completely neglected. This arises partly from the fear lest any cultivator of the land in question should be called upon to pay up the arrears of taxes; but the Governor's proclamation specially mentions this exemption.

THE following is a translation from the *Chiugai Bukka Shinpo*:—"Cotton yarn is a principal import into Japan, and the purchases usually amount to between five or six hundred thousand to eight hundred thousand *yen* monthly. This valuable commodity is chiefly imported by foreigners, not more than ten per cent. being imported by Japanese. The business is therefore, under the control of the former, and consequently always unfavourable to the latter. Five native merchants desirous of changing this state of affairs, have subscribed a capital of one million *yen* to form a company to trade in yarn direct with foreign companies, in order to evade the officious intermeddling of foreign merchants (in Japan). This is the only way of restoring our commercial rights, and we ought to congratulate ourselves upon the action of the five merchants."

THE agricultural statistics of New South Wales for the year ending March 31, 1880, show that the extent of land under cultivation was 489,404 acres freehold, and 145,800 acres leasehold; and the extent of land enclosed and not cultivated, was 16,106,396 acres freehold, and 1,471,793 acres leasehold. The extent of land unenclosed was 3,982,642 acres freehold, and 524,930 acres leasehold. The total extent of holdings was 20,579,078 acres freehold and 2,142,524 acres leasehold. Of wheat for grain there were 233,369, acres, and 25,280 acres for green food. Of maize there were 135,034 acres grown for grain, and 2,145 acres for green food. The total amount of wheat produced was 3,613,266 bushels, maize 4,761,856 bushels, and barley, 131,541, bushels. There were 3,091 acres of vineyards, and the total number of oranges produced was 2,763,811 dozens. Of sugar, 17,229,296lbs. were produced. The returns, as a whole, show that agriculture is progressing rather slowly, although the averages of the yield of crops compare very favourably with those of other colonies of the continent. The live-stock statistics are not yet published. It is confidently expected that they will disclose great increase in all classes of stock.

THE discovery of a new fibre in Mexico, called "Pita," which grows in a wild state over large areas, is likely to prove a considerable source of trade, and of great value to the Republic. Experimental shipments to England have been manufactured, and returned to Mexico in handkerchiefs and cloth, which are described as of a beautiful color, and the material—durable and soft as silk. As industries develop in India, there are no doubt many fibres, as yet undiscovered, which will form important additions to the productive resources of the country.

Florida has a weed growing over large tracts of country, which is found to be wild jute. The fibre grows in the greatest profusion in Putnam, Marion, and Sumter counties, and also in many other districts. Hitherto, this wild jute has furnished grazing for vast herds of wild cattle, as well as for domestic herds.

Experiments are now being made, under scientific processes of cultivation, to determine the yield per acre, and the quality for manufacturing purposes of this apparently large source of new wealth to the export resources of the States.

OFFICIAL PAPERS.

TASAR SERICULTURE.

GOVERNMENT OF MADRAS.

9TH AUGUST 1880, No. 945.

FROM Major G. Coussmaker, to the Secretary to Government, General Department, dated Poona, 21st February 1880, No. 2.

I HAVE the honor to report for the information of Government, on the experiments which I have during the past year made in Tasar sericulture, and the conclusions which I draw therefrom.

1. As mentioned in my Report No. 1, of 10th January 1879, I had put by 50 cocoons of the crop of 1878 for breeding, and during the hot weather I collected in the districts, where I was, upwards of 1,000 more; several of which were good enough to be kept for the same purpose; of these I sent some away to different correspondents, and from others I got a good supply of moths, many of which I allowed to escape, as I had not sufficient food for many caterpillars. I kept the eggs from 76 moths, amounting to some, 15,000, of which I sent away one-third only, hoping I might find food in Poona for the remainder, but I miscalculated my resources and the power of protecting them from their enemies, for I was only able to secure 500 good cocoons; of these I have kept 100 for next season, and I have sent home a large portion of the remainder to Mr. Thomas Wardle.

2. In my previous reports I had mentioned that the great difficulty in rearing these worms was to ensure an unfailing supply of suitable food, and that in order to obtain this, I intended to plant my bushes in the form of hedges. Accordingly, in June, as soon as there appeared to be any promise of rain, I began my plantation. There is in my garden a convenient plot of ground about one-sixth of an acre in extent, with a southerly aspect; this I had cleared of trees and bushes, and laid out in ridges 4 feet wide with, gutters on either side; on these ridges I have planted all the shrubs which I have collected during the time I have occupied the house, and have now my hedges continuous and complete, supplementing them with more plants raised during the last six months. I have now got 340 feet of Lagerstrœmia Indica, vern. *Daiyeti*, 270 feet of Zizyphus Jujuba, vern. *Bher*, 90 feet of Carissa Carandas, vern. *Karinda*, 107 feet of Terminalia Tomentosa, vern. *Ain*, 15 feet of Terminalia Arjuna, vern. *Sadara*, and 46 feet of Ficus Benjamina, vern. *Nandruk*. Of those the *Daiyeti* is certainly the most promising, as the harder it is cut back or eaten off by the worms, the more luxuriantly it throws up shoots especially when watered liberally; these shoots are clothed with leaves the whole way up, and the caterpillars greedily devour every bit of leaf, and even the more succulent parts of the shoots; I have not been able to raise this plant from seed, but find that the roots have excessive vitality. The *Bher* is the tree on which in the Deccan the greater number of cocoons are found, it grows very quickly but only from seed, as far as my experience goes, the leaves are rather sparsely distributed, and the growth is very straggling, the caterpillars eat up every leaf and also devour the flower. The *Karinda* is more leafy than the *Bher*, and the caterpillars also eat it off very closely, but it recovers leaves slowly, and the plant does not grow quickly. The *Ain* and the *Sadara* have much larger leaves than the preceding shrubs, but they grow very slowly, at all events, for the first two years of their existence, the *Ain* is the favorite

food of the worm in the Konkan. I do not know whether it eats the *Sadura* to any extent, and as my plants are only seedlings of this past monsoon, I cannot yet give any information as to its utility. The *Nandruk* plants have not thriven well, nor did the worms feed on them this last monsoon, though on the more elevated country from Satara towards the south, I have found many on this tree, in the neighbourhood of Poona, therefore I should not recommend it for this purpose, but am in favor of growing *Daiyeti* thickly planted on ridges, so as to form continuous lines of food while the *Bher* and the *Karinda* might be planted as hedges surrounding the plantation, as they naturally grow into thick tangled masses, and being thorny would keep out cattle. In three years the *Bher* will grow from seed into a bush 4 feet high, and in the same time the *Daiyeti* raised from cuttings and root suckers would be nearly as high, and the whole plantation would be ready for feeding by the commencement of the third monsoon after it had been started. I should, if possible, lay it out with a view to irrigating it, for, though there is no necessity to water the trees during the rains, still, liberal watering and plenty of manure will always increase the supply of leaf; by high cultivation of this nature, my small plantation is now so far advanced that next monsoon I hope to be able to state how much ground will be required for a definite number of worms.

3. I regret to say that the cocoons which I sent home last year to Mr. Wardle were spoilt; I had dried them in an oven, and the fibre was burnt. I afterwards sent some home with live pupæ in them, but it was not at the right time of the year, the moths came out and spoilt the cocoons. I have, however, now prepared some cocoons carefully, and expect they will give a better result, the chrysalides having been killed by hot dry air.

4. As stated by me in a former report, I keep all my seed cocoons hung up on a wall, out of reach of rats, &c.; and find as long as they are left thus undisturbed; the moths only come out at the regular season. Last year the first worm was hatched on the 15th June and the last spun its cocoon on the 15th November. It appeared to me that as soon as the cold east winds which we had at the end of October, set in, that the worms made no further, progress, and more of them died at that time, instead of spinning their cocoons than at any other period of their existence. During the five months, I was rearing them this last season, I could not detect any epidemic nor any well-defined sickness among them, nor did their appear any difference between those reared in the open or in the shade, or on large or small trees for under cover; insects, birds, mice, rats, squirrels and lizards, carried them off repeatedly, but the great cause of so much life being lost, was that I tried to preserve more than I had food for: in fact they died from preventible accidents.

5. During this last season, I was working in the Ahmednagar districts, where I had been informed by a native official in the Forest Department that there were no Tasar cocoons to be found, when, however, in March and April, the *Bher* trees become completely leafless, I perceived that there were many cocoons hanging from the branches; by fixing a price, one pie per cocoon, and paying some small boys for every one they brought, I soon got many people to search for them, and in less than a month the men, women, and children of one village, where my camp was, brought in upwards of 1,000. This quite confirms my former experience that the insect is found nearly everywhere, and the wild cocoons are very easily obtained—in the Konkan where the rice-cultivating classes go into the forests to cut down the small branches to place on their fields and burn for manure in January and February—in the Deccan where the *Bher* tree sheds its leaves in March, April, and May. If therefore the Forest Department would always buy every cocoon offered to them (I believe two cocoons could be obtained for one pie), these might be sold annually like any other forest produce, those that are empty or injured,* should be at once put into sacks, all extraneous matter as the leaves and twigs on the outside, and the exuviæ of the caterpillars and chrysalides inside the cocoons having been first removed if practicable, for such things only harbour beetles and moths; those that are sound and heavy containing live pupæ in fact, should be hung up on walls out of reach of rats, mice, and squirrels, and if possible protected against ants as well, a window might be left open at night and then all the moths which come out of the cocoons would be able to escape. If, with a view of rearing the worms near the place where the cocoons were kept, it should be thought advisable to collect some fertile eggs, it would only be necessary to put the female moths out on bushes and trees, during the night the males would visit them, and at the following sunset the females would begin to lay their eggs. In this way a large supply of eggs can be obtained with great certainty, and during the interval of eight or nine days between the laying and hatching of the eggs, they may be despatched through the Post Office without receiving any injury.

6. By taking some such steps as these, this industry would soon become firmly established, and in a few years would develope greatly, the demand is large. I constantly receive letters from merchants in this country and from manufacturers in Europe urging me to ensure a steady supply. I may here mention that within the last month, M. Daniel of St. Etienne, a ribbon manufacturer, has written twice to Messrs. Treacher & Co., asking them whether they could engage an agent for him to collect cocoons in this presidency. I have had these letters in my hands and have communicated their contents to the Conservator of Forests, Northern Division, asking him whether it would not be possible to stimulate the collection.

7. One of the most interesting and I think important facts that I have this year been able to prove, is with regard to the composition of the cement with which the caterpillar hardens its cocoon. Former analyses of this agent made for me in England by Dr. Taylor, and in Bombay by Dr. Lyon, had shown that it contained the acid urate of ammonia, that it was in fact excrementitious, and this year by opening the cocoons at various intervals, I was able to convince myself of the fact that when the caterpillar has left off feeding and begins to spin, it voids the food remaining in the alimentary canal, first of all in a more or less solid form and of a dark color, but after it has become fully enveloped in the cocoon, the excrement comes away as a light colored liquid, the hue and consistency of which depend upon the amount of vegetable matter not previously evacuated, and the amount of lime, carbon, and ammonia present; the respective proportions of these ingredients vary, I presume, with the food on which the caterpillar has fed and with the state of the atmosphere at the time of spinning, also the longer they remain coating the fibre, the harsher and more discolored it will be; it is therefore very necessary, I think, to remove this cement at a very early date, and this, chemistry has shown the manufacturers how to do; judicious feeding too may alter its nature. Before long fresh cocoons will be at an early stage thoroughly cleansed of all discoloring matter, and Tasar silk will be available for manufacturing purposes as colorless as it is when first put forth by the caterpillar.

8. Besides the small experiments which I made this last season in Tasar sericulture, Mr. Stormont, the Superintendent of the Khandeish Experimental Farm, tried to rear some of the worms; at first he met with several difficulties, but these he gradually overcame and gathered a few very good cocoons out of the first crop, the second promised very well for some days, but just when the worms reached maturity, the weather proved very unfavorable, and from one cause or another he did not succeed in getting a crop; next year we hope for better results. Some fine cocoons were gathered in Dharwar, and in Uran from seed supplied by me. Mr. Natu, an Inamdar of Poona, has several times come to watch my method of cultivating the worms, and he assures me that he intends to do the same. Mr. Baird, on behalf of the Maharana of Udepur, has lately called on me for the same purpose, and he tells me that he believes that the Maharana will also start a plantation. Through the kindness of my correspondent in the Santhal country, I have procured a few cocoons of the large or *Chattisgarhi* variety of the Tasar moth, and as this crosses readily with the small or *Desi* variety, which only is found in the Southern Maratha country, I hope next season to procure larger cocoons than I usually do.

9. I had Rs. 283-13-11 remaining (out of the money granted to me in 1875 for Tasar experiments) at the commencement of last year. This has now been expended in purchasing cocoons, in forming the plantation already mentioned, in despatching cocoons and eggs to various correspondents, and in paying for the manufacture of silk yarn from cocoons as stated in my Report No. 9, of 20th November 1879. The account has been submitted to the Accountant-General. If Government will place the further sum of Rs. 500 at my disposal, I will continue to purchase cocoons from the villagers in the districts where I may have to work, and will carry out more experiments.

From R. W. Morgan, Esq., Deputy Conservator, Wynaad, to Colonel R. H Beddome, Conservator of Forests, dated Manantoddy, 24th May 1880.

With reference to your Endorsement No. 198, of the 17th instant, on G. O. No. 479 of the 28th ultimo, I have the honor to state that I have been continuing my experiments with the Tasar silk-worm.

2. After attempting in vain to procure cocoons in this presidency, I tried Bengal, and in April received 275 from Simla. The moths commenced to emerge at once, but the sexes refused at first to unite. This perhaps was owing to the elevation, some 4,500 feet,* but after a time a few couples did. The average number of eggs laid was about 270.

* This is a mistake, Manantoddy being only about 2,700 feet—R. H. B.

3. I noticed that the females were of two distinct types—one being of a rich golden tint, and the others a warm brownish-grey. This latter type varied considerably, some having a reddish tint, whereas others inclined to buff; the males, however, which were invariably smaller than the females, were of a deep chocolate-lake in color, occasionally having a slightly golden or purplish tinge in the wings.

4. The copulation lasted for from 20 to 30 hours, and I noticed that the males never mated again, unlike the mulberry silk-moths. The fertilised females were removed into a muslin-covered box in which they laid their eggs on twigs of *Eugenia*. On an average they lived about 10 days. The eggs were hatched in from 10 to 15 days. I placed the young worms in a large case covered with muslin, in which there was a tin-box filled with wet sand, and stuck full of the young shoots of *Careya arborea Eugenia Jambolana*. Finding they preferred the latter leaves, I fed them entirely on them. On the seventh or eighth day they cast their skins for the first time.

5. The oldest caterpillars were hatched some 39 days ago, but are only one inch in length. This has not been from starvation, for they have been fed liberally and look quite healthy, but I fancy on account of the exclusion of sunlight which is essential to their well-being. The last 10 days I have been feeding them on *Lagerstrœmia* (Venteak) which they prefer to *Eugenia*.

6. I have placed several worms out on trees in my compound, but have slight hopes of their escaping their numerous enemies.

7. The total number of caterpillars of various ages in my possession at present is about 2,000, but it can hardly be expected that the whole of these should reach maturity. They are very troublesome to manage on account of their wandering propensities, and you can scarcely open the box they are confined in for a moment without their swarming out all over the place. They maintain their hold with such extraordinary tenacity that they will suffer being torn in two before they relax it. This makes it very difficult to shift them.

8. The moths almost invariably escape from the cocoons through the up or pedicel end, but I find that about 2 per cent. of my cocoons have been pierced at the lower end.

9. In this district the Tasar is but sparingly found, though the climate is undoubtedly suited to it. I have found cocoons here as large and larger than any I have seen from the North. The moths here seldom or never lay more than one to two eggs on each tree. There are two crops of cocoons in the year—one in May and June, and the second in October. In this latter the moths do not seem to escape till the following April, lying dormant the six intervening months. This, no doubt, is due to the forests in India being deciduous; for the eggs if laid would be lost through the falling of the leaves to which they are attached, and even if they managed to escape this peril and were hatched, the young would speedily die from want of proper food.

10. The Wynaad contains a vast area of forest more than half the trees of which are capable of feeding silk-producing caterpillars. The whole of this is wasted, for although the climate is favourable to insect life, yet its enemies are sufficiently numerous to more than keep it in check. Attempting therefore to breed silk-worms in a state of Nature, will, I fear, never pay in this district, for though we may protect them from a host of their destroyers, yet there are some, such as the various species of the *ichneumon* flies, against the incursions of which I cannot see any possibility of guarding. To breed them however under cover, and in a state of partial domestication is feasible enough, provided the building devoted to that purpose is thoroughly lighted and ventilated, and means devised for preventing the worms from indulging their wandering propensities. If the breeding-shed were made portable, it would no doubt, be a great advantage, and this might easily be done were it constructed of wood; it could then be shifted (the supply of leaves being exhausted) from one spot to another.

11. I had hoped to have tried experiments on a larger scale than I have hitherto done, but find that, owing to my frequent absences in the district, the caterpillars are neglected and die.

12. So great an amount of constant care and attention is necessary for the success of an experiment like this, that a single day or hour's carelessness may render futile the patience and trouble of weeks. I have therefore determined to wait until September next, when I mean to devote a considerable portion of my furlough to experiment and to start a breeding establishment.

13. I have not been able to procure the *Cricula trifenestrata* cocoons you asked me to send to Dr. Bidie, for, though I have obtained a great number of them from Coorg and its neighbourhood, the whole almost proved to have been destroyed by ants and *ichneumon* flies.

14. *Careya arborea* trees, however, are loaded with young caterpillars, and as soon as the cocoons are spun, I will send Dr. Bidie any number.

OPIUM IN CHINA.

(From the Press Commissioner.)

FROM E. L. Osenham, Esq., Her Britannic Majesty's Acting Consul at Wu-Hu, to the Under-Secretary to the Government of India Financial Department,—No. 36, dated Wu-Hu, 15th October 1879.

In conformity with your letter No. 238, dated Simla, the 4th May 1871, I have the honour to forward the Annual Report on Opium for the Port of Wu-Hu for 1878-79.

Opium appears to be but scantily grown in the southern portions of this province, An-Hui, where the ground is chiefly devoted to the cultivation of rice. I am, however, informed that in the district of Kuang-Te-Chow, in the extreme south-east, small quantities are grown for local and individual consumption on spare patches of ground not required for ordinary crops. This district was depopulated during the T'aip'ing rebellion and is now chiefly inhabited by poor immigrants from other provinces, who, destitute of money, can only obtain opium by growing it themselves. They do not, however, rely on it as a source of livelihood, nor is the cultivation likely to increase to such proportions as to sensibly, affect the importation of the foreign drug.

In the more northern portions of An-Hui, where cereals are chiefly grown, in the districts of Po-chow, Shou-chow, Ying-chowfu, Toug-Yang, and Su-chow, the poppy is extensively grown, and regarded by the people as a source of profit. An eye-witness informs me he passed through many acres of country covered with the poppy. The rows of plants were very irregular, the ground only partially weeded, and the cultivation generally careless and slovenly, offering a marked contrast to the neatness and care displayed in growing a similar crop in other provinces. This want of care displayed may be due to the recent introduction of the plant into the province, and lack of knowledge of the proper methods of cultivation.

Cultivation of opium is strictly prohibited, and proclamations against it are to be seen in all large cities. Within five or six miles of the cities no poppies are visible, but beyond that radius opium is openly grown without incurring official interference. The cultivation is increasing, and is likely still further to do so, if the severe measures now directed against opium growing in Shan-Si remain long in force. The crop this year was an excellent one. This native-grown opium is all sent north to the provinces of Ho-nan and Shan-Tung, some of it, I understand, finding its way to the Treaty Port of Chefoo. None is sent to Wu-Hu.

* * * * * *

I append a table giving the import of opium for the last three years. Wu-Hu was opened to trade in April 1877:—

	1877, Nine months.	1878.	1879, January to September.
	Piculs.	Piculs.	Piculs.
Malwa	1,157	2,325	2,170
Patna	2	2	10.80
Benares	......	......	3.80
Persian	......	1	70.50
TOTAL	1,159	2,328	2,255.10

The prices at present ruling for opium here are—
Best Malwa, taels 560 per picul.
Persian „ 430 „ „
Patna „ 410 „ chest of 120 catties.
Benares „ 390 „ „ „

A large increase in Persian opium will be noticed. No native opium being used, the demand arising for cheap opium is to a certain extent satisfied by the lower priced Persian, the flavour of which is at the same time more palatable than that of Patna or Benares.

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From A. W. Hewlett, Esq., Her Britannic Majesty's Consul at Canton, to the Under-Secretary to the Government of India, Department of Finance and Commerce,—No. 57, dated Canton 2nd April 1880.

1. An abundant poppy crop has been gathered in the provinces of Sze-chuan, Yunnan, and Kweichow. Little is known in Canton regarding the yield in Shen-Si, Kan-Su, and Manchuria; but it is believed that the prohibitory measures taken by Tso Tsung-tang have considerably hindered cultivation of the poppy in the provinces of Shen-Si and Kau-Su.

2. Nothing is known of what is likely to affect the outturn (*i.e.*, the quantity of crude opium yielded by the crop).

3. Cultivation of the poppy is generally believed to be on the increase. No opium is grown in the province of Kuangtung.

4. During the year before last, 1878, *i.e.*, Kuangsu, 4th year, proclamations against the growth of the poppy were issued generally throughout the empire. The effect of these, however, has only been to diminish cultivation in districts situated close to official residences, outlying districts being as thickly sown with the poppy as before.

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The following table has been compiled from the statements of an opium-smoker, who spends $5 a month, out of a salary of $10, upon opium. The average value of the dollar for 1879 was 3*s.* 8*d.*

	Price the ball or package of 48 Chinese ounces.	Amount of prepared opium after boiling.	Amount of taxation, the ball in Canton.	Amount of dealer's profit in Canton, each ball.	Cost of each Chinese oz. of prepared opium.
	$	Chin. oz.	$	$	$
Malwa	24	38	3 20	0·80	0·66
Patna	18*	28	3 20	0·80	0·83
Chinese	...	..	3 20	0·80	0·50

* *Note.*—The ball of Patna weighs from 44 to 48 Chinese ounces.

A.—One advantage of Malwa is that it can be cut up, and consequently sold by the ounce in an unprepared state. It is the favourite opium in the Swatow and the Ka-ying (or western) parts of the Kwang-Tung Province. Eighty per cent. of the people around Canton smoke Patna, and ten per cent. Chinese opium.

B.—Malwa produces more prepared opium than does Patna from the same weight of the unprepared drug. All opium smoked on the mainland is boiled on the mainland. The farmer's monopoly at Hong-Kong makes prepared opium but little cheaper there than at Canton.

C.—The precise taxation now laid upon opium was explained in Mr. Hance's Despatch No. 70 of the 19th of April 1879. The boiler's tax (local) is $0·4½ the ounce of prepared drug. See Mr. Hance's Despatch No. 103 of the 20th June 1879.

D.—The prices, each ounce, are retail prices: 28 ounces of prepared Patna cost about $21 in Hong-Kong and $22 in Canton. The ball of unprepared opium is now about $2 dearer than it was two years ago.

E.—Chinese opium is said to have a "fishy" taste. The leaves in which Patna opium is wrapped, are sold and boiled down.

7. Foreign opium, other than Indian, is rarely imported at Canton. Small quantities of Turkish and Persian opium, however, are brought annually to Shanghai.

* * * * * *

From A. W. Hewlett, Esq., Her Britannic Majesty's Consul at Canton, to the Secretary to the Government of India, Department of Finance and Commerce,—67, dated 11th May 1880.

In compliance with instructions which I have received from Her Majesty's Minister at Peking, I have the honour to enclose a report relating to the consumption of Persian opium within this Consul district.

PERSIAN OPIUM.

1. It is stated on turstworthy authority that not more than about 4 piculs of Persian opium were imported into this province last year, but none as yet this year. This opium is chiefly consumed in Hui chonfu, west of Canton. The consumption in this part of China therefore being so limited, cannot be held to affect seriously in any way the position of other kinds of opium. For some years past the annual importation has ranged between 4 and 9 piculs.

2. A few years ago the sales of Persian opium in this province used to affect Indian opium on account of its cheap cost; but, as it was found a very profitable trade to Persian importers, great competition sprung up, and consequently its lay-down price was quickly raised, and importers were at last unable to sell at lower rates than those ruling in the case of Bengal opium, so that both kinds were kept at nearly equal rates, and the sales of Persian gradually fell off.

3. Persian opium made its first appearance in the Chinese market about ten years since. The "touch" of this opium is about 80 or 70, and it is most liked in Formosa, where the Chinese prefer it to Benares opium. The first five or six years the quantity imported was very moderate, *viz.*, about 1,200 to 1,500 chests annually, each chest weighing 1 picul, but of late the arrivals have increased at the rate of 2,000 to 3,000 chests a year. This year the import may be estimated about 8,000 to 9,000 chests. Half the quantity is required for the Formosa ports, and the balance is consumed in Shanghai and the north, partly on account of the high rates ruling there for Malwa opium, and also in part because the drug in shape, color, and touch is made to resemble Malwa opium.

Persian opium comes free of duty; consequently it pays the Persian importers well. As on our opium a duty of Rs. 750 per chest or picul is levied, it will pay Persians to sell at rates as much as $350 per chest below our opium prices. The price of Persian generally depends upon the price of Malwa and Bengal opium, and usually keeps on an equal footing with them.

E. H. PARKER.

SELECTIONS.

DR. CENTER AND BRIGHAM YOUNG ON *REH.*

SOME years have passed since Dr. Brown of the Lahore College, wrote a valuable paper on the manurial treatment of *reh*, the saline efflorescence which is the curse of Indian soils. The same subject has again been attacked by a gentleman who possesses the reputation of being the cleverest analytical chemist in India, Dr. Center, of the same institution. Dr. Center has added to his many distinctions, by putting under requisition a no less remarkable authority than Brigham Young, whom he visited in the course of his rambles round the world, and with whom he smoked many a friendly pipe, whilst the Professor furnished all the science, and the Prophet all the rule-of-thumb. "There is," said the Prophet, "salt in everything. Water has salt; plants have salt; and earth has salt; and the Bible tells us that if the earth have lost its salt it is useless." Mr. Young, however, hinted that Providence rather overdid it; and accordingly, both he and his Mormon community had taxed their wits to discover some means of circumventing Nature's overflowing bounty. Their simple and effective methods of relieving the Utah soil of its superabundant salts are described at the end of Dr. Center's paper, and some of them will be quoted further on. Meanwhile we may refer briefly to the author's account of the formation of saline efflorescene in soils.

The oldest and perhaps most popular theory of its origin is the marine theory. According to this hypothesis, "The Indo-Gangetic depression was considered to be an old sea-bed, the soil of which became impregnated with salts from the existence of shallow *runns* and lagoons in a former geological age." Now there is some evidence that the Punjab plain was once covered by an Eocene sea, bounded by portions of the outer Himalayas, and penetrating the mountains as far as the valley of the Upper Indus. However, the theory of recent marine impregnation, at all events, has been abandoned; and it has been established that "the whole of the materials of the Indo-Gangetic basin are fresh water alluvia to an unknown depth, and consist, in fact, of the *débris* of the Himalayas carried down by its drainage." Dr. Center tells us that borings in the Umballa district to seven hundred feet; in Calcutta to four hundred and eighty; and at Rajanpur to four hundred and eighty-four, have shown nothing but fresh water alluvium. The causes of salinity in soils have been only those which are still in operation, such as the decomposition of mountain rock, and of the more or less comminuted *débris* of the plains, by the action of water, light, and carbonic acid contained in the atmosphere, and in the pores of the ground. Dr. Center traces all the cunning, intricate processes, with the patience and the loving familiarity of an Isaac Walton discoursing on fishes and fly-hooks.

The soluble substances produced by rock decomposition are remarkably uniform in their nature. The main ingredients are carbonates of alkaline earths, chiefly of lime; and alkaline chlorides and sulphates, chiefly of soda. Of salts of this description, the Ravee, Jhelum, and Indus contain from eight to fifteen grains per gallon, according to the state of the floods. The proportion of soluble salts capable of efflorescence varies from about two to four-and-a-half grains. The rain water, which contains free carbonic acid gas, acts powerfully as a decomposing agent on the soils of the plain, which consist of rock and other *débris*. The depth to which the rain and other water penetrates through the soil depends on the nature of the latter being greater of course in sandy soils and less in clayey soils. After the rains evaporation sets in, the soluable salts are drawn to the surface by capillary attraction and are finally left in the form of a whitish "efflorescence." Here is Dr. Center's more detailed explanation of the change :—

When evaporation succeeds, it draws up the moisture in the more porous surface soil by capillary action. As the water and carbonic acid pass off, the solution becomes more concentrated, and carbonate of lime is re-deposited. This last action takes place first, and as the concentrated solution is drawn up to the surface, it finally deposits its most soluble salts, on drying as an efflorescence on the surface. An essential condition is the dryness of the climate. In more temperate but dry regions, as in the Utah Basin and the elevated parks or plateaux of the rocky mountains, efflorescences appear as well as in the scorching plains of India. The action, however, is intensified by heat, which increases evaporation. By similar capillary action the moisture will creep up the sides of objects lying on the ground, such as pieces of brick, and deposit a copious efflorescence. At first it appears in glittering crystals, but as the sodium sulphate gradually loses its water of crystallization, it breaks up into a copious white powder of anhydrous salt and it is then that it is most apparent.

For an inquiry into the Mormon system of removing saline ingredients, the Prophet referred Dr. Center to Mr. Woodruff, Secretary to the Agricultural Society, and to some of the best farmers about salt lake city :—

The plans adopted were the following :—A salt field was ploughed and small runlets of fresh water were sent down the field, at short distances apart, washing the soil and running off into the drainage of the country. Another method was to plough up a field and make a terrace round it and then flood it. The water was allowed to soak for some time till it had dissolved the salt and was then run off. Another plan was to terrace a ploughed field and dig a deep trench round it. The field was flooded, and the unploughed subsoil being less permeable, the water holding the salt in solution filtered into the trench. I observed similar processes carried out on the salt marshes round the Bay of San Francisco. This is gradually silting up, and surrounding it are miles of low flats impregnated with sea salt, and growing only saline plants. Through these pass shallow delta channels, scoured by the rise and fall of the tide. To reclaim this soil, low earth embankments are raised round the farms. These are fitted with floodgates closed by the rise of the tide and opening on its fall. The salt in the soil is washed out by the fresh water of the streams falling into the bay, by a process of sluicing such as I have described, and is run off as the tide falls. In the depression between the coast range and the second range of hills artesian wells can be made, and these were used where none of the mountain streams were available. An English Company was working on a salt marsh by the aid of artesian water only, but it was generally considered that it would not be a success, as the amount of artesian water was after all only trifling compared with the area to be reclaimed. The universal opinion in Utah was that if they once succeeded in covering an alkali field with a crop of any kind, the victory was won. After the land was half cured, they generally covered it with a hardy grass, the most approved being red-top American grass. Beetroot was also said to grow well as an early crop; after that Indian corn and other crops by degrees. Tuberous crops grow well in the country, and the potatoes are said to be the best in the world. The last method I shall mention was that employed by Brother Fenton, an energetic Devonshire farmer. It happened to be impossible for him to get fresh water to wash the salt out of his fields, and he tried large quantities of manure, —20 to 50 tons per acre. Barn-yard manure was considered the best, and, as his great object was to keep the surface from the sun which drew up the salt, he also used litter to cover it. The first crops he covered the ground with were the red-top grass and oats, and he sowed his crops in September, so that the ground should be covered with vegetation when the alkali would be appearing. As soon as by this means he got his first crop of red Timothy grass, he found he had succeeded. Mr. Fenton complained that after partly curing one field, he ruined it by trenching and bringing up a saline subsoil. His idea was that the salt was a sort of perspiration of the earth and, therefore, mostly on the surface, and that by turning up the subsoil he would get a better soil. In India it is certainly the case that a short distance below the surface less *reh* is found. It may be different in a closed basin like that of Utah, where the subsoil also may become saturated with salt. Utah city is partly situated on bench at the base of the Wasatch hills adjoining the plains, and at first the farms surrounding it were made on the ground that was not saline. About one-fourth of the land under cultivation was salt, and three-fourths of this had been cured by sheer cultivation, much in the way I have described in the case of Mr. Fenton's farm. For the other fourth sluicing and irrigation had been available. The cultivation of saline soils is also carried out in other settlements. In most old settled countries, and especially in India, agriculturists are very conservative in following the practices of their forefathers. In America, where the population is composed of emigrants from all countries, every man brings the method used in his own, and all sorts of trials are made and the fittest survives. These are made in a new country under new circumstances, and people are not bound by traditional customs, but are anxious to try whatever succeeds in the hands of others, and also make experiments according to their own ideas. These may be crude, but still a vast number of experiments are made,—not isolated ones by a Government, but everywhere generally by the people themselves—and anything that is successful is hailed as a discovery. Some of the methods I have described as used in America may not alway be practicable in the plains in India. To run off the saline water requires a slope and lines of natural drainage that may not be available. It might be possible to run off the salt-impregnated water into absorption wells, thus returning the salt to its natural destination, the underground water. It is a law that a well will absorb as much water

without raising its level as it would give out without sensibly lowering it. This means has been used in some cases to get rid of liquid sewage, but was found to poison the wells. The plantation of trees is also proved to be a very efficient means of cure. The kikar is well known as capable of flourishing in such soils. They not only assist in moderating excessive evaporation by shade, but they also absorb and remove a certain amount of salt from the soil. As the alkali exists chiefly in the surface soil, and in much less amount at a small depth, trees may grow readily where annual crops could not. The latter have their rootlets only in the surface soil, and are poisoned by the excess of salt; while the roots of trees extend deeper into less saline ground; also plants not only consume portion of the salt, but they prevent its concentration on the surface. A most conclusive experiment made near the Western Jumna Canal by the Irrigation Department is reported by Colonel Fulton. A piece of utterly useless *reh* land, for which revenue was remitted, was taken up by the department and planted with kikar trees. These flourished and a very fine crop of *doob* grass, two feet high, came annually up under the trees, and the efflorescence disappeared. The villagers, seeing that the land was improved, and fearing it would be alienated by the new settlement, applied for the restoration of both trees and land, and carried their point in the courts of law. A few days after the restoration, the wood was sold to a wood merchant, and every tree cut down. At present the *doob* grass is all gone, and the soil is encrusted with salt. Such an experiment made among American farmers would have excited the keenest interest and given rise to numerous trials of the same.

The paper ends with an account of Dr. Brown's suggestions in regard to nitrate manures. It contains an immense amount of scientific information, concentrated in a small compass, and well deserves the attention of those who are interested in the agricultural development of India. We believe that Dr. Center has received the thanks of Government for his very able and interesting essay, which will shortly be published in the Records of the Indian Geological Survey.—*Civil and Military Gazette.*

WELLS AS A PROTECTION AGAINST FAMINE.

THERE can be no doubt that a very large sum has been well and liberally spent, and thousands of lives saved by the Indian Government during the famines of India, especially the last one. A few differences of opinion on the plans adopted were inseparable from so large an outlay over so vast an area, and among millions relieved. The important question still remains, how can such visitations, known to recur in cycles of seven or ten years, be best met and alleviated? To entirely prevent them in India, is simply impossible. They are visitations of Providence, on the failure of the periodical rains. In India, under the influence of a tropical sun, water will produce grain in almost pure sand. And no one therefore will probably question the oft-repeated assertion that irrigation (wherever practicable) should be extended to the utmost. It surely has been so to a very large extent. In three provinces in which I served (in Tinnevelly seven years, in Coimbatore eighteen years, in Trichinopoly three years), I know that under the care of intelligent engineer officers, almost every drop of available water for irrigation is utilized; in cut channels of seventy and ninety miles long, no waste water reached the sea, except at high floods; all river water is directed into watercourses, or into tanks. The rice crops were often finally saved by wells when the channels began to fail. But much lies behind the one word "practicable." Irrigation is only practicable in level tracts, bordering on perennial and unfailing rivers, chiefly from the S. W. monsoon. To cover India with a net-work of channels and series of tanks, all certain to dry up on the first failure of the monsoons, would only be a costly delusion. There are many provinces above the level of practicable irrigation, others with only small temporary rivers which are torrents in the rains, but dry beds at other times. Again there are soils unfit for irrigation where water, if supplied, either disappears as through a sponge (*e.g.*, the black cotton soils); or where the permeating water brings, to the surface, salts or other latent ingredients fatal to crops; (some such are found I believe in parts of the great Ganges Canal). I wish to advance no crude theories, but only a few practical facts gathered in forty years' residence and service in India, from careful observation and intimate association with the ryots.

The province of Coimbatore is a high-lying, dry district, incapable of much irrigation; with a rainfall under 20 inches per annum (on forty years' careful record), and therefore a good example of what is practicable, without irrigation, to alleviate a famine. In such a province (and doubtless there are many such in Bengal, Madras, and Bombay) what can be done to meet a drought? It is possible, as of old to buy up grain in the seven plentiful years and store it for the 7th or 10th of famine, Government selling it out at fair rates in the time of distress? It is worth consideration, but I fear it is impracticable. There are few Indian grains that will keep, except one or two kinds of millet (raggy, tenny, &c.). Rice and other grains rot, or are insect-eaten in three or four years; but millet, if preserved from the air, will keep twenty years and more. I do not agree with those who say that the Indian ryot refuses irrigation from stupidity or improvidence. The ryot, in my experience, though without science, is a shrewd observer of the nature of his own soils and of climate; and can get more out of his small farm of a few acres than most of his able European masters could do. He will use irrigation if it will pay him, he knows its value and often covets it, but he can often raise a cheaper and more saleable crop (than rice) by the rain from heaven for which he pays nothing. The water rates are often also too high; if lowered, water would oftener be bought by ryots and utilized in a dry season to assist a dry grain crop. Irrigation usually means rice only.

How then are a drought and a famine to be met? The only other means, and which I have long advocated is "well" cultivation: encourage wells, wherever possible, and there are a few provinces where they are not so. Wells can be and are sunk in all soils from 20 to 80ft. deep, costing from Rs. 50 to Rs. 1,000 each by the ryot himself for his own profit with no enhanced Government cess; but getting as he ought the full untaxed profit of his own labour and capital. This was formerly not so, but is I believe now conceded to the ryot throughout the Madras Presidency; if not, it ought to be. Government should advance small loans to the poorer ryots (without interest) for three or five years, to be repaid by instalments on the mortgage of their (saleable) lands. I advanced in Coimbatore in this way (under Government sanction), Rs. 50,000 and 5,000 new wells were dug by the ryots, and the whole amount lent was duly recovered, without a single failure, within the five years. Had I remained in the province, I should have repeated the process. During the last famine, I have reason to know the Coimbatore wells saved many a family from starvation and ruin. One failure of a monsoon dries up all tanks and channels not fed by a perennial river, but a well will stand one and even two such failures; it will still irrigate a portion of the land immediately round it; and save grain enough for the ryots' family, while the straw saves his cattle; with drinking water for both. Moreover the water raised and used for the fields near the well, percolates partly again into the well and is raised a second time for renewed use. Not so with a tank or channel; the water flows once over and off the field and is lost. The well too is the ryots' own property, and adds tenfold to the saleable value of his land, and is thus a safeguard and an advantage both to the ryot and the State: for if the ryot prospers, the State benefits and is sure of its rent.

In looking at Indian agriculture, we must not take an English view only, but look also at the peculiarities of the Indian soil and climate; the ryot knows them well, and acts accordingly, and with his apparently rude but sufficiently apt implements, he draws from the soil as much as any scientific European could; he knows the value of manure and loses none. Some people say, "the ryot should try deep ploughing:" I reply—"excellent in Europe; impracticable for the most part in India." You may as well try to plough deep a hard barn-floor, as a sun-baked Indian dry field, with small Indian cattle. It can't be done in any but the friable and light "black cotton soils" so called, which are porous and do not cake, but crack and open under a hot sun. Even then it can seldom be done; it would require four or five yoke of oxen at least to each plough; and the ordinary ryot has seldom more than one, or at most two yoke. Then "why not breed and use larger cattle?" Again I reply, "usually impracticable; there is no pasture fit for such; larger cattle could be bred in a few favoured localities and high table-lands like Mysore, not in the plains of India usually:" the plough may be improved, the cattle cannot. The Indian Government have tried many improvements. I had under me four fine thorough-bred stallions (of Government) to improve the breed of horses; several fine bulls; fifty merino rams. All had much care bestowed on them; the experiment looked well for a few years, and then failed; climate, soil, and pasture were against it; the progeny dwindled down to its original standard; the foals degenerated; the heifers the same; the lambs became hairy, and the old (woolly) merinos gradually died from the heat, and poor pasture. I am only giving facts. The experiments were begun by my predecessors, and carried on by myself for some years, earnestly and carefully.

No doubt Indian agriculture is much as it was 500 years ago; not from the ignorance or apathy of the ryot, but from the necessities of climate and soil. With a good soil and water much may be and is done, new crops, as flax, and others, can be, and are raised; but such are limited. A large province such as Coimbatore, 90 miles from E. to W. by 120 from N. to S. is a fair sample of many Indian districts, dry and of poor soil. I lived and moved in it for eighteen years, and, I hope, improved it somewhat; but not by unsuitable European machinery, nor deep ploughing, nor irrigation, nor teaching "ignorant ryots" what they knew already. I have in my own limited sphere urged "wells, wells," for many years, and I have yet to learn any better alternative, especially when it involves no State expenditure, beyond moderate, safe recoverable loans, the stimulating, and enabling the people to help themselves. I repeat, I see nothing equal to enlarged well cultivation, fostered by Government, to enable the ryot in a year of drought and consequent famine, to tide over the crisis for one and even two years. The loss to the State by small loans is simply the interest of the money for five years; the gain, the life and stability of the ryot, and ultimate advantage to the State itself, both interests being one. We shall no doubt have famines again. How can we best meet them, is worthy of much thought and inquiry, and of every practical suggestion.—M. C. S. *in Madras Mail.*

VILLAGE TANKS.

UNDER the title of "The Backwoods of Ceylon," in a recent number of the *Fortnightly Review*, the reader is told how "by engaging the natives on the side of work and activity, and by using and enforcing for that purpose the rules which their own immemorial customs have prescribed," the Government of Ceylon are solving the great problem of how to get the tanks of the country repaired, to a great extent, by the villagers themselves. This is of interest for India; and the more so since the people of the district,—the interior portion of the northern half of

Ceylon,—where the experiment is being made, are of the same race, with the same social institutions, as the people of India. Some centuries ago, when Anuradhapura was a centre of attraction to Buddhists, the whole plain was a highly cultivated country with its villages, tanks, and paddy-fields. Now the villages are in ruins, the tanks out of repairs, and the paddy-fields are covered with a dense impenetrable jungle. And all this is due to neglect of the system of irrigation which the rulers of a long past age had so wisely planned and carefully executed. When Sir Hercules Robinson was Governor, he saw that the ancient system of settling purely local disputes by the elders of the villages was in great danger of disappearing before the encroachments of the criminal courts. As a measure of judicial reform he resuscitated the institution which governed the village communities, by passing what is known as the "Village Communities Ordinance." When Sir W. Gregory introduced a scheme for making each shareholder in a village responsible for doing a proportionate share of the work of restoring his own village tank, the revival of the old institution of the country was found to be of the greatest value. According to the rules now in force, every shareholder in a village is obliged to give annually such labour, not exceeding that of an able-bodied adult for 30 days, as the Government agent may declare necessary for the repair of the village tank. A shareholder may at a certain rate commute his labour for money, but in order to do away as far as possible with cash transactions this is discouraged. In consideration of the villagers doing all the earthwork connected with their tank, Government supplied an iron sluice fixed in solid masonry. This scheme was commenced in 1874. At the end of 1878, or in four years, 856 tanks had been more or less repaired by the villagers, and Government had supplied sluices to 117. The estimated value of the work done by the villagers, was Rs. 3,90,000, while the cost to the Government for sluices was Rs. 1,30,000. There was some difficulty with the first few villages to make their inhabitants understand that they must perform their obligations; but a little judicious severity soon brought them round, and now they look with pride at the amount of work they have done. A calculation having been made as to the amount of earth in cubic feet which would fairly represent the number of days' work to be done, the ground is marked out for each shareholder. So long as he digs out the pit to its proper size, and places the earth on the bund of the tank before a certain given date, the times and seasons for working rest with the shareholder. The general supervision of this work can safely be left to the village community, who are keenly jealous to see that each individual does his allotted share of the task.

The words "forced labour" have an ugly sound, and in one sense there can be no doubt that Sir W. Gregory's scheme is nothing more than forced labour and a return *with improvements* to the old system in force under the native *raj*. But if this system is found to work easily in Ceylon, why should it not be introduced in India? In teaching the people of this country the great blessing of individual liberty, we have too long forgotten to instil into their minds the principle that the individual owes a duty to the community at large. In no case does the duty come out more strongly than in the repair of the village tank. Personal labour to be given, within certain limits at his own convenience, is a form of public duty well suited to the purse and character of the people, and one in which the individual can best fulfil his obligations. While putting the individual to no expense, it enables the Government to spend the public moneys on that kind of work which the villagers could not themselves carry out. The maintenance of the village tank is a matter in which all the villagers as a body are interested. The work of an individual, however willingly performed, is of itself inadequate. All must combine and each perform his own proper share. But the petty jealousies among the villagers in the absence of an acknowleged head prevent combination even for the performance of a common useful object. The old village institutions have gone down before British administration. There is no one who can command, no one whom all will obey. The Ceylon Government, by officially recognizing the institutions which formerly governed the village community, have given to the elders of the village a position which all cheerfully acknowledge, all obey; and has furnished itself with a valuable agency for carrying out local public works. What has been a possibility for the Ceylon Government ought not to be an impossibility for the Indian Government.—*Pioneer.*

THE OPIUM DUTY.

THE *Bombay Gazette* tries to prove in the following extract that the Government loses about two crores of rupees of opium duty every year:—

With respect to the question of the relative amounts derived from the Bengal monopoly, and the Bombay pass duty, we will, to make the matter clearer, give a few figures which leave no doubt that we have given a most profitable monopoly to the Native States and populations of Central India. A chest of Malwa opium of the usual consistency, 95 per cent., is equal to 1¼ chest of Behar, which is of 75 per cent. consistency only. Now a chest of Behar at last auction realized Rs. 1,406, the cost of which to Government, with interest on capital, is Rs. 380, leaving a clear profit of Rs. 1,026; but as 1 chest of Malwa is equal to 1¼ chests of Behar, if the profit on the latter be Rs. 1,026, it ought to be Rs. 1,282 on the former. But the pass duty being only Rs. 700, Government clearly suffer a loss of nearly Rs. 600 a chest on Malwa. We have seen that our N.-W. P. ryot voluntarily cultivates the opium for Government at less than Rs. 380 a chest; the equivalent for a chest on Malwa to the Central India cultivator is Rs. 475, or very nearly the figure we put down, in our last article, as the fair share in an ordinary or average year. That will still leave our Government out of pocket to this extent of Rs. 500 a chest in the collection of revenue on Malwa opium. And taking the average export of that drug, at say 40,000 chests a year, the loss to our finances comes to two crores of rupees. This is not a sum to be lightly thrown away during these times of normal deficits, as we believe and we hope we have made it sufficiently clear that this loss is simply owing to the want of proper skill in arranging the incidence of the opium taxation. Can it be fair and just, that while we exact the uttermost pie from our own heavily taxed ryot, we should be so lavishly generous to the untaxed foreign ryot and the protected native prince, for whom we have actually created a monopoly by prohibiting the poppy culture in our districts? It is to be trusted that our remarks may be able to rouse the attention of Government in the Financial Department, and some means may be devised to secure to our revenues an equitable share of the enormous amounts which our own policy with respect to China has provided for the Central India States and their population. It is a notorious fact that the cultivators and dealers have waxed so rich of late, that the former are able in most instances to hold the valuable product of their fields for months and months without any assistance from the sowkar so necessary to ryots in our territories; and the dealers are now actually holding back a large proportion of last year's crop, and delaying the one for this year, in the vain hope of frightening our Government into lowering the pass duty, and that too with heavy stocks and the fact of a more than average crop for the year, staring them in the face. We must confess, however, that of late the figures for Malwa opium revenue have been small, and may have raised anxieties as to the future; but the Central India Agency can easily ascertain the amount of stock held over from last year's crop and the quantity of new crop juice already warehoused at Oojein and Indore. We are confident that the figures will largely exceed those of last year. Only a few timely showers or an intimation from Government that, far from contemplating a reduction they were resolved to raise the pass duty, say from September, when the new crop is all manufactured, will set free the usual stream of shipments from Bombay.

BAMIEH COTTON.

A CORRESPONDENT who signs himself "Observer," sends us (*Bangalore Spectator*) the following notes about Bamieh cotton, which we think will be interesting to our readers:—

During the last three years or so there have been several articles in the *Indian Agriculturist* on the cultivation of the "Bamieh cotton," the subject being so strange, as to make it almost incomprehensible. From all known precedents, it would not be safe to launch out at first on an extensive scale, as experiments in India to the present date have not been satisfactory, from a variety of causes. What are Government and our Agricultural and Horticultural Societies doing? But as in many other projects, so in this, the interloper must begin and go on spending time and money till he succeeds, and then pay tribute to his paternal Government. The only way at arriving at satisfactory result would be an experiment in a small way in the kitchen garden, where the master can be continually present, either to do everything himself or supervise all that is to be done.

This prodigy may be of the *Mule type*, unable to reproduce itself, or if able to do so, perhaps, only in a meagre way, for want of a revivifying power, which I will state further on. Now look at the cocoons spun by the silkworm, of which the varieties are white and yellow. When these are put by for propagation, the white and yellow are always carefully put away separately, but it often happens, that some get mixed, and the result is, that in the next batch of cocoons there is a third variety, *i.e.*, of a very light green kind, and these have invariably been quite superior in every way to either the white or the yellow from which they sprung. I have known trials to be made for several years to get the moths of this kind to give this variety; but all to no purpose, for instead of getting this light green, there would be a mixture of yellow and pure white. For many years, it was supposed that one vaccinating operation was sufficient for a life time, while now it is only considered safe for seven years at most.

It would be well for those who have time and the inclination, to make the trial in two distinct ways: *1st*, by sowing some cotton together on one side, *2nd*, by sowing the Bamieh quite apart by itself. If the former turns out a success, and the latter a failure, then the seeds of Bamieh in its vegetable or *original* state must be sown afresh, year after year, between rows of cotton trees, and for this purpose preference may be given to the Parnambuca cotton plant, for two reasons:—*First*—this plant grows on for years, and consequently will save all the trouble and expense of raising fresh plants from year to year. *Secondly*—the pods of the Parnambuca plants are larger than those of any other plant, while its staple is the largest and silkiest of all others. It is from the cotton of this plant that the sacred thread of the "twice born" and Rajpoots is made. It is to be had in gardens. It would, however, be advisable to try with a variety of cotton plants, so as to be able to prove which kind would be the most profitable, and if getting the most profitable crop comes from the Bamieh direct, there will with it be the value of the fibre of that plant.

I have no doubt that there are many who would be glad to make a trial on a small scale, and if anything herein stated will in any way be of use I shall be quite satisfied.

ASIATIC CAOUTCHOUC.

THE credit of first bringing to the notice of Europeans the existence of Caoutchouc in the East, seems to belong to Mr. James Howison, a Surgeon in Prince of Wales Island. In his paper on "The Elastic Gum Vine" of that island, published in the 'Asiatic Researches,' 1798, he says that the general way of obtaining the gum, was by cutting the plant into lengths of about two feet. By means of wax moulds he made himself gloves, boats, waterproof garments, and other articles. This plant was named by Dr. Roxburgh, "*Urceola Elastica.*" The next discovery was in 1810, by Dr. Roxburgh himself, who receiving from Silheb a turong or basket filled with honey, as a present, found that the lining of the turong possessed greater interest to him than the honey, being of Caoutchouc. He named the tree producing it "*Ficus Elastica,*" familiar to us as a window and greenhouse ornament in England.

I shall first speak of the caoutchouc produced in India, and from the Malayan Archipelago from a species of "*Ficus.*"

Assam or Sylhet caoutchouc, as it is sometimes termed, is the only kind obtained from India, and is the produce of the "*Ficus Elastica*" of Roxburgh, known in Bengal as "Kusnir" or "Kusmoor."

The trees are cut with a knife, and the milk is received in holes prepared in the ground, or leaves folded up in a funnel shape. About 50 ounces of milk is the average yield of a tree, giving about 15 ounces of dry caoutchouc. To prepare the "loaf" kind, the milk is poured into boiling water, and stirred till it acquires some degree of firmness, and then dried. The small "ball" kind consists of strings of caoutchouc, which has been allowed to dry on the tree. Assam caoutchouc, either in the form of large blocks or separate balls, is shipped from Calcutta in baskets made of split rattans, and generally covered with a "gunny" bag, such baskets weighing about 3 cwt. each. This caoutchouc, and indeed all caoutchouc prepared from a species of "*Ficus,*" has a peculiar mattled appearance; in this variety the colour of the various agglunated juices ranges from cream or flesh to that of pink colour, verging into red, and with a glossy surface. Its good qualities, however, are much injured by gross adulteration with sand and other impurities. In the Malayan Archipelago, large quantities of caoutchouc are produced and exported to this country.

AFRICAN CAOUTCHOUC.

MADAGASCAR, termed also "Mauritius" caoutchouc, though not known so long in England as in France, has quietly risen into favour. It is the produce of two or three species of "Vahea," found also in the Comoro Islands, *viz.*, "V. Gummifera," Lamarck (called Vaughnia by the natives). "V., Madagascariensis," Bojer, called Voua, and "V. Camoriensis," Bojer, a beautiful shrub, 10 feet high, with white, sweet scented flowers and fruit of the same shape and colour of an orange. In Madagascar the natives prepare the caoutchouc by means of salt water or artificial heat. It is rather more pinky in colour, but otherwise much resembles that of Borneo.

West Coast.—One of the principal plants producing this caoutchouc has been identified by Dr. Welwitsch, the Portuguese botanical explorer, as the "Landalphia owariensis" of Palicat de Beauvais. It is known to the natives as "Lecongue" or "Sicomgue," and is described by him as a large climbing plant, 4 to 6 inches in diameter at a height of 2 or 3 ft. from the ground. From this point it divides into several long thin branches, which are sub-divided, climbing along the stems and larger branches of neighbouring trees, to which they fix themselves very tenaciously by spiral tendrils formed out of the indurated flower stalks after the ripe fruit has fallen off. The fruit is like an orange, with a hard reddish-brown shell, containing sweetish aciduous pulp eaten by the natives.

In the case of such a very useful and highly necessary article as caoutchouc, the question naturally arises, how can we secure lasting supplies at a sufficiently cheap price, as it is a well-established "axiom" that we cannot long depend on the spontaneous products of the forests, or rely on the caprices of native collectors, and that recourse must be had, sooner or later, to cultivation. I have strongly urged this necessity and will mention some of my reasons for so doing, I first shewed the desirability of cultivating the "Ficus *Elastica*" in India on as large a scale as possible, and also how the caoutchouc should be collected and prepared. The mode of tapping as generally practised is exceedingly hurtful to the trees, and I have recommended the use of a kind of "tapping" knife which should only cut through the bark and save the wood from injury. Trees so tapped or bled should be allowed a period of rest of from two to three years. Proper metallic vessels should be provided to collect the milk so as to prevent contamination with clay, &c.

As to the preparation of caoutchouc, several methods are resorted to which may be thus classified:—

"Group" I. Coalescence brought about by heat. Examples:

1	Artificial heat	(dry)	Pará, Madagascar.
2	"	(hot water)	Assam.
3	Natural heat		Assam, Ceara.

"Group" II. Coalescence brought about by the addition of various substances:—

4	Alum		Pará.
5	Liq ammonia fort		Pará African (best kinds)
6	Anacid ?	(acetic acid)	Pará.
7	Certain plants		Nicaragua.
8	Fresh water		Borneo, Madagascar.
9	Salt water.		"
10	Sulphur		Pará.

Of all these various methods that of dry artificial heat seems to be much the best, though aqueous preparation is also good, if means be taken to dry caoutchouc by adequate pressure. The milk should be strained with a sieve before submitted to coagulation, to free it from accidental admixture of bark, &c. It should also be prepared in the form of thin cakes, to reduce the possibility of adulteration to a minimum.

Thus, two of the chief desiderata, "purity and dryness," would be secured. I have endeavoured to show the great desirability of the acclimatisation and cultivation of the Hevess yielding respectively Pará Central American, Madagascar, African, and Borneo caoutchoucs, Castilloas, the Vaheas, and Landolphias and the Urceola.

The Para caoutchouc is undoubtedly the finest known, and, where the question of price does not interfere, is used for the most valuable articles. Madagascar caoutchouc comes next to that of Pará, and I mentioned that all of these trees would be improved by careful cultivation, and that the caoutchouc from them would be held in high estimation. Larger quantities of good caoutchouc at a cheaper rate is much wanted, and if supplied, would lead to corresponding increase of activity in its industrial application.

Crude India-rubber juice, when first obtained from the tree, has the appearance of a creamy substance, like cow milk, and has a smell of cheese or putrescent milk.

The following are the prices paid per lb. for best description only.

	s.	d.
Pará	2.	11
Ceará	2.	0
Carthagena...	2.	1
Guayaquil (pressed)	2.	1
African	1.	11
Honduras	1.	11¼
Mexican	1.	10½

Allowing all the varieties to be "equally pure," their relative value may be taken in the following order:—

Pará, Madagascar, Carthagena, Ceara, West India (sheet), Guayaquil (pressed), Singapore, Assam, Penang, Guayaquil (common), African, Borneo, and Guatemala.

ARTESIAN WELLS.

MR. W. KING, of the Geological Survey, in an "additional note on the Artesian Wells at Pondicherry," remarks:—"An important fact was brought to my notice by his Grace the Duke of Buckingham in connection with the tidal observations made at Madras by Colonel Baird, which shows that there is very free percolation of fresh water into the sea on the coast there. It appears that a well or cylinder was sunk in the vicinity of the harbour works for a tidal gauge, and it was found that the water in this well became fresh in a very short space of time. This indicates a head and large supply of water which should be struck by borings of no great depth. It may be that a stratum of this kind has been tapped by all the wells, except that of the Ville Noire and in the neighbourhood of Pondicherry, the few tubes put down having offered a freer exit than that existing, not only on the sea face, but also in the beds of the rivers near the coast. This observation at Madras, implies that the flow of water shows itself at a very shallow depth, but the free percolation must be deeper than this under the Madras plains for it is well known that at the ordinary depth to which open wells are made here, there is not free communication of their waters. For instance, in many compounds, wells have been dug at various spots, only some of which contain fresh waters. A case in point is that of Mr. Franck's compound on the Mount-road, an area of about 3 or 4 acres, in which, as far as I remember, 5 wells were dug, most of which gave brackish water,—so here in this small space and at a very shallow depth are seams of permeable strata which can hardly be in free communication with each other."

A NEW PLOUGH

WE believe that Mr. T. T. Leonard, who possesses a very flourishing farm at Kristnarajpuram, some four miles from Bangalore near the railway line, recently imported a new pattern plough from Cawnpore which has attracted the attention of the local Government, owing to the advantages it has over other ploughs which have been introduced into the province. In the first place, it is so light, that a ryot can carry it on his shoulder, and any ordinary pair of cattle can drag it. The great difficulty with the English plough has been that it required very superior cattle to drag it, and, of course, poor ryots could not afford to launch in to the expense that it would entail. Then again, the Cawnpore plough can be made to turn up earth to the depth of twelve inches; it can be repaired by any village blacksmith when damaged, and it only costs four rupees, while the average English plough costs thirty! We understand that Mr. Gordon has ordered some of these ploughs from Cawnpore, and intends to explain their advantages to the ryots, and to induce them to invest in them, if possible. The idea is a good one, and we hope it will succeed. Mr. Leonard must be complimented highly on the service he has rendered in the cause of local agricultural reform by his introduction of the plough.—*Bangalore Examiner.*

VEGETABLE TALLOW.

THE *Englishman* says:—There is an opportunity in Borneo for any one desirous of opening out a new industry in these hard times of slack trade and over-competition. In that island among other productions, there grows a tree which the natives call *Tangakwang Tonggal,* which, no doubt, must be a very euphonious name if pronounced with the true accent. The speciality of the tree is that it yields fruit out of which a very excellent description of tallow can be and is obtained. The wood is also extensively sought after by the Dyaks for prahu-building

purposes, but the tallow-yielding fruit is its distinguishing and most attractive point. The tallow is obtained as follows—The fruit is allowed to remain on the tree until it ripens and falls off. It is then dried in the sun, by which process it grows brittle, and the outer skin can be peeled off. It is next put in a bamboo basket and steamed over boiling water until it becomes soft, and looks much like dough. It is now squeezed in a cloth and the oil exudes and is caught in vessels and allowed to cool, when it presents very much the appearance of wax. There is already some trade in this article to Singapore, amounting to several thousands of piculs, the greater part of which is, shipped to England to be used as grease for machinery. There is however, the possibility of largely developing the trade by proper means, and with every prospect of very substantial success. No European has as yet embarked as a manufacturer of the tallow. That portion of the business is left wholly in the hands of the Dyak tribes of Borneo, who, as might be expected, use very primitive means, indeed, for extracting the oil. There is therefore a new opening for European energy and skill backed by all the latest improvement."

We may add that the Straits Government are sending sample of these tallow seeds and a bottle of vegetable tallow to the Melbourne Exhibition.

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday, the 26th August 1880.

W. H. Cogswell, Esq., v. p., *in the Chair.*

The proceedings of the last meeting were read and confirmed.

The following were elected Members :—

Mrs. A. J. Hughes, Messrs. W. Mackenzie, Newton E. Jennings, and the Secretary of the Patna Municipality.

The names of the following were submitted for membership :—

Rai Jaikissen, Honorary Magistrate of Patna,—proposed by Baboo P. C. Mittra, seconded by Mr. S. H. Robinson.

Captain W. A. J. Wallace, R E., Saidpore,—proposed by Mr. H. J. Leitch, seconded by Mr. R. A. Lyall.

Charles Ryves, Esq., Deanstone Tea Estate, Urngala, Ceylon,—proposed by Mr. J. W. O'Keefe, seconded by Mr. J. E. MacLachlan.

A. B. Holmes, Esq., Blackburn Tea Estate, Debrooghur,—proposed by Mr. W. H. Cogswell, seconded by Mr. W. Stalkartt.

Rejoined—C. T. Castle, Esq., District Superintendent of Police Budaon, and Lieut.-Col. H. R Wintel, commanding at Futtehgurh.

CONTRIBUTIONS.

1. Memoirs of the Geological Survey of India. *Palæontologia Indica.* Ser. XIV, From the Superintendent.
2. Journal of the Bombay Branch of the Royal Asiatic Society, No. 37, Vol XIV. From the Society.
3. Transactions of the Asiatic Society of Japan. Vol. 8, Part 2. From the Society.
4. The *Indian Forester* for July 1880. From the Editor.
5. Memoirs of the Boston Society of Natural History, Vol 3 Part 1, No. 3. Proceedings Vol. 20, Parts 2 and 3, and Occasional Papers, Vol. 3, From the Society.
6. A number of Mahogany seedlings. From the Superintendent, Royal Botanic Garden, Howrah.
7. Seeds and plants from the Nicobars. From E. H. Man, Esq.
8. Seed of the Wild Vine of California. From John Martin, Esq.
9. A small quantity of acclimatized Tea seed from Bottiah. From C. F. Carleton, Esq.

SEED POTATOES FROM MELBOURNE.

The Secretary intimated that he was unable to carry out fully the resolution of the last Meeting in respect to the potatoes received from Melbourne, in consequence of its being too early in the season for sowing at Darjeeling and other hill stations. He had sent out two or three boxes to other localities with the remote chance of succeeding. Messrs. Anderson, Wright & Co., had again kindly promised their assistance towards obtaining another supply in the cold season.

PLOUGHS.

Submitted a letter from the Secretary in charge of the Experimental Farm at Cawnpore, intimating that the plough reported on at the last Meeting was Mr. Crawley's private plough, and not that employed at the Model Farm.

Submitted also the following letter from Dr. Macgregor, Superintendent of the Benares Central Prison:—

I am in receipt of the report of your Sub-Committee on the Benares Jail Plough, and while grateful to the Committee for the trouble they have taken in the matter, I am unable to accept their verdict as satisfactory for the following reasons :—

(1.) This plough alone has been used in the Jail Farm for over a year, and during that time over 200 acres of soil has been turned over.

(2.) During the ploughing season there are from three to six in daily use in every kind of soil and with every variety of crop. That the work is efficiently done, no one who sees it can have any doubt about.

(3.) This plough makes ridges or drills for potatoes, carrots, turnips, cane, cotton, &c., &c., which the native plough cannot do.

From the above it is not unreasonable to suppose that to the inexperience of the ploughman employed by your Committee, the failure of this and the Cawnpore ploughs are due. It requires some experience to properly adjust the length of the full rope, if too long, the nose of the share buries itself in the ground. Mr. Martin's plough being on the native system was more easily managed by an inexperienced ploughman. If you remember, I volunteered to send a properly trained ploughman to work it, and if I had done so the plough could not possibly have failed. Here it has long passed the stage of experiment and become part of the routine work of the Farm. If your Committee consent to re-open the trial, I shall send a man at my own expense to work the plough, only stipulating that he should work the bullocks for a day or two's practice beforehand, for bullocks require training as well as the ploughman. I am aware of the prestige attaching to the report of your Committee and would do all in my power to place the plough in a more favorable light, because I know what it can do.

Resolved, that as the piece of ground in the Society's Garden on which the experiment was made, is now utilized, and no other piece of ground. is available, the Meeting regret that they are unable to re-open the trial

CROCODILE OIL.

Submitted the following letter from the Secretary of the Eglinton Chemical Company, "Limited," of Glasgow, to the address of Dr. Kany Lall Dey Bahadoor:—

We observed some time ago some reference in a London newspaper to an examination which you had made of Crocodile Oil, and if we remember rightly, the name of Mr. Purcell of Agra was referred to in the same communication.

As we are going into a new process for manufacturing leather, in which process such an oil would be invaluable to us, we shall be obliged, if you will kindly say, from whom we can procure a sample of it, and at what sort of price it could be supplied. If, at the same time, you can send us a small sample, we shall be happy to pay the expense of same.

The Secretary reminded Members that Mr. Purcell's letter and Dr. Dey's report on this oil appeared in the monthly Proceedings for February 1879. He had lost no time, on receipt of the above letter, in addressing Mr. Purcell, but the letter was returned a short time ago, the addressee not being at Agra.

Agreed, that the letter be published in this day's, Proceedings in the hope that it may attract Mr. Purcell's attention.

SUPPOSED VALUE OF THE JUICE OF EUPHORBIA AS A PROTECTION FOR IRON WORK.

The Secretary brought to the notice of Members a letter from Col. W. M. Lees, which was inserted in the Proceedings of December last, introducing a cutting from the *Times* on the above subject. He (the Secretary) had addressed the Superintendent of the Botanic Garden of Cape Town on the subject, and had received the following letter from Mr. McGibbon on the subject :—

Since receipt of your letter of January last, I have been endeavouring to obtain more full information on the uses of Euphorbia Juice than I possess, but I am sorry to say, without success.

Euphorbia sap is not used in any form at the Cape nor is it an article of export. I have consulted the Customs Returns to that effect. In the neighbouring colony of Natal a patent was taken out, some years ago, for the use of Euphorbia sap made into a form of paint for use on ship's bottoms, iron and wood, and marine structures generally. I have not learned that it is used in Natal for those purposes, nor do I find any of the sap is exported. I am told that the preparation of Euphorbia juice is worthless as a preventative against the attacks of *animal* life on wood or iron in water.

The species of succulent Euphorbia are very numerous at the Cape. The largest growing Cape sp. is E. grandidens. It reaches a height of 20 feet with numerous fleshy branches irregularly arranged round a straight stem. It is very abundant in the Eastern districts of this colony. It bleeds freely and copiously.

Another sp. found more to the Eastward and in Natal is E. quinata (a bad name of no authority I fear). This is the largest growing succulent Euphorbi I am acquainted with, exceeding in height E. grandidens, and larger in circumference than that sp. A good specimen of E. quinata (?) is a handsome object, although of so singular aspect. The quantity of juice yielded by this tree is very plentiful. From this and the preceding sp. the sap was taken, I believe, for experiment. I would have much pleasure in sending you a few young plants or a lot of cuttings of both or of other Cape species of succulent Euphorbiaceæ, if you desire to have them.

Apologising for the delay in replying in reference to the above matter, I venture to add a request for some seeds, as much as can be conveniently spared, of Euchlæna luxurians. This plant succeeds fairly in certain situations, but it does not seed freely (as yet) with us. It is desirable to distribute seeds of the plant to our farmers. [A large quantity has been sent.]

RHEEA FIBRE.

The next paper submitted was a letter from Mr. T. Sandys, dated 3rd August. to the Magistrate of Bhaugulpore, on the subject of Rheea Fibre, which is forwarded, together with a piece of the Rheea fibre tape therein alluded to by order of the Government of Bengal, in continuation of the papers inserted in the proceedings of last month.

"In reply to Messrs. Burrows, Thomson, and Mylne's No. 2,188, dated Beheea, 30th June last, addressed to the Secretary to the Government of Bengal, General and Revenue Department, copy of which I am favored with under your Office Memo. No. 234 G. of yesterday's date, I beg to state that I know nothing of the Dhunook party, now said to have removed to Synthia, and whom perhaps you will be able to discover by making inquiry in that quarter.

"2. For more than sixteen years past, I have kept up a small cultivation of Rheea for experimental purposes only. Altogether I have followed out above a dozen experiments eventually discarding them all for one. During this long period, the various processes have been generally made no secret of, though there are portions I have kept in my own hands. They have been manipulated by various work-people, and are known to many. Plants may or may not have been surreptitiously obtained from my cultivation, as I took no particular precaution in this respect.

"3. I began with about 100 cuttings obtained variously from Chowringhee, Purneah, Dinagepore, and Rungpore. Eventually there being no particular difference in the outturn of these plants, they all got mixed up together.

"4. I have met with great reverses in the cultivation, the difficulties of which I regard as secondary, if not equal, to those of the extraction of the fibre. Nothing but the highest state of garden cultivation will answer. Will this pay? I think it will, provided that an economic organised system is pursued from the planting of the cutting until the fibre is woven into cloth, not otherwise. I cannot speak positively on this point, as it has not been worth my while to try it as yet on a proper scale. I have confined myself mostly to hand-work, though machinery may be largely employed at various stages. Life spared, I may follow it up two years hence when more at liberty. In the meantime I have been watching for the discovery of any better process than my own; satisfied on this point, I am ready to reject my own.

"5. Rhees, from the character of the plant, must be grown on high lands in contra-distinction to submerged lands. Hence, as a rule, high lands will always be of a poorer description than low lands, whilst it is always on the latter that white ants prevail the most. I purposely selected some high calcareous land abounding in kunkur to see what should be the outcome of a poor soil. The first two to three years the plant succeeded pretty well, but after this period the white ants seem to have discovered themselves stronger for the first time. After harvest cuttings they attacked the woody portion of the stem thus left exposed and burrowed downwards inside the roots, completely honeycombing them of their pith, leaving nothing but the bark untouched. They eventually attacked all weaker plants of all ages. I persevered several years, sometimes losing two-thirds of my crops, until wearied out, I removed the remains into a well-manured plot in the garden, where they at once recovered themselves, became healthy plants and have given good produce.

"6. Whenever convenient to you I shall have much pleasure in showing you this plot, and present you with a ripe plant, entire, which you can send down to Dr. King by the night train, and it will reach him the next morning, quite equal to retransplanting and watching it will be more complete than a supply of leaves only. Annexed is a photograph of one of my oldest plants which escaped the white ants' outrage. I did not observe that the calcareous soil was particularly detrimental to the plant. Its roots pierced to considerable depths, and I have actually found roots growing through crevices in the kunkur nodules themselves.

"7. Through the Imperial Government I offered to make my processes known at the late Saharunpore trial, and I sent on three samples of its cloth roughly woven, still retained, though that is immaterial, as my later process is an improvement. The Committee did not accept my offer. I could not compete under the conditions of the advertisement. My processes are not immediate, but require time, though it does not necessarily follow that they must therefore be rejected as expensive. My many years' experience goes to show that any violent rapid extraction of the fibre is injurious to its strength. The fibre can be brought out white and silky in its green state, in a few hours, but very much entangled and ruined.

"8. Enclosed are two samples of half an inch. Tape, according to my latest process, spun and woven by a common village-weaver with his rude implements. I shall be very glad to communicate my process to any one who will put me in possession of a better one."

APPLICATIONS FOR SEEDS AND PUBLICATIONS.

Letters were read—

From the Director, Department of Agriculture, N.-W. P., requesting the aid of the Society in procuring a quantity of the "wheat rice" from America, which is referred to in following extract from the *Pall Mall Gazette.*

"A new sort of wheat, which is said to have been discovered in Arkansas about two years since, is at present attracting the attention of farmers in the United States. It is called wheat rice, and is supposed to have been originally brought to America by emigrants from the south of Russia. The grain is said to be well rounded and full, rather smaller than that of corn, yielding a fine white flour, which is more nutritious than either maize, oats, or rye, and forms an especially good food for every kind of cattle. The stalk of the plant is described as being tall, stiff, and plentiful. One of the peculiar qualities of the new cereal, and one which makes it particularly suitable to certain soils, is that it will live and thrive in districts where other kinds of corn would die on account of the dryness of the land. It remains unaffected by a drought of eight months. Its hardiness is likewise shown by the fact that it resists the attacks of almost every sort of insect, and the cost of cultivation is much less than that of wheat, maize, or rye. On analysis, the new corn has been found to contain 4 per cent. more starch and 3 per cent. more oily matter than wheat, but, on the other hand, it possesses 2 per cent. less nutritive matter, and 5 per cent. less water."

From the Secretary, Local Fund, Kohat, to the same effect.

The Secretary intimated that steps had been taken towards meeting these applications.

From Secretary, Public Garden, Sumbulpore, applies for seeds of various kinds of the *Eucalypti.* Complied with.

From L. A. Bernays. Esq., V. P., Queensland Acclimatisation Society, acknowledging receipt of certain recent publications of the Society and asks for back numbers of Journal, Vols. 1 to 4, new series, to complete the set, "as your Proceedings and Journals contain so large an amount of most valuable matter."

It was agreed, on the recommendation of the Council, to present these back numbers to the Society in return for the many useful plants and seeds which Mr. Bernays has contributed towards this Society's Garden.

From Messrs. Thomson and Mylne of Beheea, forwarding some printed copies, giving detailed statements of the advantages derived from the use of their sugarcane crushing mill, as proved by the figures of comparative costs given.

MINERALOGY.

A COPPER HINDU idol, representing a woman with four arms, has recently been unearthed near Orenburg. Archæologists believe it to have been the prize, several centuries ago, of some of the Mongols who invaded India, and to have been conveyed in the course of their nomad wandering to the spot, where it was discovered in the Orenburg district.

LONDON speculators in gold mining shares may perhaps soon find a sphere of activity nearer home than the Wynaad. We read in a home paper that there is a prospect of operations being resumed at the Kildonan gold diggings, Sutherlandshire. A German gentleman has lately been testing the gold-producing properties of quartz taken from several points. The results are reported to be very promising. A chemical process will be adopted for separating the gold from the quartz. Persons long resident in Australia state that they are struck with the resemblance of the geological features of Kildonan to those of the Australian gold fields.

THE WYNAAD GOLD FIELD.

[MR. H. A. SEVERN, who is far-and-away the highest authority, on gold mining now in India, and, indeed, one of the first authorities on gold mining in the world, has sent us [*Times of India*] an admirable letter, showing the mischief that will be wrought if anything like a gold mania is forced upon the Indian public. He is, however, terribly outspoken, and though we should like to publish every word he writes, we are constrained to acknowledge that such publication might be inexpedient as well as unpalatable at the present moment. We shall therefore, confine ourselves to a few salient, if impersonal excerpts.]

TO THE EDITOR

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SIR,—There is a vast difference between such reports as these and reports founded on a real practical basis. The former are not worth the paper on which they are written. The preparation of the latter is among the most difficult and delicate of scientific tasks.

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There are men down here pretending to possess an acquaintance with gold mining and crushing, who to my own knowledge have drawn up lengthy reports after having washed off one or two dishes of earth, and receive for the said reports large sums of money. Such proceedings are wholly detrimental to the development of this district, and are a simple and ready means for blinding the public, for pecuniary ends. During an experience of twenty-seven years I have been constantly on gold work, followed it with scientific care, by day and night, into its many and varied ramifications, seen it in every form, above ground and beneath it, almost pure, and associated with silver, antimony, copper, iron, &c.; have put up crushing mills, burnt tailings, and have treated specially many thousand tons of quartz. In view of this lengthened experience on this special kind of work, and aided as I have been all through life by strong proclivities for physical science, I naturally feel a deep regret that persons should be tempted to draw up reports having little or no practical acquaintance with the subject, but only with a view of misleading the public mind. My intimate friend, Mr. Ruskin, said well when he called Mr. Whistler "a cockscomb and an impostor" for flinging a pot of paint at the public and calling it a picture. Fortunately Whistler as an artist is defunct. That all impostors, though they may be "*artists*" in one or several professions, may become extinct sooner or later, must be the earnest wish of all real practical men. My earnest endeavour during all these years has been to promote the application of science to practical ends. In the colony of Victoria, in New South Wales, in Queensland, in South Australia, in New Zealand, and in England, these facts are well known, and H. E. the Governor of Bombay will, I feel sure, bear his testimony to my statements should it be necessary.

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Yours, &c.,
Davallah. H. A. SEVERN.

INDIAN COAL.

CAN nothing be done to improve the demand for Indian coal? A large and important industry seems almost starved by the limited demand which exists for the output of the Indian mines. During 1878, the total output was 1,015,210 tons, as against an average of 817,602 tons for the three preceding years. At the same time India continues to import the article largely, for the consumption of coal is on the increase. During the three years ending 31st March 1879, the average quantity imported was 522,755 tons, valued at Rs. 92,10,451, a valuation equal to Rs. 17-10 per ton. There is this peculiarity about the coal industry, that the quality of the coal interferes with its use in a large number of instances, and no amount of commercial enterprise can remedy this. In other industries one can improve matters by giving closer attention to the modes of production, but with coal no amount of care can improve the raw material. If one could by any means reach an improved quality of coal, or a quality in any way equal to that of the English mines, not an ounce would ever be imported; but this seems out of the question.

Indian coal is cheaper per ton than English, and for many purposes does quite as well; but when space is a factor in the calculation, as on board of steamers, the Indian coal is heavily handicapped, in spite of its relatively lower price. One ton of English may be as serviceable as one-and-a-half ton of Indian coal, while in many cases the price of this latter quantity will not be one-half the amount that has

to be paid for the one ton of the superior coal. On the other hand, a vessel requiring, say, one thousand tons of English coal, would have to carry fifteen hundred tons of country coal, thereby depriving the owners of space for five hundred tons of cargo. This it is which makes English coal so extensively used on board of steamers, even at its relatively higher cost price. Besides the driving of machinery, there are, however, many ways in which this coal might be used. There is a continual cry that the country is being deforested for fuel. In the early days of the use of coal in England, it was much hated, and stringent laws were passe regulating its use, and confining the burning of fires to certain hours. Now, who could do without the coal fires? Can nothing be done to introduce coal as a domestic fuel in India?

The cost of carriage is certainly a serious drawback, but at least, within reasonable distance of the mines and of the railway, it ought not to be too dear. Coal is four times more valuable as a heating agent than wood, and its price need seldom be more than double that of wood. True, different appliances are used, but we may trust native ingenuity to tide us over this difficulty. Of the quantity of coal brought to the surface (1,015,210 tons) 957,248 are from the mines. The output of the various districts is as follows :—

Bengal.	*Tons.*	*Per cent.*
E. I. Railway mines	301,976	30
Other mines	655,267	64½
Total, Bengal	957,243	91½
Mohpani	12,758	1
Warora	35,209	4½
Total	1,015,210	100

The output at the Warora mines has increased largely, the average for three years, 1875-71, having been only 13,229 tons as against 55,109 tons in 1878. This is not surprising, when we consider that the Great Indian Peninsula Railway Company pay an average of £1-7-4 per ton for their coal, as against the East Indian Railway Company's outlay of £0-5-5 per ton for their fuel. The Warora mine lies contiguous to the Nagpore extension, and will find a large sale for its output, as the line extends eastward towards Sumbulpore, Midnapore, and Calcutta. The Mohpani mine, too, will acquire importance when the Bhopal extension of the Gwalior line is continued on the G. I. P. line near Mohpani. Our greatest hopes, however, lie in the Assam district, where there is an extensive field of coal, which will compare favorably with the best English article. At present it is quite beyond our reach, and perhaps it would not pay to work it on the limited scale necessary to supply the Assam steamers. Doubtless this field will be utilized whenever the railways shall go up the valleys of the Brahmapootra the Soormah, and the Barak.—*Indian Daily News.*

THE KARHARBARI COAL FIELD.

THE Karharbari field is not without drawbacks from its value. Mr. Hughes, at the outset of his report, uttered a warning to those who, he said, had strongly upheld its advantages; he said they seemed to have failed to attach sufficient weight to the drawbacks of its limited area, the character of its seams, and its geological structure. The surface of the field is broken by two outliers of the crystalline series; numerous trap dykes run in various directions through the field, and affect the value of the seams; and quartz reefs are common. The disturbance of the strata has been considerable towards the northern boundary, where the dips are as high as 32° and 35° in places, and very various. The beds dip generally from all the boundaries towards the middle of the field, and the intersecting streams do not seem to be at sufficiently low levels to give efficient drainage. Hence arises a cry for more pumping machinery, and the necessity for increased expenditure on "block account," which is always in debt to "revenue." The issue rates, for company's purposes, of coal of all sorts, were increased last year seven annas per ton, with the view of squaring this account before the colliery should be handed over to Government on 1st January 1880. The estimated expenditure on works and new machinery for 1879 was over two lakhs of rupees. In July 1878 a scientific man, Dr. Walter Saise, was got out from England to act as Assistant Manager, and for the rest of the year he was principally occupied in completing the surveys and taking sections through the field, from which he prepared a report showing what remained to be done to develope it. The output for 1878 showed a slight falling off, which was attributed by the Manager to want of machinery, for the working faces of the principal mines had been carried so far down the dip that it was found impossible to keep the workings dry, and half the galleries that should have been yielding coal were full of water.

Indeed it would have been impossible to have complied with the requirements of the Locomotive Department of the E. I. Railway itself, had it not been for one seam in a hill, which was worked by drifts and required little or no machinery. A tramway had been completed to the foot of this hill, but the one locomotive available was in sufficient for hauling the coal, and carting had to be resorted to. The mining in the Serampore part of the field was interrupted by the falling in of the roof of one mine owing to the pillars getting crushed, and the consequent inrush of a neighbouring stream. There are 40 shafts in the Karharbari workings, 35 drifts in the Bhuduah hill, and 18 shafts in the Serampore portion of the field. Of these, twelve, including a quarry, were worked in 1878 at Kaharbari, four of them being then nearly worked out, and another about to be closed for want of an engine. Only four good mines, the quarry and the hill workings were left available at the end of 1878 in the Karharbari quarter, some of the others being full of water, and others requiring to be sunk deeper.

Altogether it is clear that the Karharbari field is troublesome, and requires a long capital for its working and future development. Henceforward the Government of India will have to find the money for new works and plant, and not merely to guarantee the interest on it, and in these times of economy they will probably not spend more than is absolutely necessary. At the same time it is of great importance to have cheap coal for working the E. I. Railway, and as this has hitherto been secured by the working of the Kaharbari coal field as a Company's or departmental concern, the same course will probably be continued so far as necessary. But even the E. I. Railway itself, now exists solely for the general good of the country, and no longer for the benefit of the shareholders; and care must be taken that neither it nor its accessory, the coal field, shall be fostered to the injury and the hindering of the development, in parts of the country not traversed by it, of other promising fields of industry. If, for instance, coal for working the upper parts of the East India Railway can be got cheaper from other quarters than Karharbari, it will be the interest of Government, and of the E. I. R. Company, who are hence forward to work the line for Government, to use such cheaper coal irrespectively of where it comes from. And if a new enterprise which promises to supply cheaper coal would also assist in the development of a backward portion of the country, and give it that cheap and rapid means of communication which is now recognized as the best safeguard against high prices of food and famine, it seems to become the positive duty of Government to see that that enterprise shall have fair play, and shall not be sacrificed to any supposed necessity of developing to the utmost the coalfield already in use. Such an enterprise appears to be the proposed railway from the head of the Sone Canals to the Daltonganj coalfield, of which, some four months ago, we gave an account, moved thereto by the uninformed notice of an up-country contemporary. The Daltonganj coal is only about 113 miles from Buxar, or 139 miles nearer that point than the Karharbari field is. And it has been calculated that the Daltonganj coal could be sold at Buxar—to yield a handsome profit on the construction of the 62 miles of railway that would have to be made to bring it down to the head of the Buxar Canal—for Rs. 10 per ton. The cost of Karharbari Coal, at Buxar, to the Locomotive Department of the East Indian Railway, at the present rate of issue at pit's mouth, *plus* the rate of frieght given in the company's published tariff for last September, is Rs. 11-6-4 per ton; and the cost to the public and to foreign railways at the same place and at the published rates, is Rs. 13-15-4 per ton. The saving to the East Indian Railway Company, or now to Government, by the use of Daltonganj coal, which is practically as good as Karharbari on the whole length of line west and north of Buxar, would therefore be Re. 1-6-1 per ton, and to the public and to foreign railways Rs. 3-15-1 per ton. It does not affect the argument for the substitution of Daltonganj for Karharbari coal that the E. I. Railway Company has been in the habit of allowing special rates of freight, lower than those in their published tariff, to certain other railway companies, or that, moved probably by the rumours about Punjab coal mines, they have recently advertised a general reduction in the rate of freight of Bengal coal (by whomsoever owned) from 5·76 to about 3·5 pies per ton per mile. All this only means a diminution of carrying profits; and, as the profits will henceforward belong to Government, it will be for Government to make such re-adjustment of rates as may seem best for the general interests of the country. To carry coal produced by other coal owners for other railway companies at unremunerative rates, will not compensate for the loss incurred by burning dear coal in one's own locomotives, and especially also if the opening up of a whole administrative division of country is thereby prevented. Cheap coal for the East Indian railway has hitherto been secured by the guarantee on the part of Government of 5 per cent capital expended by the East India Railway Company. Now that this is no longer possible, Government have the power of securing it for the upper portion of that line, as well as for all the other lines in Upper and Central India, by the smaller guarantee of 4 per cent. on the capital required for the construction of a railway into Palamow. This question only requires to be dragged into the light of day; and the railway companies in Upper India, who now pay so dearly for Bengal coal, will be glad to hear that the question is now at last under the serious consideration of Government.—*Englishman.*

FORESTRY.

THE French preserve timber with lime; the planks are placed in a tank, covered over with quick lime, and then stocked with water; they are allowed to remain thus for a week or so.

THE Lieutenant-Governor of Bengal is pleased to order that, on and after the 1st October 1880, the following shall be the rates for forest produce in the Sunderbuns Protected Forests in supersession of those published in Rule 1 of the Rules of the 17th August 1880 :—

(1) On every maund of sundri, pussur, or amoor timber ... ... one anna.
(2) On every maund of keora timber ... ... one-half anna.
(2) On every maund of any other forest produce... one-quarter anna.

THE Forest Department is very far from being held in the "full odour of sanctity" by our mofussil fellow-subjects. The inhabitants of the Talukas of Mahim and Dahanu, in the Tanna Collectorate have addressed to the Revenue Commissioner of the Northern Division what they modestly term a petition, but which is in fact an indignant remonstrance against the systematic piecemeal encroachments of Government upon the rights of landholders, never disputed up to the time of the English advent nor even then, until it became the misfortune of this country to find itself under the direct rule of home authority. These people complain that the ever-increasing restrictions in the Forest Laws have, at length, drawn the string so tight as to preclude the owner or holder of land from taking from it as many sticks as will make his kettle boil. To begin with, his land is rack rented and assessed at rates from which he can scarcely hope to scrape the means of existence, he is next told that he must appropriate some portion of the land he pays for, to the continued growth, on behalf of the Government, of such forest trees as the Collector, not he, may think desirable. Injustice, it would be supposed might have ended here, but it did not. It was thought that another turn of the screw might be ventured upon, and even the brushwood was seized upon, thus denying—except for a consideration—that common right to the fuel of the forest, which since forests came into existence was never before known to be disputed. Has the Government of this country fallen into such abject poverty, as to necessitate this huckstering for a few rupees' increase of revenue?

THE *Indian Forester* for July says:—

Under the head of *Official Papers* are published important despatches regarding the staff of the Indian Forest Department, the most noticeable feature of which is the employment of native agency on a greatly extended scale. Sub Assistant Conservators are in future to be recruited from the ranks of native candidates, who will be specially instructed, and who will be eligible for employment as Assistant Conservators, as vacancies occur. If as Assistant Conservators, then why not in due course as Deputy Conservators, and so on? No doubt this will be eventually carried out, and the department will *in time* be filled almost exclusively by natives, who will receive the same salaries as Europeans, so no saving will be even effected thereby. For the present however, half-a dozen "thoroughly competent candidates" are to be selected annually in England to fill the posts of Assistant Conservators. We regret to have to demur to the correctness of the statement of the Government that "great care and educational tests and other special qualifications were rigorously insisted upon" in selecting "the considerable number of men" appointed to the department in this country.

It is a matter which ought to attract the serious attention of the Government, says the *Bombay Gazette*, that the patches of timber which have in the past been preserved adjacent to each village are steadily disappearing through the demand for fuel to work the steam engines at the different cotton presses scattered over the Berars. In the compound of each cotton press there is stacked a quantity of timber sufficient to keep the engines going for months to come. The high price of coals renders it more economical to burn wood in the furnaces, and the consequence is that village babul-bunds are steadily disappearing. Provision should be made to supply the place of the timber cut down by systematic planting of young trees. Without the order of superior authority nothing will be done. The re-afforesting of certain parts of the territory is a work which should be undertaken at once, and the old babul-bunds should be preserved, and, if possible, extended by the direct intervention of the executive, for nothing else will suffice.

THE conservation of forests which the Government Forest Department has so far effected, cannot but have a beneficial result in proportion to its extent, which, as compared with the vast size of our Indian territory, seems but small as yet, the whole area at present protected being only 18,113 square miles. It has been said indeed that the deprivation to the ryot, in the protected districts, of the fire-wood, which is now no longer available to him, causes him to burn for fuel the manure which would otherwise be thrown upon the land. But the average consumption of manure for fuel common to all India, evil though it may be can be very little increased by forest conservancy, while the benefit which will ultimately accrue from the increased quantity of fire-wood, which the forests will produce, will more than balance the loss to the ryot. The more woods we call into existence, the better for the future generations of ryots, and portions of them may ultimately be set aside expressly to meet the demand for fuel, though it is obvious that the reckless cutting down of young trees must be prohibited while the first steps for creating forests are being made.

THE Bombay papers are protesting against the way in which the scanty patches of timber in the Berars have been used up to provide fuel for the numerous steam engines scattered over the country, and they call upon Government to interfere to prevent the entire denudation of the country. It is much the same in other parts of the country. Although we have expensive and extensive branches of the Forest Department established for the conservation of our timber tracts, we are afraid the most important work entrusted to the officials is to a great extent neglected. It should be insisted upon, that wherever a growing or full grown tree is felled, saplings should replace it in the proportion of three to one. There can be little doubt but that the reckless denudation of the country of its timber growth is surely inducing climatic changes of a deleterious character. It has much to answer for in bringing about the decreased rainfall of recent years, and, if persevered in, will in all probability turn some of India's most fertile areas into so many Saharas. Too much attention cannot possibly be devoted to forest conservation in this country.

THE PINE IN BURMAH.

A WORK recently published by Mr. Kingzett, a Fellow of the Chemical Society, entitled *Nature's Hygiene*, sets forth numerous examples of the chemistry and hygiene of the eucalyptus and the pine. It seems that the valuable disinfecting properties of the Australian eucalyptus trees, which have been proved in many feverish and marshy localities in Europe are possessed in a larger degree even by the pine. The quantity of oil of turpentine that finds its way into the atmosphere from a pine forest, especially in hot weather, is simply incalculable. Valleys and swamps may by this agency be freed from malarial fever, and, in the place of a poisonous atmosphere, these trees substitute a state of balminess and purity at once luxurious and healthful. We believe Mr. A. H. Hildebrand, the present Assistant Commissioner of Engtsein, when he was in charge of the Salween district, drew attention to the pine trees which existed in that region. The head quarter town of the Salween district, Pahpoon, is noted for the dangerous fever which prostrates all new comers for many months, and attacks even the seasoned foresters who pass through it *en route* to Zimmay or the red Karen country. We understand a European forest officer also now has his head-quarters at Pahpoon. Might it not be advantageous to the health of the residents in this feverish locality if he were directed to form plantations of pine at or near Pahpoon. The wood itself perhaps may not be of much use exceeded as it is in hardness and all enduring qualities by teak and many other descriptions which have their habitat in the Salween valley. But as pine is found in large quantities in this district it should not be difficult to obtain a sufficient quantity of young trees to form a sufficiently large plantation and purify the malarial influences of the head quarter town. Every European officer who has been quartered in this town has hitherto had to obtain leave after a few months' residence, so prostrated have they been from fever. The Burmese and Shans also suffer in a lesser degree, and, though we have made it the head-quarters of the Salween district for many years, we have not done anything to improve the health of the place. It seems, if the reports by Mr. Kingzett are correct, and we have no reason to doubt them, that we have in the pine tree a preventative of malaria and fever which should be tried forthwith at this feverish out station. We believe, when Mr Hildebrand made his report on the pine trees of the Salween district, a paper on the subject was published in the *British Burmah Gazette* and experiments made on the turpentine which could be produced from the Salween pine. But, although these seem not to have been commercially successful, for we have heard nothing more about them, there is no reason why the hot weather of Pahpoon should not make a pine tree plantation there give off a sufficient quantity of oil of turpentine to the atmosphere which would replace the present poisonous atmosphere and remove the stigma which Pahpoon at present labours under of being the most pestilential station in the whole province of British Burmah, not even excepting the Arakan Hill tracts.—*Rangoon Gazette.*

GARDEN.

DR. KING, Superintendent of the Calcutta Botanical Gardens, makes the following observations regarding the *Guango* or Rain-tree. "This wonderful tree grows faster than any hitherto introduced into Bengal with the single exception of the *Casuarina*. It gives a beautiful shade and yields a pod with a sweet pulp, which is greedily eaten by cattle. For avenues, cantonments, squares, and situations where dense shade is wanted, no tree is more suitable than this."

A CORRESPONDENT writes to us from Cashmere, under date September 3rd:—Some time ago Monsieur Ermans, the Superintendent and Manager of the Maharajah's vineyards, imported from Champagne some valuable grape cuttings. These flourished luxuriantly under his care, and to-day, a very interesting ceremony was performed, *viz*, that of cutting the first cluster of French grapes grown in Cashmere, and, if I am not mistaken, in India. A number of gentlemen who witnessed the ceremony were subsequently entertained at a sumptuous *déjeûner* by Monsieur Ermans. The wines drunk at this repast were all of local manufacture and were pronounced by one or two connoisseurs present as very good. Monsieur Ermans proposed the health of H. M. the Queen-Empress, which was drunk with honors.

A VERY praiseworthy endeavour on the part of the Agricultural and Horticultural Society of India, has been made to test the real value of the properties ascribed to the juice of the *Euphorbia* in the preservation of iron and wood. This plant would seem to have its main habitat in the Cape Colony, and the Secretary of the Society addressed a letter on the subject to Mr. MacGibbon, the

Superintendent of the Botanical Gardens at Cape Town. The reply, however, though clear, is by no means conclusive, that any real virtue has so far been discovered from the applicaton of this sap. Rome, however, was not built in a day—northe virtues of gutta-percha discerned in a year. There is something yet to be made out of that *Euphorbia* milkjuice as an antiseptic.

The famous valley of roses, in the neighbourhood of Kazanlik, in Roumelia, is said to be covered this year by a perfect sea of flowers of the most glorious kinds. This valley is wholly set apart for the cultivation of roses, out of which is made the *attar* so highly valued at Constantinople and elsewhere. The sight now afforded by the virgin forest of rose-bushes, covered with flowers, is unique. One sees nothing but roses from every hill top For miles round, the air is heavy with their delicious aroma. The valley is annually hired out in lots, and most of the contractors are English and Russians. Eastern Roumelia used to collect in yearly taxes, from the valley alone, a round sum of over two millions of francs.

ON HARDY LILIES.

NO more beautiful tribe of plants, whether hardy or tender, can be named than the genus lilium. Their superb, pure, and pleasing colours, their stately and for the most part refined aspect render them invaluable decorative plants. Their cultural requirements are in most cases simple—they succeed well in any good garden soil, but best in that which is rich, deep, and well-drained. The proper time to plant the roots is as soon as the growth is ripe—that is, when the stems die down. Very usually they are kept over winter in a dry state, and planted in the month of February or March where they are to grow and flower; but this is an evil practice, leading to the weakening of the bulbs, and eventually, if continued year after year, causing the death even of the most vigorous sorts. When the roots are lifted with the view of being replanted, let any fresh, healthy scales of any variety that happens to be scarce, be carefully kept and planted thickly in sandy soil. In the course of three years these will form excellent flowering roots. Lilies delight in high culture. They will take almost any amount of manure —cow manure being the best. Some species are very liable to suffer from damp in winter. A good plan to prevent loss in this way is to cover the surface of the ground with exhausted tanbark or coal cinders to the depth of two or three inches, to absorb and throw off excessive wet. Nearly all the species and varieties are fond of peaty compost, but good, well-decomposed manure suits all of them fully better, and is more easily obtained than the best quality of peat. It is the custom of some cultivators never to disturb their lilies after planting them till they show signs of falling off in vigour. Our practice and advice is to lift and replant every second year; and if our land were very light and hungry, we should do so every year, as soon as the first indications of decay manifested themselves. Never leave lifting and replanting of stock in hand longer than this; shop or imported roots you can only plant when you get them in possession; but if the weather and condition of the soil are favourable, plant them without delay when obtained. The most favourable weather for planting is fair and sunny, and the best condition of the soil is when it is so dry that it will not clog the tools.

The above remarks have been based on the requirements of such species and varieties as will succeed well in the open border. There are many sorts which will not succeed without very special conditions; but these we have at present excluded from our selection, and also from any consideration in our cultural remarks. In a general way lilies are benefited by partial shade and shelter in spring and early summer. Shelter especially from cutting east winds and spring frosts, is indispensable to protect the young growth. Hence the advantage of planting them in the bays or openings on the margins of beds or borders of shrubs, where their young growths will receive such open protection as they need. The following selection includes the hardiest, most distinct, and beautiful sorts

Lilium bulbiferum.—Of this species there are many varieties, distinguished by differences in colour, and also, somewhat by, differences in stature and the size of the individual flowers. All are beautiful, and the type is popularly known as the 'orange lily.'

L. candidum.—This is the common white lily, one of the handsomest flowers of June and July. It requires a little shade and shelter to bring it to perfection, the foliage being very apt to be destroyed in spring, by wind or frost, and to be scorched in summer before the flowers become fully developed. There are some varieties of this species, but we consider the ordinary pure white form the most desirable, The double-flowered variety has the merit of more durable flowers, but the beautiful symmetry is somewhat marred by the doubling process.

L martagon.—This is the true 'Turks cap,' lily, so called on account of the resemblance of the fully expanded flowers to the form of the turban of the Turk. *L. chalcedonicum*, the so-called scarlet martagon, is not really a form of the true martagon, but a true species and one of the most beautiful—certainly unequalled in the brilliancy of color, which is vermillion scarlet of the richest possible hue. The martagons being all rather tall-growing species, should have background positions.

L. longiflorum.—Of this there are several varieties, all being dwarf growers. The flowers are white, very long in the tube, and very handsome.

L. tigrinum.—This is the common 'tiger lily,' of which there are many varieties, including a double-flowered one which should be in every garden. It is in all its forms one of the hardiest and most robust of the species.

All the forms of *L. speciosum* succeed well in the open ground though generally grown in pots in frame or green houses. When attempted out of doors, they should be placed where they can be sheltered as they may require protection in spring.—*N. B. Agriculturist.*

TEA.

GREEN-FLY blight has, we learn, been generally bad this year on the Assam tea plantations, and will materially affect the outturn.

TEA planters on the Neilgherries will see from the *Fort St. George Gazette* that the Commissariat Department is asking for tenders for the supply of 110,871lbs. of tea. Tenders may be sent in at any time before the 9th November next.

FROM some statistics prepared by the Board of Revenue in the Madras Presidency, we learn that tea cultivation is confined to the Nilgiris where there are 79 estates which comprise an area of 9,002 acres: of these 4,831 acres were taken up and planted, 2,543 acres with mature and 1,628 acres with immature plants. The approximate yield of tea was 645,126lbs. last year, giving an average yield of 253lbs. per acre of mature plants.

THE Kumaon correspondent of the *Delhi Gazette* hears various reports as to the yield of tea in that district, ranging from 1½ maund to 4 maunds, according to cultivation and situation, and as high as over 5 maunds per acre under very favourable circumstances.

AN Association has been formed in London to sell pure Indian teas in packets both in the United Kingdom and on the Continent. The Association will work under the auspices of the Indian tea districts, and is, it is said, prepared to embark on the enterprise on a large scale. This should be good news for the tea interest.

THE fall in the value of tea in England is quite a phenomenon and is not confined to Indian tea alone. The *Times* calls attention to what it terms "the extraordinary figures of the tea trade as exhibited by the trade and navigation returns for the month of July last. According to those, England imported in that month 21 per cent. *more* tea than in the same month of 1879, but the value of it was 23 per cent *less*. As the *Times* remarks: "Figures like these must indicate severe loss somewhere."

A BETTER feeling is latterly reported in the English tea-market, partly owing to the prospects of a good harvest, and partly to the fact that all good first chop teas have reached a fair and safe level. Shipments of tea from China are below those of last season. Up to the 23rd instant, the amounts advised as shipped were 88 million lbs. against 99 million lbs. at the corresponding date a year ago. There is an increase of four millions from Shanghai and Hankow, but a decrease of six millions from Foochow. Good export orders are also daily relieving the stock at home, and with the large delivery figures confidence is being restored, and there has been little forcing lately to effect sales. The stock of tea at the end of July in the bonded warehouses of the United Kingdom amounted to 67 million lbs. against 64½ million lbs. a year ago.

To the end of August, the exports of cinchona from Colombo this year amount to 1,135,236lbs., and of tea to 102,452lbs., while up to the 21st ultimo, the quantity of coffee shipped was 618,222 cwts., as compared with 809,433 cwts. at the corresponding period of last year. The *Ceylon Observer* says: "It is evident from the large number of tea seed and plants (chiefly from Assam varieties) which have been distributed throughout Ceylon during the past year, that the tea enterprise here is destined to be one of the chief supports of the planters in the future. One planter alone has sold Rs. 15,000 worth of seed and plants during the last twelve months. The retail price of Ceylon tea in the island is, however, still not less than Re. 1."

THE use of limestone appears to be entirely neglected as a manure in India, though its renovating properties are well-known to the Khasias who (if possible) always select limestone reefs as sites for their *pân* gardens, while the Sylhet orange groves near Shellapunjee owe their prolific crops undoubtedly to the mixture of lime and sand in which they grow, as also to the fact that they are inundated several times throughout the year with water impregnated with lime. One look at the vegetation in the neighbourhood of lime deposits indicates what a powerful nourishing agent lies ready to the hands of tea-planters, and yet all manner of expensive manures are sent up to Assam, ignoring or oblivious of the fact that the basis of most of them abounds in profusion within reach of all.

A LUCKIPORE tea-planter was disagreeably surprised one night recently by being awakened by a number of armed men got up in the usual burglar fashion surrounding his bed, threatening to kill him if he called out, and demanding the key of the safe. The gentleman naturally complied with the request, as his refusal would probably have cost him his life; and the dacoits went off with all the rupees and pice they found, leaving the currency notes alone. This robbery was evidently a well-planned one, and it ought to be a lesson to tea-planters, who very often have large sums of money in their bungalows. Every coolie on an estate knows when the monthly garden remittance arrives, and it is easy enough for them to arrange so as to enter the house when everybody is asleep and capture or intimidiate the manager, secure the key of the safe, open it, take away its contents, and disappear long before there was any possibility of the unfortunate planter being rescued or of their retreat being cut off. The lesson to be learned from this case is that no planter should keep a large sum of money

in his house at any time. If he does, he simply offers a premium to the badly disposed amongst his coolies to combine and rob him with impunity.

The difficulty of obtaining a sufficient amount of labour, which has so long been the bane of the tea industry in India, seems now to have been removed; not by the repeal of the objectionable and over-restrictive Act of the legislature, but in consequence of improved facilities for the migration of coolies to the tea districts, better sanitary arrangements, and a general improvement in their condition. This has been so far accomplished voluntarily by the planters themselves, and has led to an influx of labour such as the *Indian Daily News* thinks, reaches the turning point of the great impediment. Time-expired coolies who were imported under the provisions of the Act, are now willing to enter upon new engagements irrespective of that Act; and with the same freedom a very large number of labourers are making their way to the tea localities for employment. The effect of these improvements is made apparent by the importations in 1878 and 1879 respectively. Whilst in the first of these years, 27,362, and in the second 15,619 were imported under the Act, the number of non-Act coolie immigrants were for the first of these years 15,699, and for the second year 9,093. It is now manifest that the Government would have acted more wisely in assisting this important industry by facilitating in every possible way the means of communication, than by instituting obstructive measures, and exhibiting systematic indifference on the subject.

LABOUR EMIGRATION TO ASSAM.

At a meeting of Planters of the Habbigunge district of Sylhet, held at Chandpore, on the 6th September 1880, to consider the subject of the letter from the Officiating Secretary to the Chief Commissioner of Assam, it was unanimously agreed :—

1. That coolies recruited under Act VII. be put under a five years, agreement, instead of, as at present, three years.
2. The employer would thus be enabled to reimburse himself for the heavy expenditure involved in recruiting.
3. This being the case, recruiting would become more general; the result would be that the labour market would get well stocked, paving the way for the time when tea gardens will be worked with free labour only.
4. On the other hand a five years' contract might influence the labourer against immigration, while his earnings as a skilled and acclimatised factory hand would not increase, as at present, on expiry of his three years' service.
5. To obviate the first objection, and to give justice to the coolie, while at the same time securing his services to his original employer for the term of five years, we are of opinion—

1st.—That the labourers' wages should be increased by Rs. 1 per month during the last two years of his agreement.

2nd.—That the punishment provided by the Act for absence without leave, or refusal of duty, is inadequate and might be more severe.

3rd.—That recruiting by garden Sirdars should be entirely unrestricted. If necessary, Government supervision only to begin at the place of embarkation.

4th.—That the limit of the price at which rice is to be supplied to coolies be raised from Rs. 3 to 3-8.

5th.—That Act XIII. should be for the tea districts as nearly as possible assimilated to Act VII. as far as regards the provisions made for the apprehension of run-aways, punishment for absence without leave, and refusal to do duty, or that Act VII. should provide for the taking of local agreements without a tax being levied on the labour thus engaged, and in other respects providing for the circumstance under which local agreements are taken.

COOLIE LABOR AT THE TEA GARDENS.

The following article from the *Indian Daily News* contains some useful information :—

The turning point in the all-absorbing question to Tea-planters—that of the labor difficulty—seems to have been passed. The numbers of coolies imported are visibly declining,—we mean the numbers imported under Act VII. of 1873 (B.C.)—while an ever increasing number is reaching the tea districts on their own account, and freely entering into service outside the pale of this Act. During 1878, the total numbers imported by the several gardens, were much higher than those in 1879; for instance—

		1878.	1879.
Act VII. coolies	...	27,862	15,619
Non-Act coolies	...	15,699	9,093
Total	...	43,061	24,712

That this is caused more by the improvement in the communication between the recruiting district and the garden, will be seen by a glance at the following table for 1879 :—

	Act VII. coolies.		Non-Act coolies.		Total.
	Coolies.	%	Coolies.	%	Coolies.
Sylhet	401	25	1,218	75	1,619
Cachar	3,077	69	1,381	31	4,458
Kumroop	134	22	486	78	620
Durrung	2,358	68	1,135	32	3,493
Nowgong	1,389	67	679	33	2,068
Seebsaugor	4,251	63	2,502	37	6,753
Luckimpore	4,009	70	1,692	30	5,701
Total	15,619		9,093		24,712

From this, it will be seen that those districts, favorably situated in regard to communications have imported more non-Act coolies than the others, and we can look to Assam being soon released from the vexatious operation of the Act altogether, by the efforts that are being made on all hands to improve her means of communication. The Assam Immigration Report for 1879 tells us of much improvement having been effected in the means of transporting immigrants into the tea districts. More strict regulations have been put in force on board of the steam vessels conveying the coolies, and in other ways, the general comfort of the immigrants has been attended to. One lakh of rupees has been sanctioned by the Lieutenant-Governor to be expended on improving the road between Dhoobree and Kaunia. This has been obtained from the Labor Transport Fund, and the accumulations of that fund could not well be spent in a better manner. The mortality tables show an improving state of affairs, notwithstanding the fact that the death-rate, comparatively low as it is, is still very high. Among non-Act coolies, it has fallen to 26·9 per thousand per annum, while among the Act VII. coolies it is 56·8. This latter high rate is, no doubt owing to the fact that the majority of the Act VII coolies are comparatively new arrivals, while many of the others are old acclimatised coolies, whose agreements have expired, and who have entered into fresh contracts under the ordinary civil laws; while the remainder, men who have marched on foot most probably all the way from their homes, are likely to be strong healthy men. In some districts, the mortality is still very high, notably in Durrung, where it is recorded as 85·3. If this be the normal health of imported laborers in that province, it almost becomes a question whether humanity should not intervene to prevent immigration where such occurs. Among non-Act coolies, the mortality in Durrung is 81·5, and Nowgong is not far behind it. The mortality in Assam among infants averages 67·9.

Regarding the working of Act VII., the inspectors report, that "a uniform readiness is shown by employers in carrying out suggestions for improvements," and that no special cases of ill-treatment of laborers were reported. Improved sanitary arrangements have been freely introduced, and everything reasonably expected has been done towards increasing the comfort and health of the laborers. It hence becomes a question whether the stringent provisions of the Act, as applied to employers, might not wisely be somewhat relaxed. The tea industry has long struggled under many difficulties, not the least of which have been the labour question, and the operation of Act VII., and now that inquiry is being instituted into this latter question, it might be a graceful contribution towards a revival of the industry were Government to remove a number of vexatious enactments, which press hard on the employer, and which are unfair in principle as well. The Chief Commissioner is perfectly correct in largely ascribing the high mortality to the unsuitability of the food, which the imported labourers are in a measure compelled to eat. Many of them come from districts, where the prevailing diet consists of barley, peas, millets, and Indian corn. When these men reach the tea districts, they are compelled to subsist on rice, and it would be wise on the part of employers, if they would take steps to import more suitable food for their laborers. If the obnoxious rice clause were abrogated, they would perhaps be more inclined to turn their attention to this very important matter. While rice is the staple food of the province, we are a little surprised that the employers should not encourage its cultivation. Almost every garden possesses large tracts of land, unfitted for tea, but suitable for rice cultivation. A little encouragement by way of cheap or free leases, would perhaps induce villagers to cultivate these patches, and thereby increase the local supply, while materially adding to the general healthiness of the country by reducing the area under jungle.

A PHASE OF THE TEA MARKET.

The *Times of India's* London correspondent writes :—

The shareholders in Indian tea gardens have suffered so severely from the year's work that they have been naturally eager to seize any straw to float to safety; and hence the airing recently of a variety of remarkable projects for the popularisation of Indian tea. There are several causes for the depression in the trade, and I have so frequently enlarged upon them that I need not now recall them; but attention has now been directed to a cause of serious loss, of which ordinary shareholders in tea companies are probably quite ignorant. Formerly, all Indian teas were put up for auction in London; the immense competition existing among the London dealers prevented a parcel going below its value. Jealousy of each other made them eager rivals; and public sale was one of the surest modes of obtaining fair value. But, for some years past, a new mode of disposal of Indian tea has come into being in the provinces. Certain people have been offering Indian teas direct to the country dealers by persons who (since they accept ruinous rates, and always below the market) seem to have no other object than the making of their commission. The effect is that the London dealer, constantly having before him particulars of sales made in the country, finds that his standards of values are too high; and he argues that, if such teas are being sold to his customers, he must see that he buys at corresponding prices, allowing for the risk he takes in holding stocks and waiting his chance of the market. In this way the new system breaks down the market, and reduces the dividends of the tea companies. The theory is one obviously advanced in the interest of Mincing-lane; but, while it need not be swallowed whole, there is a good deal of truth in it as accounting for the discouraged state of the market.

INDIAN TEA CULTURE.

IN 1850 the area under plant may be approximately estimated at not more than 1,000 acres, and the total outturn of tea at little over 250,000lbs. At the present time the area under plant may be put down for—

Assam	Acres	85,000	207,600
Cachar	"	47,000	
Sylhet	"	18,000	
Darjeeling and Terai	"	34,000	
Dehra Doon	"	4,300	
Kangra Valley	"	7,400	
Kumaon	"	4,400	
Chittagong	"	4,200	
Chota Nagpore	"	3,300	

producing about 40,000,000lbs. of prepared tea, and representing a capital invested not far short of fifteen millions sterling, while about two millions sterling are spent annually in India in the working and upkeep of the plantations. Of the advantages accruing to India—directly to the people, and indirectly to the Government—from the disbursement of so large an amount of money, there can be no question. It will be seen that, of the total area of 207,600 acres brought under cultivation, 150,000 acres lie within the administrative circle of the Chief Commissioner of Assam; and the statistics of that province demonstrate the continuous and rapid progress of its revenue and general prosperity during the period in question,—a prosperity which may be fairly claimed as being almost entirely due to the beneficial influence of the tea industry. There still remains, however, a vast field for future development, not merely in the production of tea, but for almost every kind of crop grown in India, more especially rice.

Tea culture alone, apart from other products, is capable of almost indefinite expansion. Land and capital can be found in abundance, and the sole impediment to its continuous development is the difficulty of obtaining an adequate supply of labour on terms admitting of its profitable employment. The hindrance to progress does not arise from the inability of the industry to afford the wages necessary to render labour highly remunerative to the immigrant, but from the excessive cost of recruitment and transport, largely due, in the opinion of all tea-growers, to the stringency of the labour laws.—*Madras Mail.*

INDIA *versus* CHINA TEA.

A CORRESPONDENT writes to an Indian paper that India is likely to profit considerably by the Sydney Exhibition. Indian tea was scarcely known in Australia previously. An English firm of tea-planters in India exhibited a small trophy of samples of their produce in the Garden Palace, and the tasting of these samples was a new sensation to the Australians. China tea was the only known tea previously, and very poor stuff, it is said, much of it was. The Australians found this to their cost, but they had no alternative. *Now* Indian tea, they say, is all the rage in Sydney. The tasting of pure Indian tea was as great a delight to the Sydneyites as Tasmanian whole strawberry jam to the Victorian miner, whom the protective policy of Mr. Berry's now defunct Ministry compelled to eat the pumpkin trash flavoured with strawberry syrup, which is so largely manufactured in Melbourne. In the bush, tea is the universal drink, and, therefore, the popularity of Indian tea in Australia ought to have a material influence upon the Indian tea trade. If the exports of India could be materially increased, there can be little doubt that the exchange would soon right itself. Year by year India is gaining upon China in the export of tea to England and its colonies. Twenty years ago, China commanded the tea markets of the world, but as Indian tea becomes better known year by year, this supremacy is destroyed. Up to 1876 the demand for Chinese and Indian tea was equally increased. Since then the whole increase has gone to the credit of India. It appears to be only a question of time when India will have a monoply of British supply. Japanese tea is similarly ousting Chinese tea in the markets of the United States of North America. More than a third of the tea consumed there comes from Japan now. So that without greater care in the manipulation of the leaf, and improved methods of culture, the loss to China will be very considerable. Hitherto this loss has been little felt, however, because the silk trade has developed so wonderfully. There is, perhaps, no country in the world where the planting cultivation, picking, and firing of the tea are more skilfully done, better attended to, or performed with more profitable results on the produce, than in India. And practically there is hardly any limit to the amount that can be raised. There is now under cultivation in India as much land, if raised to its full tea-bearing power, as would supply the entire British demand—including North America, the Cape, and Australia, whilst, if the cultivation extends in the future as it has done in the past, there will be, in ten years, land enough under tea cultivation in India to supply all the world. For strength of flavour, I was told there is none superior to that of Assam, Sylhet, and Cachar, whilst the various growths of Darjeeling, Kumaon, and Kangra are equal in aroma and delicacy of flavour to the very best brands imported from China. The Kangra is to ordinary Chinese tea what Chateau Margaux is to *vin ordinaire*, and the most prejudiced of English tea-drinkers are beginning to become convinced of this fact. But it takes time to remove prejudices, particularly in the matter of eating and drinking.

TEA ADULTERATION.

SPECIAL attention has of late been directed in Europe to the sophistication of the leaf whose infusion makes the chief beverage of millions of people in Europe. England and Russia are the chief consumers, in that continent, of the Chinese product. France takes two hundred times less than Great Britain; but, notwithstanding this, it has fallen to the lot of a French chemist to illustrate adulterations which have heretofore been unsuspected in London. It is not the constituents which are employed in firing the leaf, whether in China or Japan, for foreign consumers, that are chiefly disagreeable or baneful. The comparatively very small quantities of gypsum, Prussian blue, indigo, and other substances, which are used in the pans for the purpose of imparting a face to the material, have often been pronounced by competent authority practically innocuous. Why tea-drinkers should prefer to have their drink impregnated with ever so small a quantity of avoidable dirt to imbibing the pure and simple decoction of the plant prepared without it, may be a matter of mystery; but it is not our present purpose to inquire into the cause of this or any other anomaly in the matter of the state of nations or individuals. Our desire is to sound a note of warning to those who, by fair dealing and the provision of an all but unimpeachable article, have secured for their wares a mart the profits from which are adequate, and may be reckoned upon with certainty for a distant future, so long as attempts are not made to enhance them by fraudulent practices. As with silk so with tea, Japan has attained in America a very high reputation for the integrity of her merchandize. It would be suicidal to jeopardize it by introducing a system of adulteration into her exports. A Chinese poet wrote of tea that "it tempers the spirits and harmonizes the mind; dispels lassitude and relieves fatigue; awakens thought and prevents drowsiness; lightens and refreshes the body, and clears the perceptive faculties." When impregnated with the ingredients used to falsify it in China and at home, it can hardly be expected to retain those attributes. The "Maloo mixture," which people attempted some few years ago to make in China, did serious damage to the trade of Shanghai: and yet it was not much worse than many of the other "lie teas" which have been so largely exported thence, and whose histories and composition are wonderful exemplifications of misdirected industry.

We have all known, probably for as long as we can remember that sloe leaves and other products of English hedgerows and shrubberies, to say nothing of the expended refuse of the teapots of hotels and coffee-houses, are no strangers to the stock in trade of the country and metropolitan grocer. Catechu and sumach leaves, entirely innocent of connection with the frauds of *thea bohea* or *thea viridis*, have mixed together in ascertained proportions and christened with high-sounding names, been palmed off upon an easily deluded British public as a tea possessing "four times the strength of the strongest tea previously known." Perhaps the compound justified the assertion, but certainly not in the sense in which the consumers understood it. Again, in former years a "Chinese botanical powder" which had some vogue, was found to be little more than a composition of catechu (the product of the *Gambir Acacia*) formerly and erroneously known as *terra Japonica* and ordinary wheaten flour. Still more patent devices were those not very long ago, if they are not still, resorted to by celestials to add weight to their wares. Leaves ingeniously enclosing iron filings were shipped away by the chest. Less audacious but scarcely more justifiable schemes were, and are now, resorted to, in order to give false or inferior articles the semblance and aroma of excellence. Olives, gardenia, and jasmine have all had tribute taken from them to supply the tea-chest; and it is notorious that a certain kind of camellia is largely cultivated in special districts of the neighbouring empire for intermixture with the genuine leaves. The willow, again, does very extensive duty on behalf of the counterfeiter. During April and May its twigs are pillaged of their growth, which, after being subjected to a slight fermentation, is carefully dried and rolled, and dusted into green tea to the extent of ten or twenty per cent. This practice, which is described "as ingenious as it is profitable," had its origin in the model settlement of Shanghai about fifteen years ago, and is said by the analyzer to be continually extending. It is odd that the Chinese carry on their operations openly, and indeed neither do, nor need, care about their customers, and they manage to get rid of all their production, spurious or the reverse. What between Mongolian and Circassian dexterity in fraud, it would perhaps be difficult to particularise foreign substances that have not found their way into the bins of the teamen, and then into the cups and stomachs of their customers. Twenty years ago excise investigation had discovered, —in addition to the products which we have enumerated,—contributions from the horse-chestnut, the elm, poplar, beech-plane, fancy-oak, several gums, and other vegetable matter not resembling tea-leaves in any one particular. But organic matter is not sufficiently copious in its resources to satisfy the greed of the dealer. We have said that a little Prussian blue and gypsum and indigo, used in what we will consent to call the legitimate manufacture, may be allowed in deference to the queer taste of foreign fashion. We hardly imagine, however, that "taste" would care to know that it swallows, in considerable quantities, from the uninebriating bowl, sulphate of lime, and such repellent filth as earthy black graphite. Magnesia may have useful effects, which, however, are certainly not contemplated by the dealers who employ it. It is said to aid the water in extracting gluten from the leaf, but this advantage is hardly a factor in the adulterator's motives for adding it to his compound. This may contain also such vile coloring matter as Venetian red, Dutch pink, rose pink, with chromate of lead, carbonates of lime, copper, and magnesia, sulphates of iron, French chalk and in fact almost anything. Whether the headaches and maternal disturbances which are said to be occasionally produced by tea-drinking, may not have their origin rather in the alien matter too frequently present in the infusion, at least in European countries, we will leave to the sense of our readers to determine. A learned authority states that "tea possesses a specific and marked influence over the functions of the brain." He might have added that its abundant concomitants must exercise a "marked and specific" effect upon other organs.

As we have already said, the practices of falsification here alluded to have, at least as far as we are aware, only been applied to the Chinese product, either in the places where it is grown, the ports where it is shipped, or the marts for which it is destined. We have every reason, as we have every desire, to believe that the Japanese leaf, with the exception of the simple and probably uninjurious additions which it receives in the firing process, is uncontaminated. And that this should continue to be the case, all those who look forward to a prosperous and increasing commerce for the growers and shippers in this empire, in one of the most gracious of Nature's gifts to bibulous mankind, will desire. Hence it is important that notice should be taken of very bad news which comes to us from another port. The *Hiogo News* distinctly

states, on what is averred to be direct personal evidence, that hundreds of Japanese were lately engaged, on the hills behind Kobe, in plucking the leaves of the *wistaria* and drying them in the sun. The writer continues :—" These leaves were taken to the village of Kita-no-mura, presumably for the foreign market, On being asked what they were to do with the leaves, the natives coolly told foreigners that they were making tea ! The open and flagrant manner in which the operations were carried on, are not however, so astonishing as the stupidity of the natives in taking this particular leaf for the purpose of mixing it with the genuine tea. In musters which have come to the hands of foreign merchants in Kobe, the *wistaria* leaf has been detected, and no foreign dealer would ever venture to send a consignment of such tea to any house in America ; for if he did, it would be the last he would be likely to send. The *wistaria* leaf is not unlike the tea leaf, except that it is not so heavy ; but it is altogether unsuitable for mixture with tea, for the purpose of increasing the bulk, which is the dishonest purpose the natives have in view. The admixture of itself defeats their fraudulent purpose, for the presence of one leaf of the *wistaria* in a cup of tea is enough to make it undrinkable. It requires no practised tea-taster to discover the presence of the leaf ; any one who has a palate at all can *easily* tell that there is something very disagreeable in the taste of the tea when this *wistaria* leaf is in the infusion. The result, therefore, is that nobody will buy the tea so adulterated which has been brought to the market." This is of itself a fortunate circumstance ; but when once a nefarious course is initiated, it is only too likely to acquire fresh developments. No one will deny that the preservation and extension of so valuable an industry as the tea export trade, have profound interest for all classes in the country. It might be advisable for the Government to protect the national welfare in this respect by the establishment of a system of inspection of which the growers should bear the cost, which otherwise would not be heavy. Possibly, however, vigilance on the part of the tea-men inspecting and tasting their musters, and stern discountenance and reprobation of dealers detected in dishonest attempts, will be sufficient to meet the emergency. By some means or other, however, producers and brokers must be taught that integrity in this respect will pay better than fraud. A few shipments of adulterated tea from Japan would seriously injure, if it did not destroy, that branch of trade,—an evil consummation which neither native planters nor foreign shippers can afford to see achieved. —*Japan Mail.*

COFFEE.

A CEYLON paper has been comparing the tea-planting industry of India with the spicy isle's great coffee industry. While 40 millions of pounds is the outturn of the former, Ceylon, even at the present time of leaf disease, can show an annual export of 70 millions of pounds of coffee. In their labour supply also, our neighbours are much better off than we are, and large numbers of immigrants have settled down permanently not only as cultivators, but as boutique-keepers, &c. The Indian Government may well take a lesson from the little island in the south.

A CEYLON planter of experience, in one of the older districts, gives what appears to us very sensible advice to his brethren higher up the country who have been complaining so freely of raids on their fowl-houses, bungalows, &c., lately. He writes as follows :—

" By-the-bye, about the lawlessness and robberies in Dikoya and Maskeliya. Has it never dawned upon the parties robbed to look at home for the thief or thieves. Fine, in a round-robin, all coolies, contractors, appu, cook, &c., say 50c. each, and I warrant that the culprits will be caught if this is carried into force. I have done it more than once during my 25 years' planting, and found it answer A1,—far better than constables do." It appears to us to be a safe inference that in two cases out of three where an estate bungalow is robbed, the thieves are to be found among the servants or coolies on the estate, or else they have worked with the connivance of the latter, The ingenuity of the Tamil coolie when he turns thief is far beyond the understanding of the average inexperienced Englishman.

THE coffee leaf disease continues to spread in Java where it has appeared in the Pasaruan Residency, rarely on rich soil, many trees on poor ground being however rendered almost leafless by it. The head-men assert that the disease has always been there, but that it has never had any injurious effects, and always disappears again after dry weather. The *Dagblad* of the 10th July thus describes the Javanese remedy for it :—

" Wherever the disease prevails, the Javanese let the coffee gardens lie fallow for several months. The grass springing up in consequence, they then cut with knives. When dry enough, it is mixed with paddy straw, spread in rows under the coffee trees and then set fire to. It must then burn without much flame in order not to injure the bark and young shoots of the trees, and must smoulder continuously for some time in order to keep up among the leaves of the trees, a constant heat not great enough to injure the shoots, but great enough to cause the diseased leaves to drop off. The trees become thereby fumigated, the appearance of new and healthy leaves follows speedily thereon and the disease germs are mostly killed."

A FORMER writer on Ceylon declared that the merchants of Colombo were in the habit of marking many of their packages of coffee with the word " Mocha " and shipping it home for sale as the produce of Arabia. The statement created a good deal of amusement in Ceylon at the time, but it was little thought that the day would come when this process would actually take place, although indirectly. We now learn that the price of native coffee has been run up to an unusual figure by sudden demand for it on the part of native purchasers for the Bombay market. Inquiries into the cause for this demand show that it is taken for re-shipment to Aden, where it is understood to be blended with Mocha coffee brought down to that port for shipment to Europe.

A CURIOUS discovery is reported by a French provincial journal. Mocha coffee shipped from Aden reaches France by way of Marseilles through Algeria. It is, for convenience of carriage by camels across the African deserts, made up in special packages consisting of a camel's skin in halves, each package weighing about 185 kilogrammes. On opening one of those packages recently, a goat-skin bottle was found, such as is used by the Arabs. Inside this bottle, which had evidently never been used, were found some fifteen letters, written in Arabic, and enclosed in little bags of linen, each letter bearing the seal of a marabout. The theory is that they have come from some caravan which was attacked by Arab robbers. The story has a curious odour of romance about it, and would supply a valuable incident for an Oriental drama. The letters have been sent to Paris to be translated.

COFFEE STATISTICS.

CERTAIN statistics required by the Government of India of the extent of tea and coffee cultivation in the Madras Presidency have been prepared by the Board of Revenue on information obtained from the districts. Coffee cultivation is carried on in seven districts in the presidency, at Vizagapatam, Madura, Tinnevelly, Coimbatore, the Nilgiris, Salem, and Malabar. In the first-named district there are but 6 50 acres under cultivation ; in Madura about 3,000 acres are under coffee, the Dindigul taluq has the largest number of plantations. In Tinnevelly there are 46 plantations, but the area of land under coffee is only 2,679 acres with an approximate yield of 236,302lbs. ; in the Coimbatore district, the averge is larger than in Tinnevelly, though there are a smaller number of plantations, the yield being 105,140lbs. The Nilgiri, district has a large area under coffee, namely, 45,990 acres with a yield of 10,256,125lbs; in Salem there are 10,059 acres under cultivation with a yield of 1,302,960lbs. The estates in the district are chiefly on the Shevaroy Hills, where the average production per acre is returned at 335 against 462lbs on the Nilgiris. In five taluqs of the Malabar district, coffee is largely cultivated, the total of plantations is returned at 14,858—which shows a falling off when compared with the figures returned in the previous year, owing to some of the plantations having been destroyed by fire and have therefore been struck off from the accounts. The acreage under coffee in the Wynaad is given at 65,829 of which 32,197 acres are returned as the area with mature and 6,905 acres with immature plants : 26,727 acres have not been planted out, but will in course of time be cultivated. The total approximate yield of coffee on all the estates in the presidency is returned at 20,381,086lbs,. for 131,353 acres, 62,729 being planted with mature and 12,996 acres with immature plants. The cost of cultivation varies and is returned at Rs. 250 per acre in the Wynaad, against Rs. 86 per acre in Tinnevelly.

COFFEE DISEASE IN NEW GRANADA.

NATURE publishes the following letter from Mr. A Earnst, of Caracas :—The following information about what appears to be a new disease of the coffee tree, is taken from an official letter written on April 29 last, by Mr. C. Michelsen, Commissioner of Agriculture at Bogota, to Mr. Jose Herrera, Vice-Consul of new Granada in this city, who sent me a copy of it, requesting me to give him my opinion about the disease. At first there appear on the leaves small spots of a light-greenish colour, which in two or three days turn brownish, and then appears on each of them a fungus divided in three or more greenish-yellow branches. This fungus is said to be phosphorescent at night, and in places where it is very common, a phosphoric smell is noted (!). After some days the diseased leaves fall off ; the fruits, which also are attacked by the parasite, follow very soon, and the trees are left quite bare. They form, however, new leaves, after some months, but these are again attacked by the fungus. The disease is reported to be more frequent in damp places than in dry ones, its ravages being greatest in plantations where the trees are planted rather close. The fungus has also attacked the shade trees, especially the guamos (*Inga* sp.). Though the description is far from being satisfactory, I think it is pretty clear that the fungus is not the *Hemileia vastatrix* of Ceylonese celebrity, However, it bears a great resemblance to it, so that I recommended to employ fumigations with sulphur under the kind of large umbrella proposed by Mr. George Wall (*Nature*, vol. xix. p. 423). The unusually rainy weather in the last year has very likely much to do with the spread of the disease, which at the same time is a new proof of the eminently fatal consequences resulting from close planting. I have asked for dried specimens of diseased leaves, in order to submit them for examination to a competent mycologist.

CINCHONA.

WE are informed that the Queen has been pleased, on the recommendation of the Viceroy, to confer on Dr. De Vry, of the Hague, the dignity and distinction of a Companion of the Order of the Indian Empire, for his long and valuable services in connexion with the introduction of the cinchona tree into India and the manufacture of Indian quinine.

WE believe we are correct in saying, that it is confidently expected the Government quinine manufactory at Mongpoo will be in a position to supply most, if not all, the quinine required for the Bengal troops in the course of 1881.

IT seems that cinchona cultivation has not proved so successful in Ceylon as was generally anticipated when planting was commenced. It appears that the sub-soil in several parts of the island is not suited to cinchona, and when the trees have sent their roots into the sub-soil they die out in large numbers.

TROPICAL cultivation is engaging a good deal of attention in the United States of America, for not only are coffee and tea to be produced, but we now learn that American exchanges claim that the climate of California, Northern Georgia, and Alabama is suited to the cultivation of the cinchona tree, from which quinine is made, and it is proposed to introduce the cultivation of these trees, and thereby save the expense incurred in sending to South America for Peruvian bark.

ADMIRAL LAPELLIN, says the *Medical Record*, draws attention to a bean (cedron) which is used by the inhabitants of Central America in the treatment of the cold fever, and which is said to be a good substitute for quinine. Dr. Coignard, who obtained the remedy in Puerto Arenas, Costa Rica, obtained favourable results with it, and Dr. St. Pere and Quesnel found it even more powerful than sulphate of quinine. The bean is cut into bits as large as a pea, several of which are given in the intervals between the paroxysms. This almond or bean is obtained from the *simaruba ferruginea.*

A SURE and certain proof of the growing demand for any article is in imitations or adulterations. Viewed in this light cinchona growers should be pleased to learn that a London chemist was recently summoned "for having mixed tincture of quinine, with ingredients or materials so as to affect injuriously the quality or potency of such drug," whereby he had rendered himself liable to a penalty of £50. A sample of tincture of quinine purchased by an Inspector of the Board at the defendant's shop, was found, on analysis, to be more than 60 per cent. deficient, some other comparatively worthless alkaloids having been added. The market price of quinine, it was stated, was about four times that of the alkaloids substituted for it. The sample would have little value as a medicine, and alkaloids would certainly affect injuriously the quality and potency of the tincture of quinine. In defence, it was urged that it was by no means uncommon to find other alkaloids which should not be in a sample of pure quinine. Sulphate of cinquinine, it was asserted, was a common substitute for quinine, and was used at some hospitals.

THE *South of India Observer* has the following regarding cinchona. Mr. Moens, the Java authority on cinchona is expected, shortly to visit the hills, at the invitation of the owner of the Dava Shola Estate. Mr. Moens is so far satisfied with the results of his experiment of harvesting cinchona bark by the scraping or Java process, that he has resolved to abandon mossing altogether. Although the process is called the scraping process, the *modus operandi* is rather that of stripping, the bark being removed down to the Cambium layer. The trees treated in this manner have renewed their bark readily, and, show no symptoms of injury. If the Dava Shola experiment is generally adopted, a seigniorage on moss, which a few years back was recommended to Government, will have to be reconsidered.

A SERIES of careful experiments have recently been tried in the Presidency of Madras and at Rangoon, having for their object, the discovery of the true value of the Sikkim febrifuge as a cure for fever. Long tables are given in the report, which tables we need not reproduce here. The conclusion arrived at is, that it is more effectual than either sulphate of cinchonidine or sulphate of cinchonine. The evidence in its favor is not marked very strongly, and it is proposed to repeat the experiment by the hands of very carefully selected medical officers, with a view to settling the point definitely. The febrifuge is cheap, and if it be found as effectual as the others, a great economy will have been attained. The percentage of cases cured by the sulphates was 87·52 and 87·78 respectively, while the Government febrifuge succeeded to the extent of 91·15. The only drawback found to the more extended use of this new remedy, is the fact of its producing nausea, immediately after being taken. This is occupying the attention of the authorities at Sikkim, and the drawback is being reduced gradually, as the results of careful experiment show.

RESIDENTS of districts where, during certain seasons of the year, fever prevails with uncommon virulence may well congratulate themselves on the new preventive planned. It has been designed by the local Government at Rangoon, that during the coming fever season, small phials of cinchona febrifuge shall be made available for sale to the people at each district and station by such local authorities as may hereafter be appointed. This medicine has been selected to the exclusion of the sulphate of quinine owing to its extreme cheapness, which places it within the means of rich and poor alike. It is sixteen to twenty times as cheap as the quinine, the values of the febrifuge and quinine being respectively, Rs. 16 and Rs. 320 per pound. At the same time the medical opinion is that it is akin, in its action as an anti-periodic, to the same extent as the sulphate of quinine. The Deputy Surgeon-General has accordingly received instructions to have this febrifuge packed in half-ounce and quarter-ounce phials, saleable for 12 annas and 6 annas respectively, for despatch to the different districts, &c.

SERICULTURE.

MR. R. W. MORGAN, Deputy Conservator, Wynaad, has made known to Government, through the Conservator of Forests, the results of his attempts to cultivate the Tasar silk-worm. A Government Order has been published, thanking Mr. Morgan for the information, with an intimation that—

"It will be considered in the Judicial Department whether similar experiments might not advantageously be made in jail gardens, now that Tasar silk is in such demand in Europe"

Another Indian product, though apparently now almost obsolete, is in great demand in Europe, namely, Indian muslin. Would that the Government would take the matter up and resuscitate that industry. The indents from friends in England for Indian muslin are extremely embarrassing, as the article in question seems to belong to the records of ages gone by, whereas the wearing a material bearing the name seems to be at an unreasonable height.

THE Government of India lately called for information respecting the Tasar and other wild silks of India. Dr. Shortt supplied some information on the subject and stated, that at a little expense a large number of cocoons may be procured. He had made attempts to introduce the cocoons on the Shevaroys, but without success. Dr. Bidie stated that there is little practical information regarding these in Madras, as the Tasar cocoons are not an article of traffic, nor the silk a product of the looms of Southern India. Three species of silkworms are found in the Madras Presidency, namely, the Antherea Paphia, the common Tasar silk insect; Actias Selene; and Cricula. The first named insect is common in Southern India, but nowhere so abundant as to induce the natives to collect it or to render its collection remunerative. The second named is sparsely diffused over Southern India, wherever the tree on which it feeds is found. The cocoons although of good colour, are thin, difficult to reel, and of little value. The last named is limited in its range, being confined to Coorg and Wynaad where it lives generally on *Careya Arborea*, but sometimes on the mango which it strips completely of its foliage. Silk is not made from wild worms in Southern India, except to a limited extent in the country of the Nizam of Hyderabad. The Chamber of Commerce informed the Government that they are unable to afford any practical information on the subject of the wild silks of India.

ATTEMPT TO DOMESTICATE TASAR SILK-WORMS.

MR. R. W. MORGAN, Deputy Conservator, Wynaad, has reported to the Conservator of Forests, that he has been continuing his experiments with the Tasar silk-worm.

"After attempting in vain to procure cocoons in this presidency, I tried Bengal, and in April received 275 from Simla. The moths commenced to emerge at once, but the sexes refused at first to unite. This perhaps was owing to the elevation, some 4 500 feet, but after a time a few couples did. The average number of eggs laid was about 270. I noticed that the females were of two distinct types—one being of a rich golden tint, and the others a warm brownish-grey. This latter type varied considerably, some having a reddish tint, whereas others inclined to buff; the males, however, which were invariably smaller than the females, were of a deep chocolate-lake in color, occasionally having a slightly golden or purplish tinge in the wings. The fertilised females were removed into a muslin covered box in which they laid their eggs on twigs of *Eugenia*. On an average they lived about ten days. The eggs were hatched in from 10 to 15 days. I placed the young worms in a large case covered with muslin, in which there was a tin-box filled with wet sand and stuck full of the young shoots of *Careya arborea* and *Eugenia Jambolana*. Finding they preferred the latter leaves, I fed them entirely on them. On the seventh or eighth day they cast their skins for the first time. The oldest caterpillars were hatched some 30 days ago, but are only one inch in length. This has not been from

starvation, for they have been feed liberally and look quite healthy but, I fancy, on account of the exclusion of sunlight which is essential to their well being. The last 10 days I have been feeding them on *Lagerstrœmia* (Venteak) which they prefer to *Eugenia*.

"I have placed several worms out on trees in my compound, but have slight hopes of their escaping their numerous enemies. The total number of caterpillars of various ages in my possession at present is about 2,000, but it can hardly be expected that the whole of these should reach maturity. They are very troublesome to manage on account of their wandering, propensities, and you can scarcely open the box they are confined in for a moment without their swarming out all over the place. They maintain their hold with such extraordinary tenacity that they will suffer being torn in two before they relax it. This makes it very difficult to shift them. The moths almost invariably escape from the cocoons through the upper or pedicel end, but I find that about 2 per cent. of my cocoons have been pierced at the lower end.

"In this district the Tasar is but sparingly found, though the climate is undoubtedly suited to it. I have found cocoons here as large and larger than any I have seen from the North. The moths here seldom or ever lay more than one or two eggs on each tree. There are two crops of cocoons in the year—one in May and June, and the second in October. In this latter the moths do not seem to escape till the following April, laying dormant the six intervening months. This, no doubt, is due to the forests in India being deciduous; for the eggs if laid would be lost through the falling of the leaves to which they are attached, and even if they managed to escape this peril and were hatched, the young would speedily die from want of proper food. The Wynaad contains a vast area of forest, more than half the trees of which are capable of feeding silk-producing caterpillars. The whole of this is wasted; for although the climate is favorable to insect life, yet its enemies are sufficiently numerous to more than keep it in check. Attempting therefore to breed silk-worms in a state of Nature will, I fear, never pay in this district, for though we may protect them from a host of their destroyers, yet there are some, such as the various species of the *ichneumon* flies against the incursions of which I cannot see any possibility of guarding. To breed them, however, under cover, and in a state of partial domestication, is feasible enough, provided the building devoted to that purpose is thoroughly lighted and ventilated, and means devised for preventing the worms from indulging their wandering propensities. If the breeding-shed were made portable, it would, no doubt, be a great advantage, and this might easily be done were it constructed of wood; it could then be shifted (the supply of leaves being exhausted) from one spot to another. "I had hoped to have tried experiments on a larger scale than I have hitherto done, but find that owing to my frequent absences in the district the caterpillars are neglected and die. So great an amount of constant care and attention is necessary for the success of an experiment like this, that a single day or hour's carelessness may render futile the patience and trouble of weeks. I have therefore determined to wait until September next, when I mean to devote a considerable portion of my furlough to experiment and to start a breeding establishment."

The Government in an order of the 9th ultimo say that they are "much obliged to Mr. Morgan for this interesting account of his laudable efforts to domesticate the Tasar silk-worm. Copy of his communication will be forwarded to the Government of India, and it will also be printed for general circulation. It will be considered in the Judicial Department whether similar experiments might not advantageously be made in Jail gardens now that Tasar silk is in such demand in Europe."

TOBACCO.

A PROCLAMATION has just been promulgated that his Highness the Maharajah of Travancore has been pleased to deduce the amount charged on tobacco imported into the bankshalls at Alleppey and Quilon from Rs. 110 per candy, to Rs. 90, for the benefit of the people as well as for the encouragement of the trade in this commodity.

A SUMATRA tobacco planter, in the Trincomalee district, is very pleased with the tobacco he has already grown and cured there and says, "there will be crops taken off nearly 150 acres in February and March 1881."

THE cultivation of tobacco in Japan from plants imported from Havana, Florida, and other places, is favourably reported on. Some experiments made have resulted in a plentiful yield of leaves of a quality far superior to the best Japanese tobacco, although the plants were of very common character.

TOBACCO MANUFACTURE IN INDIA.

TOBACCO manufacture is now making a small beginning in India, and though the quality is still susceptible of improvement, the beginning is one full of promise. In the enterprise being carried on at Ghazipore, in the North-Western Provinces, and at Poosah, in Bengal, by Messrs. Begg, Dunlop & Co., of Calcutta, both the cultivation and manufacture are carried on under the skilled supervision of American growers and curers. Some of their tobacco, which the French Consul-General in Calcutta sent for trial to the *Administration des Tabacs* in Paris, has been very favourably reported on and the administration has asked for further and much larger supplies to test it on a more extended scale. The following extracts from a recent report by Mr. E. Buck, C.S., Director of Agriculture and Commerce North-Western Provinces, on the venture at Ghazipore and Poosah, are interesting as showing what can be done by combination of capital, energy, technical skill, and perseverance, and also the capacity for improvement possessed by Indian tobacco:—"The factory is now turning out 500 lbs. a day of all classes, the greater part of which is black cavendish and honeydew, intended for sale to the army. The finer smoking mixtures are only turned out in quantities required to meet the more limited demand for refined tobaccos. . . . The machinery is capable of turning out 3,500lbs. a day as soon as a sufficient number of hands have been properly trained. . .

"Hitherto no Indian tobacco has realized any valuation approaching that of American tobacco. Taking the average of the American leaf, which is called shipping tobacco, as 5*d*. to 6*d*. a lb., higher classes of bright leaf, from Virginia, realise as much as 7*d*. to 13*d*. a lb. ; the price of Indian tobacco has generally been from 1*d*. to 2*d*. a lb. But for the last year, an excessive stock and a new tax have driven down the market for American tobacco to exceptionally low rates, and the low-priced shipping leaf did not fetch more than 4*d*. to 5*d*. It was at this time that the leaf raised in 1877 (the year of drought) reached England. The amount sent was 15,000lbs. of Poosah leaf.

"The consignment was, however, packed in rather damp order, and contained a quantity of moisture which caused it to be assessed under the highest rate of the new tariff, which imposes 3/10*d*. duty on tobacco with moisture over 10 per cent., against 3/6*d*, on tobacco with moisture under 10 per cent. This being a new regulation, passed after the shipment of consignment, made a considerable difference in the value of the tobacco, a difference estimated indeed by the English broker at 1*d*. per lb. Had the regulation been promulgated earlier, the loss could have been easily avoided. The price obtained was 3½*d*., which would have been 4½*d*. had the tobacco been dryer, and the sale has been followed by a telegram from England to prepare for despatch of large shipments. The market was more than 25 per cent. below its normal rate, and it is now fast improving, partly in consequence of a bad season in America.

"The high price, however, realised both for the best samples of the 1876 and 1877 crops, indicate very strongly that an Indian leaf can be turned out of equal quality to the best shipping tobacco from America. A tierce of strips from the 1876-77 crop from Ghazipore sold for 7*d*. a lb., and the greater part of the rest for 5*d*. or more, while a portion of the Poosah leaf of 1877-78 was actually valued at 5*d*., when the market was, as already observed, 25 per cent. below normal rates. These facts seem sufficient to guarantee future success, since year by year the quantity of the higher classes can be largely increased and the greater portion of the crop brought to the same higher level. The chief point to be ascertained was *whether a sufficiently high level could be attained at all. It has been attained.* The cured leaf of 1878 is, indeed very much superior to any which has been hitherto turned out, especially that from Ghazipore. In all, 165,000 lbs. are now lying in 'bulk' in the curing-houses, of which from 50,000 to 100,000lbs. will be shipped round the Cape at the end of the rains, and must for the reasons already given, realise much higher prices than the consignment of 1877.

"A new market is not unlikely to open in France. The French Government have already asked for and received samples, which they have pronounced to be better than any they have had from India before, and they have shown their practical appreciation of its quality by asking for a larger consignment for trial, to the extent of 1,000 or 1,500 lbs. . . .

"It is necessary to explain why, if the principal object in view is competition with American leaf, manufacture of smoking tobacco for Indian consumption has occupied so large attention in the operations of the year. The reason is simple. The Indian market, though small, pays far more handsome profits than the English market. The price paid for reasonably good American manufactured tobacco in this country ranges from one to three rupees a lb. The Ghazipore and Poosah tobacco is sold at just one-half that price, at a much higher profit than can be obtained by sending cured leaf to England.

"The success which is being obtained in Indian sales is as satisfactory as it could possibly be. Buyers are numerous in all parts of India, and in the majority of cases a first order has been followed by others from the same purchaser. Tradesmen are beginning to make large wholesale demands, and numerous testimonials have been received to the excellent quality of the tobacco. . . .

"While, therefore, India *cured* leaf can find a sale in the English market at prices which will enable it to compete there with American *cured* leaf, Indian *manufactured* leaf is proved to compete successfully with American *manufactured* leaf in India itself, with a fair prospect of success in a similar competition in the colonies.

"I refrain purposely from giving exact details of the cost of preparing cured and manufactured tobacco, but I may state in general terms that a price of 4*d*. a lb. for cured leaf in England, and from 6 annas to 10 annas for manufactured leaf in India will secure sufficient or even handsome profits. Now the Americans do not hesitate to say that they can raise the price of the cured leaf to more than 5*d*., a lb. In years of normal rates, while experience has proved that they can readily sell manufactured tobacco at wholesale rates of 8 annas to 1 rupee a lb., which prices, whether for cured leaf in England or for manufactured leaf in India, will more than command success. The opening for profits will perhaps be better understood if it is explained that 1*d*. a lb. represents an asset of about £5 an acre. . . .

"The one great advantage which India has over America is the cheapness of labour. It is now proved that the leaf is, for all practical purposes, as good as the American leaf, and there is hardly any doubt that the high price of labour must handicap America which cannot afford to send home leaf at the price at which India can sell. The prices of this year in England actually caused loss to many American exporters and growers, whereas they never reached a limit which does not leave a margin of profit to India."

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.
Proprietor.

Calcutta, 1st Feb. 1876.

CONTENTS.

NOTICES TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

CORRESPONDENCE.

NOTICES TO CORRESPONDENTS.

SUGGESTION.—Declined with thanks.

RASTALE.—Unauthenticated.

TREE MALLOW.—T. T. L. writes:—"I will be glad to receive some seeds of the Tree Mallow with a view of cultivating, and will be glad to note and send you results." This refers to a letter in our last number, headed "A Substitute for the Poppy." We have accordingly sent our correspondent a small packet of the seeds.—ED., *I. A.*

THE "KIKAR" TREE.

TO THE EDITOR.

SIR,—In an article on *reh*, at the top of page 282 in the October *Indian Agriculturist*, a tree is mentioned, the name of which is *Kikar*. I judge this to be a local term. Can you inform me what is the botanical name of the tree,, and also let me know where I can procure some seed for trial on similar land here in Southern India.

W. S. HOWLAND.

Mandapasalai, South India.

NOTE.—The *Kikar* of India is the *Acacia Leucophloea*, a very thorny white barked tree found in most parts of the country. The timber, in characteristics, much resembles that of the *Acacia Arabica*, and is used for the same purposes, viz.: spokes, naves, and felloes of wheels, ploughshares, and tent pegs. The seed of the *Kikar* can be obtained at any place where the tree grows, which is principally in the N.-W. P., and the Punjab, but we do not suppose any one keeps it for sale. Our correspondent must try and get some from a friend in the N.-W. P. or from the Curator of the Lucknow Botanical Gardens, or those of Saharunpore.—ED., *I. A.*

MANGOES: INFORMATION WANTED.

TO THE EDITOR.

SIR,—Is the Madras Presidency a good mango-producing country? by which I mean, is it like the N.-W. P. and Oudh, and is mango graft growing remunerative in Bangalore. I should also like to know if the natives of the benighted Presidency have advanced so far as to name the different kinds of mangoes.

LUNGRA.

NOTE.—Perhaps some of our readers well acquainted with the climate and *flora* of the Madras Presidency will afford the information.—ED., *I. A.*

AVERAGE YIELD OF COCOANUT PALMS.

TO THE EDITOR.

SIR,—With reference to the letter in your last number, extracted from the *Ceylon Observer*, on the subject of the yield of the cocoanut palm, I have inquired of several ryots owning cocoanut topes in this division, and they all tell me that a cocoanut palm in full bearing yields from 60 to 100 nuts per annum. Ryots are generally accurate in their statements about such matters. Are they wrong here? Some two months before I saw the letter referred to, I inquired about the yield of these trees, of the owner of a large tope in the Madakseira Taluq of the division, and he told me that it was not uncommon for a tree to bear 140 nuts per annum. I should be glad to learn if the tree any where else is said to bear so prolificly.

M. HAMMIELL.

Camp, Pennaconda, Bellary District, 18th Oct. 1880.

NOTE.—We do not for a moment question the accuracy of the information given by the *Observer* as to the average yield (25 to 30 nuts per annum) of the cocoanut palm in Ceylon; we can only say that it is rather small and certainly below the average obtained in other parts. For the whole of India we should think that 40 nuts is a fair figure for an *average*. But of course the yield varies considerably in different parts and under different conditions. In some districts, for instance, trees in full bearing yield about 100 nuts (in clusters of about a dozen each) per annum, while in other places even more than this; so that we see no reason why our correspondent should doubt the truth of the ryots' assertions.—ED., *I. A.*

OATS: INFORMATION WANTED.

TO THE EDITOR.

SIR,—I would feel obliged for some information regarding the cultivation of oats.—What description of seed is suitable to India; the kind of soil best adapted; the best period for sowing; whether oats should be irrigated or not; how sown, and whether it will bear transplanting; and any other hints that may suggest themselves, that would be useful.

I believe that oats are grown with much success in the vicinity of Poona, and from a small experiment tried on my farm near Bangalore, I am inclined to think that a good crop could be raised. Before, however, venturing extensively in oat cultivation, I should like to have the advice and opinion of those who have succeeded with it.

T. T. L.

Bangalore, 23rd October 1880.

NOTE.—We insert our correspondent's letter with pleasure in the hope that it may catch the eye of some philanthropic friend who, with plenty of time at his disposal, and well acquainted with the subject, will good-naturedly sit down and indite a pamphlet on Oats for the special edification of T. T. L. But, joking apart, we wonder our correspondent does not see the absurdity (and some other of our subscribers might take the hint) of putting a host of questions, covering so vast an area as the above, on a special subject, and which therefore necessarily requires special information. To reply to his questions in a manner to be of any use to T. T. L., would occupy *pages* of the *Agriculturist*. For indeed some of the queries are of such an elementary nature that it would be necessary for us to enter into a detailed exposition of the whole subject. We would recommend our correspondent to provide himself at once with a book on the subject, of which there are plenty to be had.—ED., *I. A.*

"HANDLING" COFFEE.

TO THE EDITOR.

SIR,—Will any of your numerous readers be so kind as to answer the following questions:—

In what manner does "handling," as it is termed by coffee planters, affect the produce.

By handling is meant by the Neilgherri planter, I believe, the breaking off of small shoots which make their appearance after the plant is in blossom. It is my theory that Nature provides at certain seasons a fruit as well as a leaf-bearing sap, and while the former is making its way up, the leaf sap is in abeyance until the flowers have formed, when the sap unites and each performs its own functions. If this theory be correct, there can be only a limited amount of fruit or sugar sap as I shall call it, which it is to be supposed depends on the moisture in the soil or atmospheric changes. Now, taking such for granted, I hold that after the flowers have formed, the removal of shoots producing leaf can in no way tend to develop the fruit, or add to its yield, but, on the contrary, it must weaken and sicken the plant if the leaves are, as is supposed, the lungs, helping to sustain life. The removal of a portion of the fruit, any gardener will tell you, tends to increase the size of what is allowed to remain on the tree, but in treating coffee in this manner, the planter would consider he would be reducing his prospects. To me it appears that this handling is an utter mistake, and that what is alone necessary is moisture and nourishment in the way of manure at the proper season, *i.e.*, after the flowers make their appearance; but being a new hand at coffee-planting, I seek for information.

E. A. C.

NOTE.—We so far agree with our correspondent in that the removal of the young shoots cannot fail to be deleterious to the future prospects of the fruit. We do not think, however, it will affect the crop of berries *then* on the plant. It will affect the future, because from these young shoots the new wood and crop are matured. If the theory of two saps were correct there would be no use in tea planters nipping off the flowers to increase the coming leap crop.—ED., *I. A.*

RAILWAY SLEEPERS.

TO THE EDITOR.

SIR,—The Deputy Conservator in charge of the Chenab Division, Punjab Forest Department, has lately advertized for sawyers to proceed to the forests in the hills, next year, to cut up *deodar* logs into sleepers.

This is a good idea in its way, and one which, if properly worked, will prove very profitable to the Forest Department. But have any facts connected with the due seasoning of the timber, been taken into consideration?

Before proceeding any further in the matter, it would be advisable for the Conservator of the Punjab forests to spend two or three days at any one of the sleeper depôts on the Punjab rivers, belonging to native merchants, and examine into the reasons of the inferior quality of the sleepers lately brought down from the hill or now being brought down from there.

He will find the chief cause to be that the trees are felled and converted into sleepers while the wood is perfectly unseasoned; they are then thrown into the river where the outside portions swell, in an unnatural manner, (it cannot be called seasoning as the wood is too green and fresh to allow of the water penetrating in an equable manner; only the surface becomes soaked), and as they alternately float about the river and lie on the rocks and islands in the water—according as the river rises or falls, and carries them off or strands them on any point they may catch on—they crack and split to such an extraordinary degree, that the greater number of them are rendered useless.

The results of careful and laborious examinations of several thousands of sleepers, supplied by native timber merchants, are, that from *fifty to sixty per cent.* of their sleepers are useless for the purposes of a main line of railway, where there is heavy and fast traffic; of the rejections a portion of them will prove useful in sidings, but for nothing else in the way of sleepers.

The cure, of course, is to allow the timber to be properly seasoned before converting it into sleepers, *i.e.*:—

1. Fell your trees and let them lie in the forests for *two years*.
2. The *third year*, clear the branches and get rid of the bark.
3. The *fourth year*, convert into sleepers and launch them into the river, but not immediately; allow the sleepers a month or two to lie in the forests to complete their seasoning.
4. Beware of the sap-wood: cut your sleepers only from the heart-wood within that outer ring.

In this way *deodar* sleepers could be obtained capable of lasting from 16 to 20 years, if not longer; it is difficult to fix the period of their duration under the new method of proceeding alluded to, as it is believed that up to the present no properly seasoned *deodar* sleepers have ever been used by the different railway companies.

Mind, a sleeper may be five years old before it is offered to a railway company and made use of on the railway. Yet that does not mean to say that the sleeper is of seasoned wood; it may have been felled and converted in its first year. It would occupy two years to reach the depôt in the plains, and it might remain there two years before it was sold; result being that it is quite unseasoned and is gradually passing into a state of natural decay before it is even laid down under the rails.

The large sleeper depôt at Wazirabad belonging to native merchants is a most instructive one, and well illustrates the manner in which the gifts of Providence can be abused when left to the care of inexperienced and money-grubbing individuals. The sleepers there, come from the territory of the Maharajah of Cashmere, and the waste is dreadful to behold; from 50 to 60 per cent. of the sleepers are unuseable, as already explained. Of course the Maharajah has no supervision over his forests: the trees are sold to the highest bidder, and the timber merchant is only anxious to turn over his capital as soon as he can, hence a plentiful supply of unseasoned *deodar* sleepers to the different railway companies and consequent frequent and large outlays for renewals at, comparatively speaking, short intervals.

FORESTER.

October 7th, 1880.

ABOUT PAPER FIBRES.

TO THE EDITOR.

SIR,—The article with the above heading in your journal of September, refers apparently to the Blue-book Memorandum on "Materials in India suitable for the manufacture of Paper" compiled by Mr. Liotard of the Agricultural Department, and published by the Indian Government in Calcutta.

I think you would do good service by reviewing this publication *in extenso*, seeing that the cultivation and treatment of raw fibrous material is an important division of agriculture, to which subject your journal is specially devoted; meanwhile I transmit you by this mail our Paper Trade Monthly journal, in which you will find abstract of that portion of the said publication relating to "*Bamboo, as a material for Paper-making*," for the discussion of which question you have been good enough to allow me considerable space during the past two years.

The abstracts from reports of Forest Conservators and Collectors in various districts in India in Mr. Liotard's compilation enumerate an enormous number of fibrous plants from which no doubt paper of varying quality could be manufactured, inasmuch as from nearly every vegetable fibre paper of one description or other can be produced. The commercial and practical issues, however, are not merely whether paper can be made from any given fibre, but of what quality, and more, especially at what cost—the latter after all being the crucial point or question, as it is useless to discuss the question of quality if cost is prohibitive.

I venture as a practical paper manufacturer fairly conversant, not only theoretically, but practically, with nearly all the fibres enumerated in the Government Memorandum, (having indeed experimented upon most of them,) to assert, that not one-third, I almost venture to say not one-fourth of those referred to, can be *economically* reduced into a

merchantable condition suitable for English or European requirements. I mean to convey my conviction, and thus throw out a warning note to those who may be intending to experimentalise, but who are probably unacquainted with the technical requirements of the paper trade, that practically and commercially speaking—that is to say *profitably*, taking into consideration the cost of cultivation, or in the case of a purely wild plant, the cost of collection, the mechanical treatment, or other necessary manipulation, and the resulting yield or produce of fibre reduced to such a condition as to make it a saleable article to the paper-maker, considering also the cost of freight and transport from a country so remote as India to Europe—taking all this into consideration, I say that few or very few of the fibrous substances enumerated can be *profitably* utilised as articles of commerce.

The object, however, of this Government Memorandum is most laudable, as there can be no doubt that India teems with raw fibrous plants, suitable for textile manufactures as well as for paper-making. No doubt also that a fresh and extended supply of paper-making material either as a pure raw fibre, or the tow or waste from any fibre prepared for textile purposes, or semi-manufactured, or reduced to a rough stock, is a great desideratum for England, seeing that we are now mainly dependent on foreign countries for our chief raw material *esparto* or *alfa*; the imports of which you will observe from the Board of Trade returns (published in our Trade Journal) amounted to upwards of 120,000 tons in the first 8 months of the current year.

Esparto, however, is becoming both scarce and dear while deteriorating in quality, and such is the demand for paper-making material both in England and the continent, as well as the United States, that a variety of articles lower priced than *esparto* enter largely into consumption; notably wood pulp, both chemically and mechanically prepared, straw also, jute ends or butts, and gunny bagging, flax and hemp waste, &c., &c., so that any new material that will minister to the requirements of our trade will be gladly welcomed.

It will be obvious, however, that to command a market, any new fibre or fibrous material must be at least as good, or better in quality, and as cheap, or cheaper, than those now in use, and as *esparto* now forms the main staple of our paper trade, any fresh material must favorably compare with it to ensure its sale.

Alfa or African *esparto* now realises from £5-15 to £7-10, or £8 per ton; and Spanish from £10 to £10-15. It is generally understood in the trade that 2 tons of *esparto* are required for each 1 ton of paper.

Rags of course still enter largely, as they always will do, into the manufacture of paper, but rags range very wide with regard to both price and quality,—from £8 to £35 per ton, or even more, for the highest classes,—and are chiefly employed for the superior grades of paper.

What is really required in a new raw fibre or that fibre in a semi-prepared condition as "stock," is that it shall favorably compare at least with *esparto* grass, in cost, and be if possible superior in quality. For such a material the demand and sale would, practically speaking be illimitable.

I propose in a further letter to point out some few of the fibres enumerated in Mr. Liotard's Memorandum that offer a reasonable prospect of success. Meanwhile, I remain yours faithfully

THOS. ROUTLEDGE.

Claxheugh, 30th September 1880.

INDIGO CULTIVATION.

TO THE EDITOR.

SIR,—Would you be kind enough to enlighten me on the following points:—

1. The soil best suited to indigo.
2. The best mode of cultivation, and the depth the soil should be turned up.
3. The best time (month) for sowing, especially in the N.-W. Provinces.
4. The quantity of seed to be sown per acre.
5. The best seed for the N.-W. Provinces.
6. The average yield of plant per acre, in Factory maunds.
   (a.) Nowda on first cutting.
   (b.) Khootie on second cutting.
7. The highest yield of plant ever known, in Factory maunds.
   (a.) Nowda.
   (b.) Khootie.
8. The quantity of plant, in Factory maunds, that should be steeped in a vat—per 100 C. ft. capacity.
   (a.) Nowda.
   (b.) Khootie.
9. Should the steeping vat be deep or shallow, and what is the proper depth for a steeping vat,
10. The average yield of dye per 100 Factory maunds of plant.
   (a.) Nowda.
   (b) Khootie.
11. The highest yield of dye per 100 Factory maunds of plant ever known.
   (a.) Nowda.
   (b.) Khootie.

I have just got an Indigo Factory, and would feel much obliged for any information on the above points.

It is a great pity that experienced Indigo Planters do not make use of the *Indian Agriculturist* for an interchange of ideas on indigo planting and manufacturing. I am certain papers on the subject would be of the greatest advantage to young hands like myself.

W.

12th October 1880.

NOTE.—There are plenty of books on indigo cultivation, and we would recommend our correspondent to get one. To answer his series of questions properly, would take up far more space and time than we can afford.—ED., *I. A.*

MR. GAMMIE ON CINCHONA CULTIVATION.

(*To the Editor of the Ceylon Observer.*)

DEAR SIR,—In a late issue, in writing of the scraping process of collecting cinchona bark, you suggest the probable difficulty of getting the brokers to take to the bark in the new shape of short shavings so obtained. This appears to me, from late experience, to be a mistake, as smashed up *Ledgeriana* bark lately sent from the Bengal Government plantations sold quite as well, relatively, as did the long quill-shaped pieces. For convenience in packing, it was put through a bark mill so set as to break the bark up into pieces of an inch square or less, and in this form was shovelled into ordinary gunny bags, thus reducing the packing to the simplest possible shape. Bark for the manufacture of quinine must necessarily be sold on its inherent merits, and appearance can but little, if it all, influence the price. Of course "show" bark is quite another matter.

You mention that the experiment of reducing bark to powder before shipment was tried in Java, but failed. I suspect the best bark was not powdered, and that the powder sold quite as well as if the bark had been in an unpowdered state. At least this appears to me to be the commonsense view of the matter. Though I do not think that the appearance of the "scraped" bark will be against it in the market, I have very little hopes of the ultimate success of the scraping process in Northern India. It may answer well enough in the more favored climates of Java and Ceylon, and the process is well worth a trial. Trees scraped nine months ago in Sikkim do not appear to have suffered in health as yet, but the renewed bark has that corky appearance which you have referred to, and which I do not like any better than you do yourself. Nine months experience shows that the scraping can be done any month in the year. One month appears to be as good as any other. Where the scraping can be repeated frequently, as appears to be the case in Java, the process must be a most profitable one.

A good deal has been written of late in praise of grafting *Ledgeriana* on to *succirubra* stocks. We tried grafting cinchonas in Sikkim thirteen years ago, but though the grafts "took" readily and grew well for a year or so, their after growth compared so unfavorably with that of plants on their own roots that the process was abandoned. Formerly I was strongly of opinion that it was of the greatest importance in forming plantation of *Ledgeriana* that plants of the known good kinds only should be put out, and had the temerity to take the senior editor of your paper to task for advocating a more venturesome policy. It was, I presume, in consequence of holding a similar opinion to mine, and the difficulty in getting cuttings of this species to root that induced the cinchona authorities in Java to adopt the grafting process for the preparation of *Ledgeriana*. But in the face of the late Bengal bark sales, I am not sure that our worthy editor's opinion was not the right one. Smashed up bark of the variety approaching *succirubra* in appearance, and which was pronounced on analysis to be our worst kind, fetched the fair price of 2s. to 2s. 1od. a pound. This, it is true, is a poor return compared with 7s. 6d., which bark of the better sorts, in the same shape, fetched, but as it is a much more robust growing plant, the actual difference in money value is not so great. I do not mean for a moment to advocate the careless selection of seed—quite the reverse, but merely wish to point out that probably you were right in thinking there would not be much risk incurred in cultivating all the varieties raised from seed of true *Ledgeriana*. There were none of these *succirubra*-looking varieties among the plants raised from the seed collected by Ledger. At the worst, the large leaved varieties grow quite as fast and as big as *succirubra*, and the bark fetches about as good a price. In my opinion it will always pay better to cultivate a species robust in habit and yielding a fairly good bark than it will to

grow a short, however rich in quinine, if of a weakly and uncertain habit. I have good hopes that the best Sikkim *Ledgeriana* will prove a good grower, exceedingly rich in quinine, and that—most important point of all—it will reproduce itself by seed almost as truly as *succirubra* does. Another year will settle these points. It seems to be generally overlooked when comparing the results yielded by the Sikkim *Ledgeriana* barks with those of Java that our bark was analysed when only four and five years old—even at that early age it yielded up to 7 per cent. of crystallized quinine.

The species yielding the Carthagena bark appears likely to be a formidable rival to *succirubra* as far as rapidity of growth and ease of propagation are concerned. But old cinchona planters in India and Ceylon will always have a warm corner in their affections for *succirubra*, and notwithstanding all that has been written against the extension of it, I believe it will yet be *the* cinchona to yield a cheap and efficient febrifuge, equal in appearance to sulphate of quinine, for the fever-stricken millions, and at the same time give a good return to the growers.

3rd September 1880. JAS. A. GAMMIE.

FROST ON COFFEE.

I.

(*To the Editor of the Ceylon Observer.*)

DEAR SIR,—I notice, in that able article* on frosts, by Messrs. J. M. Robertson & Co., what I suspect to be a flaw in the writer's philosophy. He is not very clear in showing how the cold could be greater on the upper branches than on the lower, and I surmise that if he tested it by a thermometer, he would find the reverse to be the case. The fact I believe is that it is not the "frosting" but the "thawing" that blackens the coffee leaves. When a man's nose gets "frosted" in cold climates, he suffers no permanent injury if the condition of the nose is ascertained in time, and it be rubbed with snow till circulation is restored. Otherwise it would decay and drop from his face.

So when potatoes are "frosted" at home, they are put into ice-cold water, and moved about till the frost is gradually removed and they are as good as ever. Otherwise they would be useless.

So when a gardener discovers in the early morning that the frost has nipped his plants, he covers them up from the sun till they have been gradually thawed.

So I fancy it is with the frosted coffee. The morning sun shining aslant, touches only the top branches, and so their leaves are blackened, while the lower ones thawing gradually, are all right. Is it not the case that many places liable to frost in accordance with the theory under notice do not suffer at all from the fact that the morning sun does not touch them?—Yours truly,

THAW.

Kandy, Sept. 14th, 1880.

* See Selections under "Coffee."—ED., *I. A.*

II.

DEAR "OBSERVER,"—It seems "the Writer of the Memorandum" and I do not quite understand each other. Not being so intimately acquainted with coffee trees as some, I had an idea that the upper primaries would not shade *entirely* the ends of the lower primaries; but would be a sort of modification of the sucker and lower primary form described by J. M. R. & Co., and consequently the *ends* of the lower primaries, though free to radiate their heat into space, and to get colder than the upper from the descent of the cold air, would yet be shaded by the upper from the morning sun, and so escape injury. The matter seems deserving attention from this consideration that it would be easy to plant a row of trees, or leave a belt of jungle in a position to protect a flat from the first rays of the morning sun, while it would not be so easy to cover all the trees on the flat from frost.—Yours truly,

THAW.

WILL WHITE ANTS ATTACK LIVING TREES?

(*To the Editor of the Times of India.*)

SIR,—Your correspondent at Dharwar calls upon me to explain theoretically why white ants do not eat plants with vitality. It is a known popular error that white ants do eat plants with vitality, but naturalists differ in this. Sir E. Tennent states, what any one in this country must have noticed, that—"Termites rarely attack a living tree, and although their nests may be built against it, it continues to flourish not the less for their presence." Likewise Mr. Gosse in his "Naturalist's Sojourn in Jamaica," states that Smeathman, who has very minutely described and illustrated the tribes of Termites, says, they do not usually attack trees in a sound state. My own experience throughout the three presidencies of India concurs with the above. In the jungles of Wynaad I have seen trees covered with a coating of soil to the height of 20ft. from the ground, as if put on by the hand of man. Return to the same tree in the dry season, this will have all fallen off and left the tree without a speck of old decayed bark sufficient to prove to any close observer that it is only decaying and dead matter that is eaten by Termites.

As to the failure of your correspondent's blue gums, there might be many causes other than a knock with a tool. Plant life appears to me to be subject to as many ills as animal life suffers from. I have got a quantity of *Poinciana Regia* trees dying off just now, with what is popularly known as colar rot. I should be very much obliged if any of your numerous readers could tell me, through your columns, the reason why? I lost some 200 blue gums similarly last hot weather, and my *malee* persisted in saying they were destroyed by white ants. I had one of these *Poincianas* dug up immediately on its showing signs of drooping, more to convince a friend that the effects were not due to white ants, than from any curiosity on my own part; when I found the liber or inner bark of all the roots as well as the inner bark of the stem to about six inches above ground line, blackened of a glutinous consistency. Might it be that the roots were not capable of utilizing the large amount of elaborated sap the leaves have been returning to them, by being injured in any way or turned out of their natural channel, as I found the roots growing in a circle, in fact just as they had been confined by the pot two years ago before they were put into the ground. My observation leads me to this conclusion, as you will seldom see tree or plant self-sown die of colar rot.

GUZERAT.

Baroda, September 18.

WILL FARMING PAY?

(*To the Editor, of the Madras Times.*)

SIR,—Your correspondent, "Unconnected Traveller," appears to think that it is no use a European or Eurasian attempting to compete with the native in agricultural pursuits. I ask, has it been fully and regularly tried in these parts? And I reply that it has not. There have been instances—and probably one of these may have come under your correspondent's notice, and from which he has concluded that farming by Europeans or Eurasians will not pay—when Europeans have taken up lands and professed to farm, but in reality left all matter pertaining thereto to natives, who, of course, feathered their own nests, and so farming proves a failure. But I have only known of one instance when a European resided on his own farm, and superintended operations personally, and he made it pay over and over again. I can quote a dozen instances of how failure was brought about in the way I allude to—*Absenteeism*. Like all other matters of business or speculation, the farmer must be on the spot and not trust to a middleman.

Only lately I came across an account in the Bombay papers of a couple of Eurasians, who had taken to farming near Ahmedabad, making it pay; they, it was said, *lived on their farm*. Again in the *Delhi Gazette* I read of the great success which crowned the efforts of two Europeans who went into farming, principally rice and sugarcane, in some part of the North-Western Provinces, *they made their home on their land*. I would have asked, *en passant*, whether if a coffee planter was to live in Madras or Bangalore and leave his estate to a native would he get the same outturn of crop as if he lived on the land? Herein lies the secret—to be a successful farmer in India or elsewhere, there must be close application to details, and to ensure this a man must *live on his land*.

Then, again, your correspondent asserts that "it is very doubtful if the land would yield any more than it does at present." There is no foundation for this statement. It has been amply and fully proved that land can be improved by careful ploughing and manuring to such an extent as to make it yield double and treble, aye and four-fold, the crop such land did under the wretched cultivation of the native ryot. Such men as Mr. Harman, at the Government Farm, Bangalore, Mr. Cameron, F.L.S., of the Lal Bagh, the Superintendent of the Sydapett Farm, and others who have made experiments with cereals on a large scale, will tell you what land in India is capable of. The former gentleman made some excellent trials of *raggi* grain, cholum, &c., which proved, by improved methods of ploughing combined with proper manuring, that it was possible to get such bumper crops as the native never dreams or hopes to get. Your correspondent ought to read the *Indian Agriculturist*, and note the progress that is being made in the development of improved agriculture in India, and I maintain that, with good subsoil ploughing, and manuring, a stout heart and ready hand, and above all a residence on his own land will conduce to farming paying handsomely.

I have my own ideas how farming in connection with the Eurasian Association would provide for a large number of men and women not

afraid of work, and give them a good livelihood, but those who have the direction of affairs do not, apparently, want the advice or experience of an outsider; so I won't trouble you, but I should like to say, before concluding, that by way of convincing your correspondent that "land will yield more than it does at present." I shall be glad to show him a field of *raggi* on my farm treated to good ploughing and proper manuring, which he can compare with fields contiguous to mine, but cultivated by natives, and if he does not admit that mine is the better of the two by fifty per cent., then I am a Dutchman, and if he waits till the grain is ripe, I will cut yard for yard with the other fields, and he will see that my outturn is one-and-a-half to one of the other.

Bangalore, 16th September. L.

NATIVE TOBACCO CULTIVATION IN CEYLON.

(To the Editor of the Ceylon Times.)

SIR,—In the Northern Province the approximate cost of raising tobacco shews a profit of about Rs. 275 an acre upon the seven months' cultivation. It would be comparatively easy to raise two crops in the year, the paucity of rains rendering the crop, entirely dependent on irrigation. The waste of time in preparing the ground is quite unnecessary, as a matter of fact more than half the value of the cattle manure is evaporated by its being left to bake in the sun.

The patches cultivated are very small, and are measured in Lachams, 17 being the equivalent of an acre English.

The details are, for say—5 Lachams.

Keep cattle on the ground for 3 months, from September.

In December	throw in the manure with 10 coolies at 37 cents...	3·70
Do.	Plough twice at a rupee each ploughing ...	2·00
Do.	Plant and shade the plants	1·87
Watering	2 coolies each 30 cents. for 120 days	72·00
		79·57

These men suffice to keep off blossoms, weed, and pluck, watering being carried on from 5 to 7 A.M., and 4 to 6 P.M. only.

For crop 5 Lachams contain 1,500 plants each 10 leaves.

3,000 top leaves each at 4 cents.	120·00	
12,000 inferior leaves each at 1 cent.	120·00	240·00
15,000		160·43

No allowance is made for superintendence, rent, or curing; on the other hand Rs. 10 per thousand buys the commonest description of leaf produced, Cuba or Havana sorts being valued at four times this rate.

A. C. H.

WEST INDIAN YAM CULTIVATION, &c.

(To the Editor of the Ceylon Observer.)

SIR,—In an interesting review of the Quarterly Statistical Report on Jamaica, in your issue of the 27th instant, you make the following query, with reference to the splendid yam crop gathered in that island, viz.:—"*Why has the West Indian yam never established itself in Ceylon?—is our soil too poor?*" If you will permit me, I think I will be able to prove that these roots succeed quite as well in Ceylon as in any of the W. Indian islands,—if fair play is only given them. True, they delight in a good virgin soil, and do come to great perfection in the wonderful volcanic formations of the W. Indies: still I feel quite sure that our fine climate, and distributed rainfall, fully compensate for the inferiority of our soil. I have seen as good a return here, as ever I did in the West, and it is not in the poverty of our soil we have to look for any want of success (if indeed fair trials have been made), but in very different causes. The first of these is to be found in the apathy and want of enterprise on the part of the rural population; the other in the abundance of four-footed pests, which haunt the jungles and clearings, but which might be got rid of, were more energy and perseverance displayed. Mr. *Hystrix leucura* (the porcupine) has much to account for, but it is very hard to bring him to account, gifted as he is by nature, with admirable weapons of defence—a keen nose and formidable spines. The *bandicoot rat*, too, is not slow in asserting his right to a full share of the plunder to be had, and the wild hog, in his midnight rambles, knows no bounds to his wholesale depredations. These maurauders are, so to speak, the principal *natural restraints* to the propagation of all edible roots, and are purely nocturnal in their habits, sleeping during the day under rocks, tree roots, and in other retreats, and sallying forth at night to prosecute their deeds of darkness. In most of the West India islands, these enemies to the cultivation of ground provisions are represented by only one interesting little rodent—the *aguti*. It is of the size and has all the habits of our little *mimima* deer, and is closely allied to the *guinea pig family*. It is easily kept within bounds, and in most situations I do not think there would be much difficulty in guarding against the ravages of our Ceylon pests.

I had a good deal of experience in the cultivation of these fine roots, and other products, in the West Indies, and I have now got a small nursery in Kandy, containing the finest varieties of *W. Ind. yams*, *Eddoes*, true *plantains*, and many other introductions. A visit to the nursery would I think satisfy any one that these handsome creepers thrive and yield remarkably well in our climate, and that too with little expense or trouble. The present crop will not be ripe for sometime, but I am now booking orders for plants or sets of the various yams, &c., and I shall furnish full instructions as to cultivation on their delivery.

I do not hesitate to say that these roots, if generally cultivated, would be a great boon to the Island. They are infinitely superior to the native yams, and very much nicer and more nutritious than the ordinary waxy potatoes sold in our markets. The *cush-cush*, *guinea*, and *water yams* were in the W. Indies generally preferred to English or American potatoes, and I believe the *cush-cush* yam to be the most delicate and palatable of all ground roots.

A. WHYTE.

The Kandy Nursery, 28th Aug. 1880.

GUTTA-PERCHA.

(To the Editor of the Ceylon Times.)

SIR,—Some time since a letter appeared in your journal on the subject of gutta-percha. As I have also taken some interest in this product, I am now enabled to send you the following few remarks on its cultivation, &c. The gutta taban, or tuban, trees are found in Sumatra, Johore, Java, Borneo, and in Singapore, extending over a tract of country from 6° to 10° N. lat. to 10°S. lat., and from 100° to 120°E. long.

The tree (tuban) has a straight stem from 60 to 30 feet growing to a height of 100 to 120 feet, and when fully grown is from 2 to 3 feet in diameter. The wood of the tree is soft, fibrous, and spongy, of a pale yellow, and marked by black lines consisting of reservoirs filled with the gum. The yield of a large and full grown tree is sometimes 23 cattys or 17½lbs. It is generally estimated that 10 full grown trees will yield 1 picul of gutta-percha or 133⅓lbs. The pure gutta-percha is worth some 2s.6d to 3s. 6d per lb. The old and destructive method of collection was to fell the tree and to ring it with an axe at intervals of 3 to 18 inches, the milk being collected in cocoanut husks, &c., and boiled to draw off the water. The soil most suited to the Gutta taban is precisely such as we have in Ceylon, the tree thrives well on naturally well drained hill-sides and in a free soil, and at a considerable elevation. The great drawback to its cultivation is, that it is a very slow grower, taking nearly thirty years to arrive at its full growth, when it is about three feet in circumference, at a height of three feet from the ground. The seeds readily germinate, and the best method of putting out the plant is in bamboo pots, as the tap-root is long, and impatient of any injury. Gutta-percha is entirely distinct from caoutchouc. It reaches the English market from the Straits in three different preparations; the first being boiled milk, of pink color, hard and tough and mixed with bark and other natural impurity: the second, gutta-muntah, being a preparation of gutta reboiled up with cocoanut oil and inferior juices (such as that of the mudar tree, which grows commonly in Ceylon;) and the third is the crude gutta-percha, being simply the milk, hardened without any process whatever. The gutta-percha of commerce consists of pure gutta and 15 per cent. of a soft resin mixed with it—the resin has the simple chemical action of absorbing oxygen, without which property, light, such as the sun's rays, would render the gutta brittle, friable, and resinous; it is known that in submarine cables line gutta-percha does not sensibly decay, being protected from the light.

PIONEER.

THE METAL OF THE FUTURE.

(To the Editor of the Public Opinion.)

SIR,—Your last issue contains a paragraph on "Cheap Aluminium," in which you justly remark that "the importance of a cheap method of producing aluminium can scarcely be over-estimated. As a metal it is probably the most abundant in the crust of the earth." The aspect of the question is indeed so vast that it is almost impossible to realise the

revolution which would be brought about by the invention of any cheap and efficient method of reducing the metal from its ores on a large scale. It is no exaggeration to say that to whatever place you go, from the equator to the poles, you will find some compound of aluminium in abundance on the surface. It enters into the composition of our granite hills, it is contained in every species of clay, it is a most important constituent of all fertile soils. In the form of rubies and sapphires it sparkles in the regal diadem; and in that of a clay pipe it solaces the humblest workman.

With regard to its possible utility, I may point out that bulk for bulk, it is only one-third as heavy as iron; it is not acted upon by air, water, or sulphur (in which last particular it excels the noblest metals—gold, silver, and platinum); it is readily malleable, and may be drawn into fine wire; it is as sonorous as silver for bells and musical instruments; it is one of the very best conductors for electricity, in which capacity it again rivals pure silver; it is excellently adapted for casting in moulds, and after rolling or hammering becomes nearly as hard as iron. Its most important property is, perhaps, its lightness, and if ever the problem of aërial navigation is to be accomplished, it will be by means of machinery made of aluminium. If used for railway rolling stock, it would reduce the weight of trains by one-half, and would be equally applicable to bicycles and artillery. Its incorrodibility points to it as the best material for the sheathing of ships, for all submarine works and machinery, and for gas and water pipes. Lastly its high electrical conductivity, together with its lightness and resistance of chemical deterioration, would render it invaluable for telegraph wires and cables.

It is possible that the iron age is destined to be succeeded in turn by an aluminium age, and if so it will assuredly be an age of unprecedented, progress and advancement in arts, manufactures, sciences, and civilisation.

Yours obediently,
SAPPHIRE.

The Indian Agriculturist.

CALCUTTA, NOVEMBER 1, 1880.

TENANT RIGHT IN INDIA.

AN instructive comparison might be drawn between the agricultural policy of Ireland and of Upper India during the past ten years. In both countries the conviction has been slowly gaining ground that it is a mistake to have divided interests in the land when a whole population is irretrievably committed to agricultural pursuits. Irish tenants, not content with the amelioration of their condition effected by the Land Act, are agitating now for the total abolition of rent; and though the object is unattainable, there is every prospect that something like fixity of rent and tenure will actually be won. The Indian peasantry are less obtrusive of their claims. It is a beneficent Government that watches over them, and interposes in their behalf when they seem to need protection. Land legislation since the mutiny has followed one unvarying tenor in favour of the tenant; and at the present moment we see no less than three measures on the Council table, each of which is an attempt to establish between landlord and tenant some *modus vivendi* which shall be more tolerable for the latter. There is the Bengal Rent Commission, there is the amendment of the Rent Law of the North-Western Provinces, and, most significant of all, there is the Tenancy Bill for the Central Provinces. Besides these, special inquiry is making into the condition of the tenantry of Behar, and Burmah is being settled on principles which ignore landlordism altogether. It is a wonder that this great Indian movement, the more remarkable because it is strictly official, has not been turned to account by any of the leading Irish agitators. They might draw from State papers most cogent arguments for their cause. India, indeed, is occasionally quoted by these gentlemen, but for other purposes. It serves them as an example of the blighting influence of English tyranny. At one of the Land League meetings, not long ago, the audience were gravely informed that by reason of the Arms Act, wild beasts had so increased against the disarmed population that a tract of country 200,000 square miles in extent had been deserted by its inhabitants, and become the haunt of the tiger and the cobra. This statement seems to have been made in perfect good faith. The speaker was a Roman Catholic priest, and ought to have known geography better. But the fact that such a statement could be made, and could pass unchallenged, serves as a good illustration of the huge ignorance of Indian affairs which prevails at home. The Irish tenantry are heated with these vain fables, while nobody points out to them that their Indian brethren are already obtaining those concessions, are already becoming invested with those privileges, which the incessant stress and clamour of the Land League have hitherto been unable to extort from the English Parliament.

The Central Provinces Tenancy Bill contains provisions which might be taken as guides towards a solution of the Irish land question. It professes to improve the tenant's position in respect of four points,—namely, (1) sufficiency of notice before ejectment, (2) compensation for improvement, (3) facility of acquiring occupancy right, (4) security against harassing enhancements of rent. The first two points are of comparatively minor importance, and have been dealt with by recent agricultural legislation in England, after a fashion which, if not wholly satisfactory, will at any rate do well enough for the present. But occupancy right and fixity of rent are precisely the demands of the Irish cottier; and it will be interesting to consider for a moment how similar demands have been met by the Indian legislature for the ryot of the Central Provinces. In the first place, a right of occupancy can be acquired (if the Bill becomes law) by cultivation of any land in the village for five years, provided that the tenant has been able to get on without help from his landlord for the last three years of the five. It is not necessary that the tenant's holding should be the same throughout the five years, but merely that the lands cultivated, though they should vary every year, shall lie within the boundaries of the same village. The right of occupancy thus acquired will not indeed be commensurate with the full right of occupancy acquired by twelve years' cultivation, but it will protect the tenant against ejectment, and thus enable him to complete the further term of seven years, necessary for the conversion of this inchoate right into the perfect occupancy status. If the tenant dies in the meantime, his inchoate right dies with him; it is not, like the full right, transmissible to his heirs. There were those who proposed, in framing the Bill, that the term for the acquisition of the full right should be reduced from twelve to five years; but this, it appears, was classed among the 'heroic remedies,' which were especially deprecated by Mr. Grant in bringing the Bill before Council. Toned down as they are, the provisions regarding inchoate occupancy right have yet to stand the ordeal of severe criticism directed by able hands. There is perhaps no more capable revenue officer in India at the present moment than Mr. C. H. T. Crosthwaite; and he has thrown all the weight of his ability and experience into the cause of the landlords in this matter. It seems a pity that the cause should be able to boast such a champion. That recent legislation, in seeking to protect the tenant, has made itself responsible for much ill-will between him and his landlord, no man who has paid the slightest attention to the land question will be prepared to deny. It is easy to urge that further effort in the same direction will only be attended with similar consequences in an exaggerated form. There is plenty of room for forcible writing on the subject; there are abundant materials for example and illustration. It can be proved incontestably that the present rule of twelve years has set the landlords on the watch to prevent occupancy right by timely ejectment, and to break it down on the first occurrence of arrears. But what is the alternative? If occupancy right be withheld, there is no alternative but the complete subjection of the tenantry to the landlord, with results such as official reports describe in Behar. It is no answer to allege the admirable relations existing between the parties thirty years ago. The India of thirty years ago is not the India of to-day, and in the absence of the circumstances which fostered those old relations, it is vain to expect that questions between landlord and tenant will settle themselves, if left to themselves, without injustice to the weaker party, that is, to the tenant. In former days, land was plenty and labourers were few; tenants were in demand, they could make their own terms, they could appeal to customary law not yet outworn, they were needed by the landlord as allies against unscrupulous superiors. The landlord himself was a new creation, a being called into existence by mistake, as yet imperfectly acquainted with his powers, and afraid to exercise them. But this happy state of things could not last for ever. Apart from all legislation, the

mere increase of population must gradually have reduced the tenant from the position of a man sought after, to that of a suitor and a dependant. The law has sought to prevent his dependence from sinking to a point not far removed from serfage. It has given him rights, the practical value of which can best be tested by the keenness with which he battles for them; and if his claims excite the enmity of the landlord, and our Courts resound with the clamour of both parties, surely even this is better than that the law should hand over the tenants, "like dumb, driven cattle," to suffer injustice without the power of complaint.

The enhancement of rent is intimately connected with the question of occupancy right. In the North-Western Province, the landlord must prove that the occupancy tenant's rent which he seeks to enhance, is below the average rent payable in the neighbourhood for that class of land. He can also claim to enhance rent on the ground that the value or the quantity of the produce has increased. By the new law for the Central Provinces, only the two latter reasons can be alleged in support of a claim to enhancement. This is a fact of the greatest importance. It abolishes the competitive theory of rents, at a stroke. It is the nearest move yet made towards that consummation which some of our ablest settlement officers have so strenuously recommended—the fixation of rents, as well as revenue, for the whole term of settlement. Under the North-Western Provinces rule, the landlord can virtually say to his occupancy tenant. 'Your rent is below the level to which rents in villages A, B, and C, have been raised by competition, and if you do not consent to have it raised to that level I will call in the power of the law.' There is not a revenue officer in the North-Western Provinces who has not good reason to know the harassment and heart-burning caused by these proceedings to the whole agricultural interest. It is unfortunately necessary, in most cases, to lend the landlord the support of the law, for he has been assessed to revenue in anticipation of a rise of rents. But the settlement officer ought to have enhanced the rents himself, at the time of assessment, so as to get done with the business once for all. This is the plan proposed now for the Central Provinces. In the intervals between settlement, that is, during periods of thirty years, enhancement of rent will be claimable only on the rare and exceptional ground of increase in quantity or value of produce. In a word, the status of the Central Provinces tenant, if this Bill be passed without material modification, will be as nearly as possible that which the most advanced section of the English Liberal party are striving to obtain for the Irish cottier. In a speech at Liverpool, a month ago, Mr. Leonard Courtney propounded what he called a solution of the Irish question according to Irish notions, by an arrangement under which "the tenant should pay fixed rental to the landowners which should be varied only by agreement or by a public tribunal, at stated intervals, and that so long as he pays his fixed rental, he should have a permanent holding of the lands he cultivates." These words might have been used by Mr. Grant in introducing the Central Provinces Tenancy Bill. India, however, is happier than Ireland in the absence of banded opposition on the part of her great landowners to all measures which would benefit the tenant by curtailing privileges which the landlord has usurped.

TEA IN AMERICA.

A GOOD deal has lately been said on this subject, and, especially during the past two or three years, the old project has again arisen by which the United States of America were to be independent of China, Japan, or India. Of Indian teas America seldom took any, but confined her attention most exclusively to that of China. Recently, however, the reciprocal amenities which have resulted from the steam intercommunication of the Pacific States and Japan, and the trading facilities which such a traffic is sure to engender and encourage, have led America to turn her attention more to Japan than to China. We find within the last few years that the tea imports from China have materially decreased, while the discrepancy is more than made up by purchases from Japan. But now America wishes to grow and manufacture her own tea, and with that ambitious feeling which is characteristic of the American, she may be looking forward to a day in the not distant future, when she may help to supply the enormous demand which exists for that article in the United Kingdom and in Europe generally. Papers from America continually refer to this as being an important matter, and it is evidently engaging public attention across the Atlantic. Of course as in duty bound, we find the trade journals of Europe taking up the subject as well; but we regret to observe that none of these journals deals up the subject in a practical manner. They all take it for granted that in the many varieties of climate obtainable in the States, some suitable locality will, as a matter of course, be found for tea, and that therefore the growth and spread of this industry is only a question of time, and, taking into consideration the energy and enterprise of the American character, it need not be a question of very long time. We have always affirmed on the contrary that tea-planting as a commercial speculation will never succeed in America, and, as this seems a suitable time for the purpose, we will proceed to state our reasons for having arrived at a conclusion so adverse to that reached by the great bulk of our contemporaries. There is a great difference between experimenting with a plant as a curiosity, and cultivating that same plant as a commercial undertaking, calculated to return a profit in hard cash to those who invest in the speculation; and here it is that our contemporaries have erred. They have looked at and still look at it in the light of an interesting experiment, and seeing the success which has followed the few trials which have been made, they jump to the conclusion that these experiments only want expansion to lead to the accomplishment of a great end. We will quote a few instances to prove that this does not necessarily hold good. On the Sewalic Hills running from the Ganges north-west nearly to the Indus, and parallel to the great Himalaya range, the indigo plant grows wild, and in those beautiful plateau valleys, known as the Doons, and which are from 2,000 to 4,000 feet above sea level, the plant may be found freely growing in every direction, wherever a patch has been left uncultivated. It grows beautifully, and the locality is evidently its *habitat*. Arguing from this, several enterprising gentlemen built vats and planted out large tracts of land with the indigo plant,—with the result of dead failure. And it is a remarkable fact that we frequently succeed better with any given crop in a locality not so suitable—to all appearance,—to its wants than we do, if we persist in growing it where it would appear from surrounding circumstances and all the evidence available to us, Nature had originally planted it. Now with regard to this indigo, the plant grows beautifully, but it so happens that exactly at that particular time when the leaf is in its best condition for yielding the precious dye, the rains set in so heavily, that the value of the plant as a dye-yielding shrub is entirely lost. Nature possibly intended it for another purpose. The deer so plentiful in these parts eat it freely. But we want it for other purposes, and cut it to suit our own ends at a time when it would perhaps not be suitable if wanted otherwise. Now we shall come nearer home for another illustration. The plentiful supply of labour in the Hazareebagh district, led to the opening out of tea plantations in that locality, but these gardens cannot hope to succeed commercially. The tea made always sells at very low prices, and the quality is poor. True, labour is cheap and plentiful, and hence the cost of a pound of tea is very little; still, we do not see much chance of success, as the drawbacks of a climatic nature are, we consider, too serious to be overcome by such an accidental advantage as cheap labour. The rainfall is deficient, and in comparison of this all other advantages are as nothing. Another illustration, and we have done. We have recently been informed, by a gentleman of great agricultural experience, that the soil of the Western Dooars is not suitable for tea. He tells us that the soil is very rich, and two feet deep, and that the growth of the young plants is marvellous, shewing that the climate is all that could be desired. Hence the rush of speculators, to open out gardens in that locality. But we are next told that below those two feet of rich soil, there is nothing but gravel, and that of such a nature as will not permit the tap-root to penetrate. If this report be correct, tea as a commercial speculation in the Dooars will fail. So long as there is plenty of humus and plant-food in the upper stratum of soil, there is nothing to fear, but so soon as the tap-root reaches this gravel, and finds its way barred, the plants will cease to yield leaf in such quantity as will pay. The Hazreebagh difficulty is the one that the American cultivator will have to fear the most, although we are not quite sure how they propose getting over the labour difficulty, unless they can induce the negroes to join this class of work. It is not of the nature of work suitable at all for Europeans.

This difficulty, however, might be got over by enterprise and energy, but the climatic one appears to us fatal to the success of the scheme. Tea would grow very well in Calcutta, and yet we go to Assam and other places at a great distance. In Calcutta we have the necessary heat, and the soil, although not perhaps quite suitable, would suffice, but the rainfall is fatal to success. And it is exactly at this point that the enterprise in America will give way. The plant will grow beautifully, for the climate which grows rice and cotton successfully cannot fail to grow tea, but the rainfall of the Southern States is too meagre to make the plant flush sufficiently to pay. It is a common remark among planters that tea will not pay where the rainfall is under 100 inches and distributed over 8 months of the year. This may be taken as a truism, although there are some parts of India where tea grows and pays, and where the rainfall is considerably under 100 inches. At Dehra Doon for instance, where the rainfall averages 68 inches, tea does pay, the compensating influence there being the lesser degree of heat which prevails, and consequent diminution of evaporation, which makes 68 inches practically do the work of 100 inches. Whatever subsidiary advantages America may have, will not be sufficient to balance the deficiency in rainfall. We have examined the records of the United States' Agricultural Bureau for information on this point, and here is what we have found. The monthly rainfall of the State of Georgia averages in inches 4·11, 4·60, 6·60, 1·75, 1·09, 3·23, 1·82, 1·77, 3·62, 2·64, 2·74, 2·93;=total 36·9 inches. This is well distributed, but the quantity is very light. This lightness too appears in a strong light when we note that the slightest falls occur just when the tea plant wants rain most—in the hot and flushing months. If we assume the manufacturing season to extend over 7 months, say April to October, both inclusive, we have during that short but important season a total rainfall of only 16 inches, a quantity in our opinion which places the success of the proposed industry out of the question, so far as America is concerned. We know well that nothing will be wanting on the part of the American farmer to make the experiment turn out well, but he cannot, by any amount of energy, make up for a want of rainfall. Irrigation may be tried, but it is not so effectual as the natural fall of rain, and if there were no other cause operating to hinder the success of the enterprise, this alone would suffice.

EXPERIMENTS WITH PLOUGHS.

THE subject of improved ploughs for the use of the ryots is one that has received a good deal of attention of late, and experiments with various implements have been made. Some of these have been more successful than others, though as whole the results hitherto can hardly be said to have been very satisfactory. But when such experiments are being conducted, the public, who pay for them, have at least the right to demand that the operations be conducted by competent persons, so that fair and proper results may be obtained. This important condition, we regret to say, does not seem always to have met with the consideration it deserves. We have before us an official report of some experiments lately completed with "English ploughs" (the term is somewhat vague) in the Trichinopoly district, and they have resulted confessedly in failure. Reasons are of course assigned for this, and we proceed to reproduce them. In the first place we are told that the "Agricultural Inspector," a native, to whom the carrying out of the experiment was entrusted, was "altogether unfit for his work," a mere raw student in fact, with no practical knowledge of agriculture whatever. What, we ask, must be done to the man who appointed such a person to conduct important experiments? Mr. Benson, Acting Superintendent of the Government Farm at Saidapet, tells us, by way of apology, that "the man I sent I chose with reluctance, but he was the only one available who was at all likely to suit." If such were the case, all we can say is, better not to have undertaken the experiment at all. Mr. Benson, however, throws the blame back on the Government, and says "the late date at which the orders of Government were received prevented my choosing a really competent man to send with the ploughs :" and this brings us to the second reason assigned for the failure of the experiment, *viz.*, the lateness of the season. The ploughs were evidently despatched much too late, for work could not be actually commenced before the beginning of August (1879). The failure is also partly attributed to the deficiency of rain subsequent to sowing. If we look at the matter leniently, these last two excuses may perhaps be considered as valid; the former we will charitably assume was to some extent unavoidable, while the latter we will likewise suppose could not have been provided against, though it seems to us not improbable that the two are closely connected, and that, had the experiments been undertaken earlier, as they ought, the deficiency in the rain at the particular time it occurred would not have so materially affected the crop. But we purposely avoid picking holes in the above excuses, in order that we may bring the stronger light to bear on the impropriety of the major reason assigned, *viz.*, the incompetence of the instructor. The only merit in the excuse is its candour. As for the man himself, he seems to have had no idea of what he was required to do. We are told he "ploughed deeply where the result was to bring to the surface a subsoil of a harmful nature, and, so ingrained in his mind appeared to be the idea that his sole object as Instructor was to plough as deep into the ground as possible, that he constantly left off the work altogether on the ground that he had not strong enough bullocks." We are gravely informed that the strongest bullocks the Musiri tahsildar could procure did not content the Instructor, and so the Collector of Trichinopoly "sent out the strongest pair that the Trichinopoly tahsildar could procure." We should like to have given Mr. Martin credit for more sense. What could the worth of an experiment, carried on under such conditions, be? Needless to state this last instalment of bullocks met with no better fate than their predecessors, in the hands of the ferocious Instructor. Mr. Martin sorrowfully tells us that "after the lapse of 45 days these bullocks were returned in a shocking state from the treatment they had received, and I was obliged to pay Rs. 16-14 to the owner as compensation ;"—an edifying sight this to the ryots, for whose special enlightenment these experiments are undertaken. We have said enough to give our readers an insight into the way in which we sometimes try to teach the ryots how to cultivate the soil ; and then we wonder at their conservatism and stubborn rejection of our ideas. We fancy the ryots of Trichinopoly will not easily forget what they have witnessed. The whole experiment was thoroughly ridiculous. But what is more ridiculous than all, is Mr. Benson's grave official assurance that "the experience gained in this experiment is valuable, and not, considering the circumstances under which it was carried out, discouraging !" But, then, we must not remember that Mr. Benson is responsible for those "circumstances," that it is he who appointed the intelligent "Instructor." Mr. Benson does not stand alone, however. Almost equally good is Mr. Martin's report of the result of the entire experiment, *viz.*, that the ploughs have not made a "favourable impression" on the ryots. In the face of these specimens, what trust can be placed in official documents and reports ? After the aforementioned encomium on the result of his nominee's labours, Mr. Benson urges the Board of Revenue that he experiment be repeated "under more favorable conditions." But the Board, while concurring in this opinion, do so from very different motives to that of the Collector and Superintendent. "For," sagely remarks the Board, "although the prospects of the ryots adopting European plough are very remote" [*very*, we should say] "yet it would be well to remove from their minds the unfavorable impression they may have formed on the subject"—if you can !

The principal objection to this plough is the usual one, *viz.*, its weight and unsuitability to the bullocks. But the Instructor knew nothing of the difference between deep *cultivation* and deep *ploughing*, and consequently, in the attempt to plough deeply, a bad subsoil was turned up, which resulted in a poor growth and the failure of the crop.

UMRITSUR CONSERVANCY.

WHEN we wrote recently on the subject of the important experiment which was being made at Poona, and which experiment we may repeat, has quite passed out of the tentative stage, we were not aware that Umritsur has for sometime been engaged on a similar experiment. Yet not quite similar. In Poona, the night-soil is removed to a convenient depôt outside the city, and with the help of the sweepings and other dry refuse, and the [illegible] says

is converted into *poudrette*, which is sold at one rupee per cubic yard—one cubic yard containing about 14 maunds. At Umritsur the whole of the conservancy filth is removed to a distance of some eight miles out of the town by the help of a sytem of sewers, which are flushed from the canals. At this depôt are two large natural depressions which with a little alteration are now used as tanks where the sewage is allowed to precipitate. This mechanical change having been effected, the comparatively clear liquid is run off and is purchased by the cultivators in the neighbourhood, the precipitated manure is then removed and stored in godowns for the purpose, whence it is purchased and removed by the surrounding ryots. An inspection report by the Sanitary Commissioner of the Punjab tells us that no smell results from this mode of treatment. Regarding the profit accruing to the Municipality, we are not in a position to speak positively, as we have no complete accounts before us. From the abstract we have seen, we should, however, imagine it to be a profitable undertaking. One peculiarity of these experiments is that they may be very profitable, and at the same time shew a heavy balance on the expenditure side of the account. The reason for this is that all such accounts include the cost of collecting the filth, that is to say the total charge for ordinary conservancy. This is not fair to the experiment, because without it, that expense would have to be borne at any rate, for sanitary reasons. We find from the accounts that the average income from sales of manure, solid and liquid, is over Rs. 25,000, and that the expenditure is about Rs. 50,000 annually; but it would be manifestly unfair to charge all of this latter sum to the experiment, because most probably the vastly greater part is due to purely conservancy services. This is a very interesting experiment inasmuch as all connected with it are on their mettle to show as large a balance at credit at the close of each year as they can; and by this means the streets and latrines of Umritsur are benefited.

What perhaps strikes an outsider most forcibly is the apparent ease with which a prejudice, hitherto considered invulnerable, can be grappled with and mastered when the opposite party have an advantage to offer. If there be one thing more than any other obnoxious to the native of India, it is the idea of having anything to do with night-soil and sewage generally. We know what use the thrifty Chinese cultivator has for all that matter, and how carefully he garners it up for his pet fields, but the idea of a native of India having anything to do with it is almost beyond belief. Yet here in two instances we find them not only using it, but paying for it, and, in the case of Poona, registering their orders accompanied with cash six months in advance, to ensure their getting it. The report on the Poona experiment says:—so anxious are the cultivators to get the new manure that guards have to watch the heaps of raw material in the city to prevent the ryots stealing it in that condition—and although we have no definite information on this point regarding the operations at Umritsur, we have the broad fact that the cultivators pay twenty-five thousand rupees a year for the material. Thus will all prejudices fall, Dagon-like, before self-interest. Education has often been called the great lever which is to remove superstition and prejudice far away from the people. Commend us—while not despising the power of education—to self-interest. We shall be glad to hear of other large centres of population following the lead of these two important towns.

EDITORIAL NOTES.

As regards agricultural prospects, we extract the following from the last Government notice to hand, being the report for the week ending 19th October:—

Favourable rain has fallen in some Madras districts, and the north-east monsoon is reported to have broken in the Kistna district; more rain is still required in parts; but prospects, on the whole, remain fair. In Bombay there is little or no rain; and it is still wanted in Surat and parts of the Deccan. Good rain fell in most parts of Bengal, with much benefit to the standing crops, but more is still required in portions of Behar; *rabi* sowings are progressing satisfactorily. In the North-Western Provinces and Oudh rain is reported only from Benares and Fyzabad, and some is also believed to have fallen in Partabgarh; rain is urgently needed in most of the central districts. Failing a further fall, the *kharif* outturn will be poor, and much of the *rabi* area must be left unsown; some distress has begun to be felt among the poorer classes in Cawnpore, Lucknow, and Rae Bareilly; and in Allahabad, Jhansi, Sitapur, and Partabgarh prices are rising. In the Punjab there was slight rain in Sealkot, but none elsewhere; the yield of the autumn harvest will, it is expected, be below the average. In the Central Provinces there was general slight rain; but in Nagpur, Bhandara, and Bilaspur, where the fall was apparently better, the reaping of the *kharif* harvest has begun, and preparations for the spring crops are in progress. There was moderate rain in Burmah during the week; more is required in parts of Pegu and in Akyab; agricultural prospects are generally favourable. In Assam prospects remain good. In Mysore and Coorg the crops have been further benefited by the week's rainfall. In Berar and Hyderabad there were slight showers. No rain fell in the Centra India States, and it is badly wanted in places. In Rajputana also the weather was clear.

Prospects throughout the Empire continue, on the whole, fair, except in some districts of the North-Western Provinces and Oudh, where the insufficiency of rain has shortened the yield of the *kharif* crops and is likely to materially lessen the area usually put under spring crops.

The concluding paragraph is characteristic of these official reports. It does not at all represent the actual state of affairs in the N.-W. P. There can be no doubt that serious apprehensions of a severe drought are entertained, and we are glad to see the local Government are alive to the emergency and are taking active measures to minimise its evil results. The Government of the North-West Provinces has in fact just issued a circular authorising Collectors to issue Takavi advances to cultivators for the purpose of digging *kutcha* wells. The amount of these advances is left to the discretion of the district authorities, and they are to use their best endeavours to induce the people to apply freely for these loans and to dig as many wells as possible, to avert the severity of the apprehended drought. We are also glad to see that the usual formalities in the matter of stamped paper, &c., which so often prove a great deterrent to Government loans being applied for, are not to be observed in the case of these advances, and we trust that the district authorities will one and all act in the spirit of these orders. The advances, we are told, are not to bear interest for one year, at the end of which interest at 6¼ per cent. will be charged on all outstandings.

There is reason to fear that if more rain does not fall very shortly, the *rabi* crops over large areas in the Lucknow, Rae Bareilly, Allahabad, Benares, and Jhansi Divisions will remain unsown. Of course there is as yet no reason to fear that the stocks of the past two bumper harvests have run short or are likely soon to run short. So far as we have been able to ascertain, the markets are well supplied; but if the coming spring harvest should practically prove a failure, the strain on the food-supply cannot but tell eventually. That the local Government is alive to the threatened danger is manifest from the special concessions offered to cultivators and others to induce them to construct *kutcha* wells in tracts which are solely dependent on the rainfall for whatever crops they produce. These wells are dug expeditiously and at a trifling cost. During the scarcity of 1877-78, such wells proved the salvation of many a family. In the Agra district, plots of land which had been prepared for the *rabi* were sown with carrots, and the crop brought to perfection rapidly by frequent irrigation.

It is not perhaps generally known that carrots form a very nourishing article of food. But what makes them specially valuable in a season of drought or scarcity is the comparatively short period required for them to come to maturity. Another valuable crop is maize, which has been successfully grown in the Lucknow Horticultural Garden during the winter months. Maize sown early in October came to perfection and was ready for food early in January. The above hints cannot be too widely made known, though we are afraid that it will be hard to overcome the obstinate conservatism of the otherwise submissive ryot. That maize should be grown at a season when his ancestors have for generations been accustomed to raise wheat and barley, is a thing which it will perhaps be hard to make the unsophisticated cultivator understand and carry into practice.

In our last issue we reproduced a letter from "Hortus" to the *Times of India* inquiring the best means for preserving the roots

of flowers and other shrubs from the attacks of white ants. Below it we inserted a recipe sent by a correspondent to the *Indian Daily News* for which he claimed that "painted on the sides of beams, &c., it will effectually destroy white ants." We have now the pleasure to give the text of a reply to "Hortus" by J. C. L. who, writing in a recent issue of the Bombay paper, says :—

It appears the natives use a plant called *som or soma*, in the culture of sugarcane, to keep off white ants. Mr. Graham. in his catalogue of Bombay plants, states :—"Dr. Gibson mentions that it is often brought from a distance by farmers to extirpate white ants from their sugarcane fields. A bundle of twigs is put in the trough of the well, from which the field is watered, along with a bag of common salt, hard packed, so that it may dissolve gradually ; the water so impregnated destroys the ants without injuring the crop." This is confirmed by Dalzell and Dr. Birdwood. The latter says :—"Water passed through a bundle of *somaluta* (Sanscrit for *Som*) and a bag of salt, will extirpate white ants from a field watered with it," quoting the *Oriental Christian Spectator* as his authority. This plant is known to botanists as *Sarcostemma intermedium* D. C. Prod., VIII. 538 ; (*S. viminale*, Wight's contrib., p. 52); it is leafless and bears during the rainy season beautiful umbels of pure white flowers ; and is to be found throughout the Deccan, in Guzerat, the Isle of Perim, and in arid jungles all over India, twining extensively over milkbushes (*Euphorbia tirucalli*), and other trees.

REPLYING to questions relative to the best method of conducting the experiments in contemplation of the use of compressed food for cattle, Veterinary Surgeon J. H. Cox has, we are told, recommended to Government that in each of the districts named, *i.e.*, Bengal, Bombay, N.-W. Provinces, and the Punjab, the horses of one British cavalry regiment, two batteries of artilery, 200 commissariat bullocks, and 100 camels, shall be supplied with the food for six months. If it is found to answer as successfully as seems to be the case in private trials, the inventor claims for his plan the merit of saving in cost five lakhs per annum. The food is besides much more convenient and easily stored. We hear that 100 tons have been ordered to be dispatched at once to Candahar. As it had been discovered that small cakes stand the effects of climatic change better than large ones they are now manufactured of ½lb. weight only.

IN our October number we noted some remarks of the *Englishman*, giving instances of the increasing tendency on the part of the Government of India to enter into competition with private capital and private manufacturing and commercial enterprise. We now extract the following from the *Indian Daily News* on the same subject .—

In speaking the other day of forest operations, we said that many officials seemed to indulge in experiments quite outside the range of their legitimate work. A little reflection will show that this might with truth be said of the Government itself. We are not now speaking of those quasi-commercial experiments, which are continually being tried in our jails, in the manufacture of various articles , although when Government goes outside its own wants, and manufactures articles of general demand, advertising them for sale in various ways, we must say the same mistake is made. We now speak of *bonâ fide* commercial transactions, and at present will confine ourselves to two. These are coal and cinchona. Since the Government took over the East Indian Railway, the practice of selling Kurharballee coal has been continued. Before the transfer, it was urged that there could be no objection to the East Indian Railway Company selling as much coal as they could, but it seems to us that the objection, which applies to the Government doing so, applied with equal force to the Railway company doing it. The Company's dividends were guaranteed, hence it could compete with the trade on terms which were not fair to the latter. Now, however, we cannot conceive of any excuse which can be offered for the Government doing this work. The land was originally purchased by the company with the consent of the Government, that the company might raise their own coals, and thus effect a saving in working expenses. This done, the connection of the company with the coal trade should have ceased, and it is unfair that the Government should thus abuse the advantages it possesses to oppose honest trade, and we trust to hear of an immediate stop being put to the practice. When a railway is opened in a district, all within the reach of its influence expect to derive some benefit from it ; otherwise why should a monopoly of carriage be bestowed on it ?—for a railway charter is practically a monopoly. The Coal Companies doubtless looked forward to a share in these benefits and they received their share till the company commenced to work its own coal. To this no objection could be raised ; but when this guaranteed company not only stopped purchasing, but actually appeared in the market as a seller of coals, the matter seems to us to have called for a protest.

Now, let us look at the cinchona speculation. Year after year extensions go on in this industry, until a large portion of British Sikkim will soon be covered with the tree. In the early days of tea cultivation, when it was not quite certain whether tea would succeed, commercially, in this country, the Government took the initiative at once, and gave the experiment a fair trial. After a few years, when it appeared beyond the possibility of doubt that success would follow the industry, the Government at once sold all its properties, and relinquished to private enterprise all the experience they had gained ; and this is, indeed, one of the functions of Government. In connection with this cinchona experiment, we have all known for some years past that, properly attended to, it is bound to succeed ; and yet the State extensions go on and there does not seem any sign of the Government relinquishing the business. It cannot be for the convenience of manufacturing the febrifuge, for that, too, is a success, and, with the cultivation of the plant, should be handed over to private enterprise.

It is surely time our Chambers of Commerce and Trades Associations bestirred themselves in the matter.

A WRITER a short time ago in the Sind issue of the *Civil and Military Gazette* observed :—

"One cannot help being struck with the widespread alarm and ruin caused in a country, the agricultural operations of which (as those of Sind) depend upon an average annual height of inundation. The current season is a case in point, the height of the inundation of the river Indus being this day more than four feet below that of the corresponding date last year. The grain crops are just now in urgent need of water, but the smaller canals and *karias* are nearly dry, and a few days' delay in the supply of water must inevitably result in the utter failure of the crops over large areas of the country. In this state of affairs some zemindars whose lands adjoin the head-works of the Hyderabad Water Works have made an application to the Municipality to have their *karias* filled with water, by means of the pumping engine situated at Tanda Gidu, they agreeing to pay for the fuel and the use of the engine ; and there can be little doubt that a few hours' pumping from time to time will enable these zemindars to save the whole of their crops at a very trifling outlay."

This leads the writer to suggest that an irrigation company should be started on an extensive scale, with floating steam pumps, each with its tender for fuel, stationed at stated intervals at the banks of the Indus, ready at a moment's notice to irrigate their constituent's lands at any period of the year. There can be no doubt of its paying. Experience would soon determine the size of the district, which could be properly served by one pumping barge—

"I have no doubt that the zemindars would soon learn how to combine to construct and maintain amongst themselves the necessary channels for conveyance and distribution of the water; and they would probably, if shown how to do it construct cheap earthen tanks above the surface of the land, through which the water for irrigation would be supplied, and such tanks would contain a reserve supply of water for use, *at discretion* ; they would soon learn to construct these channels of permanent and impermeable materials, and to distribute the cost amongst the participants in the advantages of the new method.

ACCORDING to a note in a recent botanical journal, the resinous substance found on the branches of *Larrea Mexicana* has been proposed as a substitute for lac in the preparation of lac dye. The plant (commonly known as the Creosote plant) which belongs to the natural order *Zygophylleæ*, is a shrub from 4 to 6 feet high, growing in dense scrub-like masses in Mexico, especially on the borders of the Colorado desert, where its luxuriant growth forms an impenetrable mass of vegetation, effectually preventing the inroads of the drifting sand. The presence of this plant is said to be a sure indication of a sterile soil, little else being found where it flourishes, though the bright green of the foliage imparts a freshness to the surrounding scenery. The common name is derived from the fact that the plant has a strong creosote-like odour which is so powerful that no animal will touch it. The resinous matter to which the smell is due is abundant in all parts of the plant, the branches being frequently covered with it, in the same manner as true lac. The resin itself is of a light ruby colour. It is used by the natives in the treatment of rheumatism ; it is also used by the Indians for fixing their arrow heads to the shafts, and for forming into balls, which they kick before them as they journey from point to point of their trail.

Mr. O'Connor's review of Indian Trade for 1879-80 shows that manufacturing industries in India, apart from those connected with cotton, jute, and silk are developing. During the year a company was formed to work a large paper mill at Lucknow, and another paper mill has actually been started at Gawlior by Maharajah Scindia. A factory for making sulphuric acid has been established at Rangoon; a woollen mill in the Punjab; and in other parts of India, various enterprises of a more or less promising nature are being carried on.

In his review of the maritime trade of British India for 1879-80, Mr. O'Connor has the following paragraph on the trade with Arabia:—

Our principal export to Arabia is rice, of which 890,403 cwt. were exported last year, a quantity greatly in excess of the exports of previous years. Some wheat and other grain are also exported, and these, with coffee, twist, oil, silk goods, and spices, constitute the bulk of our exports to Arabia, the total value of which was about 70 lakhs of rupees. Sending coffee to Arabia seems like sending coals to Newcastle, but it is said that a good deal of it only goes there to pass out packed like Mocha coffee, and that it is sold as such, here and in Europe. It is also mixed with real Mocha.

And now native dealers have begun to buy and export Colney coffee for the same purpose!

The Central Provinces administration report for the year 1879-80, by Mr. J. H. Morris, C.S.I., has just been published. The year was a good one for the Central Provinces; a year of fairly suitable seasons and plentiful harvests, and this after two years of general depression. The trade of the year shows a decrease under the head of exports of cotton, due to a failure of the crop. The grain trade also fell off; owing, it is said, to the more plentiful harvests in other provinces and the cessation of famine prices. The working of the Warora Coal Mines showed a loss during the year of nearly half a lakh. The machinery broke down, and the mines were flooded. It is believed, however, that when the improvements now in hand are finished, they will secure the profitable working of the mines for many years to come. For the year reported on, the yield was but 32,000 tons in the whole twelve months; but 1,000 tons a month is expected eventually.

The foreign trade of the Punjab has naturally been considerably affected by the famine in Cashmere and the war in Afghanistan. From the report for the year 1879-80, now before us, it appears that the imports to British territory decreased by 12 per cent. in weigh. and 32 per cent. in value, while the exports to foreign countries though much the same in weight as last year, show an increase of 14 per cent. in value. The apparent diminished value of the trade during the last five years is attributed to the more moderate estimates of value adopted in pricing the articles imported and exported. The great difference of value between the imports and exports of Cashmere, noticed in the last report, has almost disappeared this year. The import of shawls, which was made in order to meet the expenses of the famine, has fallen off again to a mere nothing. The falling off of imports is explained by the loss of population, and the consequent failure of the indigenous manufactures. It is also due in part, no doubt, to the difficulty of procuring able-bodied coolies and ponies for carriage, as nearly all of these were employed in importing grain to the valley. The silk trade of Cashmere has suffered most of all, and it will take some years for it to recover its seemingly prosperous condition before 1878.

The gradual settling down of things in Yarkand and Kashgar, and possibly the visit of Mr. Elias to the former place, have affected the trade with Ladakh; and now that pilgrims have once more been allowed to proceed to India and Mecca, the trade may be expected to revive considerably. The falling off in the trade with Chinese Thibet is noticeable, though the reasons of this do not appear very clear. The decreased import of borax is, no doubt, due to the low price now obtainable for this article, which is being driven out of the European market by South American borax. As would be expected, there was a great falling-off in the trade with Bajaur and Barwah, tracts not subjected to the immediate influence of the march of British troops, but sufficiently near to be profoundly affected by the results of the war. The exports to Cabul and Sewestan show an increase of 20 and 50 per cent., due, in a large degree, to articles sent up for the consumption of the army. The Lieutenant-Governor remarks:—"It is doubtful if the money poured into Afghanistan has to any general extent induced the people of the country to purchase more largely, but the whole report on the trade with countries west of the province shows an abnormal state of things from which no satisfactory conclusion can be drawn."

The resolution of the Lieutenant-Governor of Bengal on the Bhaugulpore Division has the following remarks on irrigation:—

Irrigation works do not exist and are not needed in the parts of the division north of the Ganges. In the southern parts there are numerous petty works constructed by the people themselves. Works on a large scale were opened a short time back by the Court of Wards on the Kharakpore estate, of the Maharajah of Darbhunga. Special interest attaches to this scheme as the undertaking of a private estate, and the Lieutenant-Governor desires that its working may be always noticed in the annual report. It is to be feared that the system of constructing large *bandhs* of dams on the lower courses of the hill streams in the Damin-i-koh has proved, as Mr. Oldham believes, a practical failure. The indigenous plan of forming small reservoirs in the upper sections of the upland ridges, before the waters gather force and volume, is found to be more successful and less costly.

We extract the following from the Resolution of the Government of Bengal on the report of the Burdwan Division:—

Silk, jute, cotton, indigo, iron, brass, and bell metal are the principal industries of the division. In Midnapore, silk manufactures continues to decline, and the year under review six out of nine filatures in the Ghattal sub-division remained closed. In Beerbhoom the working was more profitable owing, as it seems, chiefly to the low rates of wages, no change having occurred in these for the past 25 years. Tusser silk manufacture is said to have revived in this district. Large quantities of this silk are also produced in Midnapore. The jute and cotton mills of Hooghly and Howrah were busy during the year, but the manufacture of country cloth is in a languishing state. Indigo factories exist in Midnapore, Bankoora, and Beerbhoom. In Midnapore the area under cultivation fell off in the past year, but there was a great improvement in the outturn as well as in the prices realized. In Bankoora and Beerbhoom the season was less favourable. No attempt has yet been made to start again the Bengal iron-works in Burdwan, so unfortunately closed, but there has been, it is said, some talk of re-opening the iron furnaces formerly worked at Mahomed Bazaar in Beerbhoom. The pottery works of Raneegunge are conducted on an extensive scale, and the ware is said to be hard and durable, of excellent quality and design. The output of the six leading coal companies at Raneegunge amounted to 163,639 tons during the year. They all mine on the English plan making large galleries, and leaving nearly one-third of the coal to support the roof. Accidents are rare at the mines.

The address of H. E. Sir James Longden, K.C.M.G., Governor of Ceylon, on the opening of the session of the Legislative Council, on the 15th September, commences thus gloomily:—"I regret that, in opening another Session, I am unable to congratulate you on an unchecked continuance of the prosperity which notably distinguished the five years ending with 1878. All countries are subject to such vicissitudes, and connected—intimately connected—as Ceylon is with Europe, through its extensive and valuable trade, it could hardly escape sharing in the great commercial depression which has affected not England alone but the whole commercial world during the last three or four years, and which is only now slowly passing away. It is not only from outside that the prosperity of the Island has suffered. Unfavourable weather, leaf disease, and other causes have diminished the produce of coffee in many of the coffee districts, and the new and thriving industries of cinchona and tea are hardly yet sufficiently advanced to compensate for the decrease in the coffee crop. At such a time, it is satisfactory to me to be able to announce that the distress among the native peasantry in the Eastern, Northern, and North-Central Provinces, which occupied much of our anxious attention last year, has passed away, and that, on my visits during the recess to those provinces, I found that food was fairly abundant and cheap."

The labours of the Government Cryptogamist are thus referred to in the address:—"The preliminary report made by the

scientific gentleman who was sent from England to carry on the investigations, set on foot by Mr. Morris, into the natural history of the coffee leaf disease, will be laid upon the table. It may fairly be hoped that the labours of Mr. Marshall Ward will result in a thorough knowledge of the manner in which the disease is propagated and communicated, and, as a consequence of this exact knowledge, a determination will be arrived at as to the best modes of extirpating the pest."

THE following on the Trade between India and Ceylon is taken from Mr. O'Connor's annual review for 1879-80 :—

Our trade with Ceylon has been described, in previous reviews, as mainly of an interportal kind, there being constant and extensive intercourse between the island and the southern ports of the Madras Presidency, whence thousands of Tamil labourers flock every year to the coffee plantations. The principal items of import, in a long list aggregating over 48½ lakhs in value, are coffee (3½ lakhs), cotton piece-goods of English manufacture (nearly 12½ lakhs), almost all coarse unbleached goods sent from Colombo to Tuticorin and other Madras ports, fresh and dried fruits and vegetables (about 8½ lakhs), betel-nuts (over 10 lakhs), gunny bags (2 lakhs).

The list of exports is even longer than that of imports, and the aggregate value (200 lakhs) very much greater. The principal items are animals (mostly cattle) (8½ lakhs) Indian piece-goods (11 lakhs), coloured handkerchiefs figuring rather conspicuously, these being a favourite article of attire with natives of Madras, grain and pulse as shown below :—

	R.
Rice	1,38,89,565
Pulse	2,84,158
Gram	2,55,460
Wheat	80 476
Other sorts	56,524

Also—oils (over 8½ lakhs), oil-cake (3½ lakhs), provisions (over 4½ lakhs), mostly flour, dried fruits, vegetables, and salted fish, spices and essential seed (nearly 5 lakhs), these seeds being used mainly as spices for curries, some tobacco and teakwood. The staple of the trade, it will be seen, is rice. Of this 151,558 tons were exported in 1879-80, the average quantity exported annually for the four previous years having been 181,749 tons.

THE manufacture of paper from the fibre of sugarcane is one of the methods of utilizing waste products which might well be started in India. The owners of plantations in the United States are endeavouring to arrange for the manufacture of the pressed cane into paper at the sugar factories, in order to avoid the cost of transporting the bulky raw material to distant paper mills. The cane required for one hogshead of sugar will produce a ton of fibre ; and the only difficulty in the way of efficiently bleaching it, so as to give a perfectly white paper, is expected not to prove insurmountable.

SURGEON MAJOR G. BIDIE, Superintendent, Government Central Museum, reported to the Madras Government, on the 27th September, that specimens of the destructive larvæ found in the sugarcane, and also specimens of the canes infested with the insects, both from South Arcot, had been sent by him to the Secretary of the Entomological Society, London. The latter writes under date, London 27th August.—The larvæ in the bottle are similar but specifically distinct from those received from Queensland and British Guiana ; but it is impossible to identify here by the larvæ alone as to the exact species. However, as to the cause and remedy, I have no doubt from my own experience at Penang, and from information from an extensive eastern planter lately at home, that the cultivators have the remedy in their own hands, and that it is simply the cleanliness of their plantations. It is in the refuse heaps of trash and other vegetable *débris* that these insects multiply, and if this was burnt and also the infested canes, the pests would show a very marked diminution indeed. Cocoanut palms in the Straits are infested with two beetles. My friend tells me that adjoining his estate are several smaller Chinese ones, where paddy husk, &c., is frequently allowed to accumulate, and then his own estate suffers by the arrival in due course of fresh swarms of these insect depredators. I am sure you will find that your native growers are a good deal to blame in this respect, and were I there, I have little doubt I could point out many choice breeding grounds which they have provided for their foes."

THE *Deccan Herald* in an article on "The Wheat Trade" writes as follows :—

We shall have this year throughout the wheat producing districts of India, a full *rabi* crop. A great deal more will be produced than will be required for Indian consumption. The large extent of acres under wheat is in consequence of the bad seasons in England. Indian cultivators have been induced to sow wheat in prospect of the demand which would be made for this season's crops. The demand in Great Britain, while it will be great, will not be remunerative for Indian wheat. The Indian carrying companies charge such high rates that it is impossible for Indian dealers to compete with the American in the British market. There is a general belief that the wheat crop of the United States for 1880 will be the heaviest ever harvested.

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There is a sure market for a certain amount of Indian wheat in Britain. It is in demand there for purposes for which American wheat does not so well answer. That quantity, however, is not so great as to be a sufficient encouragement for extending the wheat cultivation of India, or to make the trade a very profitable one for the producers of this country. What will be done with the large crops which this season will produce? Wheat will have to become a more general article of food for the people of India. It would be the best thing for the country if more wheat were consumed in it.

THE American shippers, with the proverbial cuteness of their nation, have discovered that it is less expensive, and therefore more profitable, to export flour than wheat. The bran takes up space, increases the weight, and to a certain extent detracts from the value of the cargo, though useful on the farm for pigs and so forth ; and it is roughly calculated to pay the miller's bill for grinding. The lesson should not be altogether lost upon Indian wheat exporters. At a few central points, mills might be constructed with a view to prevent the waste of room and money entailed by the carriage of bran over so many thousand miles. The refuse would be acceptable to the owners of cattle, while the poor beasts would revel like common-councilmen at a Lord Mayor's feast. If the Indian trade in wheat is to be maintained as a serious branch of commerce, small economies will have to be practised, and the expenditure kept as low as possible.

THE Shiraz correspondent of the *Times of India*, writing to that journal on the 4th October, says :—

Everything here remains quiet, and there is little to write about. About a year ago there was a rumour that the Persian Government contemplated the imposition of a duty of 30 per cent. on the export of opium, and, although nothing definite has transpired, I have reason to believe that the matter is still under consideration. Indeed, I believe we shall see such a duty imposed before very long. When this comes about, we may expect the culture of the poppy to be greatly extended. The yield is now about 6,500 chests annually.

The public health here is good and the weather pleasant, the nights being rather cold. We are in the midst of our wine-making season, and large quantities of grapes are daily arriving. Everyone here, whether he be a Mahomedan or a Jew, a European or an Armenian makes his own wine, and drinks it too.

The price of wheat has somewhat declined. The scarcity of rice no longer exists, good supplies of the new crop daily arriving.

WE take the following glowing account of the richness of the country in South-Western China from *La Province Chinoise du Yün-nan*, the new work by M. Emile Rocher of the Chinese, Imperial maritime customs. He is referring more particularly, to a visit made to Hsiu-hsing-chou :—

"The productions of the district are very important. Rice, wheat, beans, fruit of all kinds, oil seed, opium, indigo, &c., &c., are all cultivated on a large scale. Sugarcane is also believed in by the farmers, but is only grown in small quantity, and, as it requires nearly two years to come to anything, they do not pay particular attention to it. The nature of the soil is here so fruitful that, after the farmers have reaped their rice, a second crop of wheat, beans, or mustard is sure to be ready for harvesting by the end of the year. The inhabitants of the district are gentle in manner, active in their habits, hospitable and, above everything else, dealers."

Mr. Rocher's description of these people and their charming country will certainly strengthen the hands of those who are urging the British Government to open up direct intercourse with this rich province.

The *Times* lately published a compilation entitled "Our Progress in Ten Years," drawn up from a comparison of the returns of the Board of Trade for 1879-80 with those of ten years ago. There is but one branch of national wealth or industry that shows a decline and this is agriculture—the area under corn and green crops having fallen in ten years from 17,069,000 to 15,650,000 acres, a decline of 8 per cent. for the United Kingdom. This is, however, in some way compensated for by an increase in the number of cattle, *viz.*, 8 per cent in cows, 12 per cent in horses, 6 per cent. in pig,—the only set-off being a loss of 6 per cent. in sheep. "Finally," says the *Times*, "it is manifest that we have grown in prosperity much more than in population; and that every succeeding decade, in spite of an occasional crisis or reverse, sees Great Britain richer, wiser, and happier, thanks to the industry and *civic virtues* of her people."

MISCELLANEOUS ITEMS.

AMONG other works Messrs. W. H. Allen & Co. announce the following, which will interest many readers of the *Agriculturist*, *viz.*: "The Irrigation Works of India and their Financial Results," by Robert B. Buckley.

OUT of the numerous candidates, who have already appeared in the field for the agricultural scholarships offered to native students by the Government of Bengal, four names have been submitted to the local Government for selection by the committee, of which the Director of Public Instruction is a member.

A NEW class of cultivators is attracting the notice of the Lieutenant-Governor of Bengal. These are known locally as *Belati Grehusts*, and are Englishmen who have taken small grants from the zemindars of holdings in the Scopole jungles. They clear the forest and grow crops like native cultivators; each holding being about 200 beegahs. The Lieutenant-Governor has asked for further information.

A NEW industry has been introduced in connection with one of the Bombay cotton-mills. The National Spinning and Weaving Company of India have lately added a flour-mill branch to their business. The first cost of purchase of machinery &c., was about Rs. 1,700. The first quality of flour is supplied to some of the local mills for sizing cloth, and other qualities are sold at shops opened by the company in different parts of the city. The very first start has resulted in a profit; and the new industry promises to be very successful in the future.

THE Government of the N.-W. P. and Oudh have resolved upon making certain experiments with the steam-plough; and have instructed Mr. G E. List, Executive Engineer, to undertake them. Banda is the district, where the steam-plough will be used first. The land destroyed by the devouring *Kans* grass will be ploughed up and sown as an initial experiment.

AN American firm is said to have turned out a big plough. It is attached to a railway car, and can make one mile of excavation, 2 feet deep and 3 feet wide, every four hours, thus doing the work of about 1,000 men. The beam is of swamp oak, 8 inches by 14 inches. Its total weight is about 1,700lbs.

WHEN are we to look for the revival of cattle shows in South India? About twenty-three years ago public exhibitions of cattle and agricultural produce were regularly held in several districts of the Southern Presidency at an annual cost of from Rs. 13,000 to Rs. 35,000. The effects of the famine are surely over by this time.

AN Aurungabad correspondent states that, after the present crops of opium in Hyderabad territory have been collected, *no more* opium is to be grown in the Nizam's Dominions. The yield of opium has been large, and added to the revenue of the State.

THE Madras Government have sanctioned the payment to Mr. H. B. Grigg, of the honorarium of rupees one thousand for the compilation of the Manual of the Nilgiri District. The Board of Revenue in submitting their recommendation remarked that Mr. Grigg deserves their best thanks for the skill and judgment displayed in this compilation, on which evidently much careful labor has been bestowed. The chapters treating of Ethnology, Early History, the Revenue System, as well as the cultivation of the Tea, Coffee, and Chinchona industries specially deserve commendation. Government in endorsing the Board's encomium on the manner in which the work has been compiled, sanctioned the payment of the honorarium as well as a grant of twenty copies for Mr. Grigg's own use.

A RANGOON paper says that "steps are being taken by Mr. Routledge's agent in Bassein to obtain a site on the Thongzai river far a bamboo paper-making factory. The spot is said to be a good one to select, as bamboos can be floated down the Thongzai river nearly all the year round. They exist in millions, a few miles from the town, which is also on the line of railway, a convenience in the matter of transport."

INFORMATION has been received from Persia that the Persian Government owing to the fact that the harvest and crops are not generally sufficient to supply the internal requirements of the country, has considered it advisable to continue the prohibition imposed in January last, on the export of grain and provisions from all parts of the kingdom. This interdict extends alike to all the provinces, and applies to all grain, whether purchased and stored for the exporation previous to the issue of the notice or not.

THE Traffic Superintendent of the N. B. S. Railway, in his report for the month of August, draws attention to the large decrease (10,454 maunds) in the weight of jute carried during the month, as compared with the same month last year. Mr. Drury says: "When the immense quantity of jute produced this year throughout this part of the country, as compared with last, is borne in mind, the decrease assumes rather a serious aspect, as tending to show that the increased rate has had the effect of driving the traffic from the line. The falling off, in round figures, is 36 per cent., whereas double the weight lifted last year might reasonably (with the larger crop) have been looked for."

THE *Bangalore Spectator* writes:—Now is the time for the wet weather crop, and many a thiglur is busy sowing his plot of ground with potatoes. About Davenahully and Chota Ballapoor the potato is cultivated very extensively, and landholders find it a very paying article of produce. The price of this vegetable varies at present from 8 annas to 1 rupee per maund of eight viss. Seed potato is plentiful and good; it is curious, however, to remark that the natives prefer just now to sow the Poona kind, and several hundred maunds were lately imported for this purpose.

THE "potato bug" is not such a scare in America now, since a lucky farmer discovered by chance that the insect can be made to yield a valuable red dye. Who knows but the farmers will yet go raising potato bugs for the market.

THE monthly report of the United States Agricultural Department estimates the cotton crop as a 91 per cent. crop; this is 6 per cent. better than last year. The corn crop is also estimated at 91 per cent., being 4 per cent. below last year's estimate. These estimates are based on the appearance of the crop in the early part of September.

THE recent rains in Alabama U. S. have, it it said, done much damage to the cotton crops. The worm has commenced to eat the cotton, and likewise the rust is injuring it.

IN the cotton States of America, the cotton seed is all carefully made into oil, the quantity used being 410,000 tons annually, and the produce of each ton is 35 gallons of oil and 750lbs. of cake of admirable fattening qualities. Hence the total production will be over 14 millions of gallons of oil, and 137,000 tons of oilcake for cattle feeding.

SOME splendid specimens of fibre from the banana plant were exhibited at New Orleans recently. It is said that the yield of

one acre from this plant is 10,340lbs. of fibre, the value of which, added to the price of the fruit, makes it one of the most profitable agricultural speculations.

THE American papers have been full of descriptions of the largest farm on the Western continent, the famous Dalrymple Farm. This farm contains no less than 36,000 acres of arable lands, of which 24,000 acres are under wheat and 12,000 acres under oats. To harvest this crop 125 reaping machines were used, worked by 375 horses and mules. The wheat produce of this huge farm is calculated for this year at 432,000 bushels, about 900 American cart loads. That is to say, the farm would need 45 trains of 20 cars each to carry off its wheat crop.

A SUMMARY of Agricultural returns for Great Britain for 1880, shows that the number of acres under wheat in the present year is 2,909,148, or an increase of 18,904 over 1879. The number of acres under barley is 2,467,831, a falling off of 199,345 as compared with last year. The number of acres under oats is 2,796,905, an increase of 140,277. The number of acres under potatoes is 550,931 against 541,344 last year, or an increase of 9,587. The number of acres planted with hops was 66,737, or a decrease of 934. The return of live stock shows that the cattle in the United Kingdom in the present year is 5,912,046, against 5,856,356 last year, or an increase of 55,690. The number of sheep and lambs is 26,621,724, or a falling off of 1,535,356 compared with 1879. The number of pigs is 2,000,722, being 90,837 fewer than last year.

OFFICIAL PAPERS.

THE TASAR AND OTHER WILD SILKS OF INDIA.

GOVERNMENT OF MADRAS.
9th August 1880, No. 944.

FROM J. Shortt, Esq., M.D., Deputy Surgeon-General, Madras Army, (Retired), to R. Davidson, Esq., C.S.I., Chief Secretary to Government, Fort St. George, dated Yercaud, 6th January 1880.

WITH reference to G. O., dated 26th March 1879, No. 729, and the order thereon, wherein I have been requested to furnish such information as I can give on the subject of Tasar and other wild silks of India, I have the honor, in the first place, to reply to the question put by M. David of St. Etienne to Mr. Wardle in the Proceedings alluded to above.

Question, No. 1.—What is the chemical agent made use of by the natives to soften the cocoon and make it ready for reeling?

Answer—(*a.*)—The agent used by natives generally to dissolve the gum of the cocoons is wood-ashes, in a saturated solution of which the cocoons are boiled from twenty to thirty minutes, when they become softened and the thread loosened and fit to be reeled off.

(*b.*)—I have used a weak solution of diluted sulphuric acid to the water in which the cocoons were boiled with the same object successfully.

(*c.*)—A friend interested in the subject has reeled off some beautiful silk simply by throwing the cocoons into boiling water and leaving the pan on a charcoal fire to keep it hot, for some time stirring them about in the pan to allow of the gummy secretion being dissolved, after which the end of the thread is picked up either from the top of the cocoon or the end attached to the tree or twig, and some five or six are placed together and the fibres reeled off into a single strand, in the same manner as is done with silk from the *Bombyx mori*. The silk comes off quite clear, leaving a thin shell or parchment that formed the inner coating of the cocoon.

Question, No. 2.—Can the natives reel a cocoon more than a year old?

Answer.—They reel off silk from cocoons of any age without difficulty, not only from the perfect ones, but the old perforated ones from which the moth has escaped are used also, the silk being reeled off in short lengths about a foot or a little more, and ... utilized in various ways.

Question, No. 3.—What is the length of time elapsing from the making of the cocoon and the time of the coming out of the moth; does not the time vary greatly?

Answer.—Yes. I have given it as nine months (*vide* Proceedings, Board of Revenue, dated 31st July 1871, No. 3188). Subsequent observation leads me to believe that the time varies greatly dependent on the climate, season, and state of health of the worm at the time it commences to spin the cocoon. Further observation is needed on this point. I have actually had cocoons in my possession for six months ere the moth perfected; the previous age of the cocoons before they came into my possession was not known.

Question, No. 4.—The cocoons in the bales are mixed in color, dark and light; are these different varieties, and are they found in the same spots?

Answer.—The cocoons are generally of two colors—dark and light. I believe this depends in a great measure on the food they consume, or rather on the particular tree on which they are found feeding; although growing in the same spot, occasionally I have found the two colors on the same tree. I do not believe the color is owing to varieties, but simply dependent on the food.

Owing to my retirement from the service and other circumstances connected therewith, I was unable to do anything in the continuation of my experiments with the Tasar silkworm cocoons in which I have always been interested. I did not altogether lose sight of the subject, and I have been trying to find out if they are to be found on these hills. All my efforts hitherto have been unsuccessful. I secured two female moths of the *Saturnia attas*, but could not find any cocoons either of this moth or that of the *Phalæna papia*, although I offered to give as much as one anna for each cocoon to the Mulialhies if they will search for them. When at Madras I was always able to secure any number of cocoons at three pies each. I have been anxious to procure cocoons with the view of establishing them up here, and to carry out some experiments that I have had in view for a long time; but the few friends I have written to at Madras were unable to procure me any more, especially as they are scattered about the suburbs of Madras, and frequently after a whole day's search a coolie may not secure more than one or two perhaps; here lies the difficulty, and it is this that makes the collection expensive.

If expense is no object, a large number of cocoons can always be collected about Madras and its suburbs.

I have now a species of moth from Malabar, the chrysalis of which is loosely enveloped, imperfectly often, with a covering of silk; specimens of this silk I have now the pleasure to submit for inspection, and am of opinion that these might be improved materially by domestication or crossing with other species. I have sent specimens of the moth to England for identification, and hoping to receive the same in time, I have hitherto delayed submitting this report to Government.

I should much like to carry out some experiments here with the *Phalæna paphia* and other species of moths, but I have not the means to do so, and experiments are always expensive.

I should have to go down to Madras myself to secure the cocoons for introduction up here, and to carry out the practice in vogue in Orissa, a full account of which I have given in the Proceedings of the Board of Revenue, dated 31st July 1871, No. 3188, already alluded to above, and to which I would beg to refer for particulars which I have given in detail.

When cocoons of the Tasar silk moth are collected, if intended for obtaining the silk, they should be killed at once by steaming, otherwise, as the age of these wild cocoons is not known, they will become damaged by the moths perforating the cocoons and escaping. The male and female cocoons can be readily recognised by their size, as those of the male are small, and those of the female large.

FROM Surgeon-Major G. Bidie, M.B., Superintendent, Government Central Museum, to C. G. Master, Esq., Secretary to Government, Revenue Department, dated Madras, 16th January 1880, No. 7.

In reply to G. O. No. 729, of 26th March 1879, requesting information regarding silkworms, I have the honor to report to his Grace the Governor in Council that there is but little practical information regarding these available in Madras, as the Tasar cocoons are not an article of traffic, nor the silk a product of the looms of Southern India. I arrange the available information under the heads specified by the Government of India.

2. *Enumeration of the different kinds of silkworms.*—There are, so far as is known here, but three species of silkworms found in the Madras Presidency, *viz.*:—

Antherea paphia (Linn.), the common Tasar silk insect.
Actias selene (Macleay).
Cricula sp. (Walker) apparently *C. trifenestra* (Helfer), but as the specimens are in bad order, it is difficult to be certain.

3. *District from which each kind is obtained, and in what quantities.*—*Antherea paphia* is common all over Southern India, but nowhere so abundant as to induce the natives to collect it or to render its collection remunerative. There are two distinct varieties of cocoons produced by this insect, *viz.*, one of moderate size and light color, and the other much larger, darker, thicker, and containing more gummy matter. At one time there was a doubt as to whether these two varieties might not be the produce of different species, but having recently examined the moths of the larger variety, I am able to say that these big cocoons also pertain to *Antherea paphia*; the only peculiarity as regards the insect being that the moth is of unusual size. There is also some ground to believe that the size and color of the cocoon is to a certain extent dependent on the nature of the food consumed by the worm; those fed on the *Zizyphus jujuba* apparently producing the biggest cocoons.

Actias selene.—This insect is sparsely diffused over Southern India wherever the tree on which it feeds (*Odina wodier*) is found. The cocoons, although of good color, are thin, difficult to reel, and of little value. They are nowhere abundant enough to be of any commercial importance.

Cricula sp.—This insect is limited in its range, being confined to Coorg and Wynaad, where it lives generally on *Careya arborea*, but sometimes on the mango which it strips completely of its foliage. It is gregarious in its habit, literally covering the trees on which it lives, and constructing its cocoons in large clusters firmly interwoven by connecting threads, and thatched externally with a number of the leaves, not detached from the tree, but simply bent down and fastened firmly to the external cocoons of

the cluster. The cocoons are of a bright golden yellow, reticulated and rather thin in their structure. If the silk could be reeled, it would be very pretty, and large quantities of the cocoons could be collected in Wynaad, should they prove of any commercial value.

4. *The species of worm from which each kind of silk is manufactured.*—So far as known to me silk is not made from wild worms in Southern India, except to a limited extent in the country of his Highness the Nizam of Hyderabad. The silk manufactured there is the produce of the ordinary Tasar insect.

5. *The trees on which the worms feed.*—The Tasar worm, *Antheræa paphia*, feeds by preference on *Zizyphus jujuba*, but is also found on *Terminalia catappa*, other species of *Terminalia*, *Casuarina muricata*, and *Wendlandia notoniana*. The *Actias selene* feeds exclusively, so far as I know, on *Odina wodier*. The haunt of the *Cricula* is *Careya arborea*, but it also lives on the mango trees.

6. *The uses to which the silk is put by the natives.*—The hill-men in Ganjam cut the cocoons into thin thongs, which they use for lashing the long barrels of their matchlocks to the stocks. It has lately been suggested that ligature thread for surgical purposes might be made from the Tasar cocoons, and some of it was tried in the General Hospital, Madras, and found useful, although less strong than that of ordinary silk.

7. *Markets where the cocoons can be purchased.*—The cocoons, as already stated, are not collected or sold in Southern India. To the remaining queries, Nos. 7, 8, and 9, I am not in a position to give any reply.

8. As regards the information required by M. David of St. Etienne, I regret to say that very little is known here, from the obvious reason that silk is not made from Tasar cocoons in Southern India. As remarked in paragraph 3, the dark and light-colored cocoons found about Madras are both the produce of *Antheræa paphia*. The difference in the size and color of the cocoons seem to depend to some extent on the nature and quantity of the food consumed by the larva.

9. I enclose a small cluster of the cocoons of the *Cricula*, the gregarious insect, divested of the leafy covering.

SELECTIONS.

MR. SIMMONDS ON FIBRES.

FROM a very interesting paper by P. L. Simmonds, author of "The Tropical Agriculturist," we have extracted the following on fibres, as being of interest to many of our readers :—

"Coir is one of the best materials for cables, on account of its lightness, elasticity, and strength. It is durable and little affected when wetted with salt water. Numerous instances have been related of ships furnished with this light, buoyant, and elastic material riding out a storm in security, while the stronger made though less elastic ropes of other vessels have snapped in two. Indeed until chain cables were so largely introduced, most of the ships navigating the Indian seas were furnished with coir cable. Of coir, and coir rope, about nine or ten million pounds are annually shipped from India. Much is prepared in Ceylon, but Cochin is noted as the port of shipment for the best quality of yarn, and many thousand cwt. are annually exported from there. In 1870, we imported from the East 168,544, cwts. of cable yarn of coir valued at 177,956*l*., 11,107, cwt. of coir cordage, valued at 13,547*l*., and 1,105, cwt. of coir fibre, value 24.347*l*. Probably the last named was intended for making matting and brush fibre, &c. Two hundred and eighty-four cwt. of ropes, twine, and strands were also imported in 1870, valued at 455*l*. The produce of fibre from the husk of one nut sometimes reaches 20 lbs. in weight.

AGAVE FIBRE.—Under the name of Mexican grass, we imported into the United Kingdom about 19,000 cwt. of Agave fibre, cut short and cleanly prepared, which is used as a substitute for bristles in cheap nail and other brushes. It is locally called Slye, and is very extensively produced in the Isthmus of Tehuantepec, and the higher lands of Mexico. One man can prepare about 4 or 5lbs. of fibre per day.

Under the general names of pita, the *Brometia Karatas* is extensively grown in Mexico. With proper care in cutting the leaves in due season, the fibre would be found not merely equal; but much superior to hemp, while from the natural whiteness of its colour, it would admit of being manufactured into the finest goods without undergoing the destructive process of bleaching.

The fibre of *Agava Americans* is used for many purposes and is of great strength.

Under the name of Sisal hemp, a large trade is now carried on from Yucatan to the United States in the prepared fibre of the leaf of *Agava sisilana*, which is used in rope-making, and, when well made, it fetches nearly as high a price in the market as Manila hemp. Several thousands of tons are imported into the States annually. An acre of plants will yield more than a ton of fibre at the end of four or five years. This plant has been introduced into Jamaica and propagated in the Botanic gardens there, and 8,000 or 10,000 plants distributed over the island. The Americans are also growing it at Key West and the adjacent islands.

In Yucatan they get out this hemp by the simple and primitive manner of beating the leaf on a block with a club or mallet, and afterwards scraping it on a bench or a smooth log or pole, with one end on the ground and the other breast high. They employ a narrow piece of board with a triangular notch in the end, which is brought to an edge, and held nearly perpendicular when used. The leaf is laid on the pole, held with one hand, and scraped with the other. In order to get rid of the gum more readily, the beaten leaves are generally soaked either in water or in mud till they ferment, but from the nature of the gum, even a small amount of fermentation stains and weakens the fibres, although it materially facilitates the cleaning of them. Such is the difference in the value of these fibres got out by the two processes of fermenting the leaves before scraping, and that of beating and scraping the leaves at once before fermentation takes place, that in the London market Sisal hemp is worth but 12*l*. per ton, when the fibres have been soaked in water or mud ; yet the same fibres are worth 50*l*. per ton when got out before fermenting by the aid of pure water alone. It would seem that this difference in the price of the fibre will warrant a good deal of labour and expensive machinery to get out the article in the better state.

ALOE FIBRE.—In Russia aloe fibre fetches about '4*d*. or 5*d*. a pound. One manufacturer turns out about 20,000 lbs. monthly, almost all of which is exported to France, where it is used for making hats, paper, cordage, stair coverings, matting, &c. The process of fabrication is simple and inexpensive ; the machinery consists of an engine of 4-horse power, moving a pair of cylinders on a system of beaters or stampers. Close at hand are the reservoirs made of metal or masonry, which are used for washing or soaking. The leaf, cut green, is passed between the cylinders or under the stampers, by which means it is crushed without destroying the fibre ; it is then left to soak for six or eight hours, at the end of which time the separation of the various elements has taken place. Thirty leaves of aloe, two yards long each, yield on an average 2lbs. of fibre. It is packed at St. Denis in banks and pressed in sacks, about 1,2?9 lbs going to the ton measurement.

USEFUL FIBRES.—Most of our tropical colonies abound with valuable textile plants, some of which are considered troublesome weeds. Those of a ligneous nature will annually produce two crops of shoots, from which good fibre may be obtained, requiring no machinery whatever in preparing it for the market. The most easy and simple plan is to macerate the shoots until the cuticle or outer bark disadheres freely from the epidermis or true bark, when the latter will separate readily from the ligneous part, and requires but little labour or knowledge to wash, dry, and pack the fibre for market.

For the plantain, pinguin, and all similar herbaceous plants, machinery is absolutely necessary to separate and clean the fibre advantageously.

Many of the Hibiscus family yield strong and useful fibre. In India and in the Southern States of America, attempts have been made to utilize the fibre of the common ochro (*Hibiscus esculentus*). About three tons of this hemp can the raised on a single acre.

In India many of the malvaceous plants are extensively cultivated and highly esteemed for their fibre. The bark of *Hibiscus cannabinus* in Coromandel abounds in strong and tolerably soft fibres, which are employed as a substitute for hemp, and are made into a coarse sack cloth. In the North-West Provinces of India, it is very generally cultivated for cordage, and for domestic and agricultural purposes, but its fibre is more remarkable for fineness than for strength, and would be of use in our manufactories in making mixed fabrics.

Several species of the grass tribe (*Saccharum*) are employed for making ropes on the river Ganges or the Indus. For these purposes these fibres are well fitted, being light, tenacious, and capable of bearing without injury alternate exposure, to wet and dry.

Gomuti or *ejoo* fibre (*Arenga saccharifera*) is considered superior in the East to all others yet made use of for the manufacture of artificial tresses, imitation horse hair for stuffing and such like purposes.

The roots of *Butea frondosa* and *superba* are made into strong rope in India. *Saguerus Iumphii* ? yields a fibrous web very fit for cables and long cordage. From the leaves of the oil palm (*Elais guineenses*) and wine palm, the natives make excellent line and rope in West Africa, indeed it is from this that they produce all their fishing lines and nets. In the Cape Colony various species of *Restio*, known under the common name of rope grass, are in frequent use for cordage. The fibre and rope made from the wild rhea (*Urtica*) or nettle species, are among the strongest known, but it is too dear to come into the markets as a rope-making material. In testing it in a rope manufactory its strength per square inch was found to be 844 ; 894 ; and when made with the fibre 90?.

The average strength of rope made with the best hemp was determined after many experiments, carried on between the years 1803 and 1808, to be 805.

The Moorgha or Marool (*Sanseveira Zeylanica*) fibre is remarkable for its whiteness. A line four feet long, made of this fibre, according to Roxburgh, bore a weight of 120lbs. when a cord of the same size made of Russian hemp bore only 105lbs.

JUTE.—The well-known jute of commerce now occupies a most important position amongst the supplies of textile materials furnished to this country, our receipts being 200,000 tons. There are two species which afford the fibre, *viz*., *Corchorus capsularis* and *C. olitorius*. It is very largely cultivated throughout the Bengal Presidency, and is much used for bags, and for baling or packing cottons, which weigh each about 2lbs. ; and is also shipped in pieces about 30 yards, called gunnies, which weigh on an average 6lbs.

IMPROVEMENT IN NATIVE WELLS.

An improvement in the method employed, nearly universally, by the natives of this country, for raising water from wells for irrigation and other purposes, has been proposed lately, and is worth the attention of all those who are interested in improving the agricultural system of the country. It is intended to supersede the present plan of raising a *charsah* of water by means of two bullocks descending an inclined plane, and is carried out in the following manner. Alongside of the well a rough drum, constructed of wood, is erected so as to revolve on a stout, upright, wooden post. A light beam is attached to another and similar drum on the same post, below the first; and to the end of this beam is affixed the yoke for one or two bullocks or a buffalo. The two drums can be attached to one another, so that they both revolve together; or they can be detached from each other, in which case the upper drum can be turned independently. This is accomplished by means of an easily arranged trigger, worked by hand by the man who drives the bullocks. The *charsah* must be of the kind common in many parts of India, having a leathern spout, or neck, attached to a second rope besides the one which raises the *charsah*—so arranged as to discharge the water when the *charsah* has reached the proper height. Both ropes for raising and discharging are brought over their respective rollers, and passed round the drums, so that when the buffalo causes the latter to revolve, the *charsah* is raised and discharged, the buffalo being of course stopped at the proper point. As soon as the discharge is effected, the driver disconnects the upper drum from the lower when the *charsah* has sufficient weight to turn the upper drum backwards and unwind the rope until it reaches the surface of the water and becomes refilled of itself. The driver then again links the two drums together and repeats the operation. If it should be found that the two ropes are apt to get twisted together, this can be obviated by having one of them made up with a right hand, while the other has left hand twist. The advantages claimed for the new method are (1) a considerable saving of first cost in erecting the drum, &c., as compared with excavating the bullock run; (2) a very great economy of bullock power, because the animals are frequently resting and may feed while not actually *raising* water, whereas in the present method they have to re-ascend the inclined plane—which is often managed by the slow and toilsome process of walking backwards—in order to refill the *charsah*; (3) the labour of the driver is also greatly economised as he need never move at all or very seldom. Experience will be required to decide on the proper diameter of the drum, and of the bullock path, in order to give the best results according as only one bullock, or a pair of bullocks, or a buffalo, may be used. Doubtless also, some patience will be necessary in order to overcome the prejudices of natives of India against anything new, combined with the objections, too common among working classes throughout the world, to the introduction of mechanical means for diminishing labour, and throwing men and bullocks out of employ. The proposal is due, we believe, to Major G. Steel, B.S.C., of the Survey Department, and has been already practically tested by his brother Mr. H. W. Steel, C.S., Deputy Commissioner at Ferozepore, where the necessary apparatus was put up at a cost of about Rs. 40. As regards the economy of labour, it it estimated that one man and one buffalo can do the work of three men and three bullocks on the old method.—*Pioneer*.

HORSE AND MULE BREEDING IN INDIA.

The *Resumé* of Horse and Mule Breeding Operations in India, 1880, has recently been issued, and a copy has been sent to us by the General Superintendent. The subject is one of great importance to the Government, as bearing on the question of remounts, and of the supply of transport animals to the army. Recent operations in Afghanistan have shewn clearly the superiority of the pony and mule as baggage-carriers, as compared with the unwieldy and less hardy camel. We have ourselves done our best to bring this important subject prominently forward. We are pleased to observe, in perusing the memorandum under notice, that mule breeding occupies a prominent place in the operations of the department. The memorandum is largely filled with details of a technical kind, but we cannot help observing the thoroughness of all the arrangements, and the close attention bestowed on those prejudices of the natives most likely to interfere with the working out of the end in view. Liberal concessions are made in regard to rules at exhibitions, and every encouragement is offered to the private breeder to undertake this work as a profitable industry. Instead of the old system of stud breeding, with its costly details, the selected sires are to be distributed over 130 stations in the North-Western Provinces, Rajpootana, the Punjab, and Bombay, and only the owners of properly examined and passed mares will be permitted to share in the undoubted advantages of this new system. In connection with mules, it is pointed out that they are reared at very small cost, and that the value of the animal, as shown by the price Government has paid, is steadily rising. The average price given for mules at Rawul Pindee Fair, was as follows:—

1876-77	...	...	... Rs.	131	12	6
1877-78	...	...	... „	129	0	0
1878-79	...	...	... „	159	0	0
1879-80	...	...	... „	191	14	0

At these prices, the breeder must necessarily make a large profit, as the rearing costs practically nothing, and does not in any way interfere with the ordinary occupations of a farmer.—*I. D. News.*

A RAILWAY TO GODRA: NEW RESOURCES.

Our readers are perhaps not aware that in the eastern talukas of the Panch Mahals, that is in Dohad and Malod, many products are cultivated in which a large and increasing business is transacted in Bombay. The land is among the richest in the presidency, producing regularly two crops a year under what is by no means a skilful system of cultivation. Wheat, oil seeds, and linseed are extensively grown. The wheat is not at present a grain of a food class, and it is often grown intermixed with gram, and from very carelessly assorted seed. But we believe that if a little attention were paid to the matter, there is no reason why wheat should not be produced quite equal in quality to any from the Central or North-Western Provinces. And mercantile men in Bombay are well aware how valuable such a grain would be as an article of export to Europe. Though the mass of the cultivators in this part of the Panch Mahals are rude and ignorant men, there are many large landholders of the highest castes who are quite alive to the importance of growing produce for foreign markets, and are able and willing to carry out any scheme which would hold out a fair promise of success towards that end. Most of the wheat which is grown in Dohad and Malod is now, we believe, exported towards Malwa, but the construction of the railway to Godra will, in all probability, cause much of it to change its direction towards Guzerat, and the cheapening of transit will cause it to become a remunerative article of export from Bombay if only the quality is improved. Much of the oil seed grown in those parts is already sent to Guzerat. Linseed is at present not extensively grown, but may be increased indefinitely. Why should not advances be made through the *Desais* and large landholders, if necessary, to the ryots for the production of a particular article, in the same way as advances are made almost every year to the cotton-growers of Broach? Dohad and Malod will be much nearer to the port of export, not merely in actual distance, but in respect of cost of carriage, than the districts of Northern India are, and can, of course, compete favourably with the latter, if only a little energy is shown in improving the article produced. What can be done in this way has been over and over again proved. We need refer only to Mr. Ashburner's energetic and successful advocacy of the improved type of cotton in Khandeish, which resulted in the complete and (in that district) universal displacement, in favour of it, of the old varieties. The ryots are ready enough to see where their own interests lie, and to adopt reasonable suggestions for furthering them. There are other important products, such especially as tobacco, which we need not enumerate here, for we have already said enough to show the commercial importance of extending the Anand branch of the B. B. and C. I. Railway to Godra, with as little delay as possible. The State trial now in progress will bring the town of Godra prominently before the public, and might we think, serve as a happy reason for attracting the attention of Government to the delay that has occurred in the construction of a line that has, we believe, been virtually sanctioned already.—*Times of India.*

AGRI-HORTICULTURAL GARDENS AT LAHORE.

The Punjab Agri-Horticultural Society's gardens at Lahore did much useful work during 1879-80, in the same direction as the Saharanpore and Lucknow gardens. The results reported in the experimental cultivation of the carob, the *prosopis*, the rain tree, *sorghum euchœna luxurians* (teosinte) generally corroborate those obtained in the N.-W. P. gardens, from the climate of which that of Lahore does not differ so materially as does that of Calcutta. In arboriculture certain species of *eucalyptus*, notably the *saligna* or *resinifera*, have done well. The *E. rostrata*, which has proved so successful at Lucknow does not seem to have been tried at Lahore. The much vaunted *E. globulus* has proved, as elsewhere, a complete failure. The carobs have seeded; but the Superintendent appears surprised that all the seeds are not the same size. He recommends the seeds being sown singly in very small pots, after being soaked till swollen, and showing signs of germination. This plan might obviate the disappointment often experienced in the germination of this hard seed. The *prosopis*, or mesquit bean, has, as elsewhere, "a straggling appearance." In Cawnpore it is found to be more like a bramble than a tree; and Mr. Wright, in a recent circular, recommended its being grown in old brick kilns, the sides of which it would cover with a dense growth of a useful fodder plant. The *Pithecolobium saman*, or "rain-tree," has so far succeeded, contrary to the experience of Lucknow and Cawnpore, where frost has proved fatal to it Experimental sowings of *sorgho* have proved it to be of no value as a cold weather crop; but as it has been grown successfully since 1876 when sown in May, the experiment of sowing it later seems of little value. As a grain crop it is not a success, and it does not therefore find favour with the ordinary cultivator, who likes more than one string to his bow, and in his *jowar* gets both grain and fodder. The saccharine properties of *sorgho* have not, however, been as yet fully utilized; it is pressed, in large quantities, in America, for sugar, with most successful results. The *moong phalli*, or pea-nut, was grown only with the result of proving that it will not succeed as a cold weather crop, and the remarks made on the experimental cultivation of *sorgho* are equally applicable here. The prickly comfrey is a distinct failure. The *Reana luxurians* has only been successful where grown with garden cultivation. The remarks of the Superintendent, Botanical Gardens, Singapore, are very much to the point:—"This grass, though useful, does not bear out its reputation in the Straits. Large quantiti[illegible]

of seed have been distributed, but all accounts state it pays far better to grow maize, as the same ground that will grow teosinte will produce excellent maize." This is also the experience of these provinces; at the same time the *Reana* is a far superior *fodder* plant to the ordinary *zea mays*, the stalks of which cattle will rarely eat, and which are constantly wasted or only used as fuel. The distributing work of the Lahore gardens was most successful. Large quantities of ornamental and useful plants and seeds (imported and acclimatised) were distributed throughout the province, and experiments in the introduction of new varieties of vegetables, trees, and flowers were successfully carried out. All that is wanted to put the Lahore gardens on a high footing, is the employment of a scientifically trained Superintendent. The available funds do not, however, at present allow of this extravagance, and Government appears disinclined to increase its annual grant. In spite of all difficulties, however, the Agri-Horticultural Society of Lahore deserves congratulation on the success obtained.—*Pioneer.*

RESIN AND TURPENTINE.

THE following account of the mode of production of resin and turpentine on the south-eastern coast of the United States is taken from an American paper :—"From Wilmington, N.C., southward, and nearly all the way to Florida, the pitch pine trees, with their blazed sides, attract the attention of the traveller. The lands for long stretches are almost worthless, and the only industry, beyond small patches for corn or cotton, is the 'boxing' of the pitch pine trees for the gum, as it is called, and the manufacture of turpentine and resin. There are several kinds of pine trees, including the white, spruce, yellow Roumany, and pitch pine. The latter is the only valuable one for boxing, and differs a little from the yellow pine, with which it is sometimes confounded in the north. The owners of these pine lands generally lease the 'privilege' for the business, and receive about 125 dols. for a 'crop,' which consists of 10,000 'boxes.' The boxes are cavities cut into the tree near the ground in such a way as to hold about a quart, and from one to four boxes are cut in each tree, the number depending upon its size. One man can attend to and gather the crop of 10,000 boxes during the season, which lasts from March to September. About three quarts of pitch or gum is the average production of each box, but to secure this amount, the bark of the tree above the box must be hacked away a little every fortnight. Doing this so often, and for successive seasons, removes the bark as high as can be easily reached, while the quality of the gum constantly decreases, in that it yields less spirit, as the turpentine is called, and then the trees are abandoned. The gum is scraped out of the boxes with a sort of wooden spoon, and at the close of the season, after the pitch on the exposed surface of the tree has become hard, it is removed by scraping, and is only good for resin as it produces no spirit. The gum sells for 1·50 dollars a barrel to the distillers. From 16 barrels of the crude gum, which is about the average capacity of the stills, 80 gallons of turpentine and 10 barrels of resin are made. The resin sells for from 1·40 dols. to 5 dols. per barrel, according to quality, and about pays for cost of gum and distilling, leaving the spirit, which sells for 40 cents. a gallon, as the profit of the business. Immense quantities of resin await shipment at the stations along the line, and the pleasant odour enters the car windows as we are whirled along. After the trees are unfit for further boxing, and are not suitable for lumber, they are sometimes used to manufacture tar, but the business is not very profitable, and is only done by large companies, who can thus use their surplus labour. The trees are cut up into wood, which is piled in a hole in the ground and covered with earth, and then burned the same as charcoal is burned elsewhere. The heat sweats out the gum, which, uniting with the smoke, runs off through a spout provided for the purpose. A cord of wood will make two barrels of tar, which sells for 1·50 dols. per barrel, and costs 37½ cents. to make. The charcoal is then sold for cooking purposes."

A NEW VEGETABLE FROM CHINA.

SOME experiments recently carried on by two or three Austrian and German horticulturists have brought into notice an almost forgotten plant, which was introduced into Europe from China nearly thirty years ago, but whose existence and whose products have been undeservedly lost sight of. This is the *Soja hispida*, a species of leguminous plant, somewhat resembling in habit and appearance the well-known pea. Unlike the latter, however, it has two distinct uses—industrial as well as alimentary. It is highly prized in China and Japan, and is said, indeed, to take its scientific title from the Japanese name of a sauce (sooja) which is made from its seeds. The seeds are very similar to a 'marrowfat' pea, but contain a large quantity of oil, which is either pressed out of them or boiled out in the process of cooking the seeds for the table, which is effected by simply throwing them into boiling water, when the outer skin bursts and floats to the surface, together with a quantity of oil, both the oil and the husks being skimmed off together. These may be either used as cattle food, or the oil may be separated and employed for various purposes, while the husks are still valuable as feeding stuff or as a manure. The peas are boiled for about twenty minutes, and furnish a dish which is highly relished, not only by the Celestials, but by many Europeans who have tasted it. It is said to resemble in flavour the green pea, but lacks its sweet taste. The boiled 'soja' is also prepared as a cake, and as a sauce, being fermented for the latter purpose, and salt, pepper, &c., being added. The sauce has a high reputation among the Chinese and Japanese, not only as a condiment, but as a medical agent. Chemical analysis of the seeds show them to be very rich in proteine. The oil is available for many uses—for burning in lamps or even as a substitute for olive oil. Being somewhat of a siccative nature, it is not adopted as a lubricant, but it is for that reason useful as a substitute of linseed oil in the manufacture of paints and in other similar industrial arts. Finally, to complete the list of virtues of this Celestial pea, the haulm forms an excellent fodder for cattle and horses. The plant seems well adapted for cultivation in many parts of Europe, and would probaby do well in the warmer districts of England and Ireland. It remains to be seen whether the agricultural success of the German experimentalists will result in its general acceptance in Europe. We must, perhaps, accept the foregoing statement from the *British Mail* with some reservation, and shall look with much interest for the advent of this interesting stranger.

THE CEREAL HARVEST OF THE WORLD IN 1880.

THE annual volume on the crops of the various corn-growing countries of the world has just been issued by Mons. Bruy Estienne, of Marseilles, and the reports it contains occupy several hundred large quarto pages. A map showing in various colours the state of the wheat crop in the different departments of France is also given. Of the whole of the cereal crops of France the reports are good. The wheat crop is in five departments very good, in 17 departments good, in 26 departments fairly good (*assez bonne*), in 16 departments medium, and in six departments, only bad. Oats are very good in 28 departments, good in 40 departments, fairly good in seven departments, medium in six departments, bad in two departments, and very bad in one department. The maize crop, grown chiefly in the southern departments, is fairly good. In three departments it is very good, in 19 good, in five fairly good, in five medium, and in one only bad. Rye is reported as very good in 11 departments, good in 53 departments, fairly good in six departments, and medium in three departments. Barley is the best crop of the year in France. In 26 departments it is very good, in 40 good, in five fairly good, and in three medium. In no department is either the rye or barley crop declared to be bad. So far as other countries are concerned, with the exception only of Russia, the reports are generally favourable. In Upper Italy the crops are reported as yielding 30 per cent. above the average. Roumelia and Upper and Lower Bavaria stand next on the list with a produce of 25 per cent. over average, and these are followed by Podolia and Swabia with an over average production of 20 per cent. In the south of Italy and Bavaria, and in Wurtemburg the estimates of crops are 15 per cent. over average; while in Bessarabia they are 10 per cent. over. The crops of the year are 5 per cent. over average in Hungary, Poland, Belgium, and the United States of America. Average crops, without either surplus or deficit, have been grown in Prussia, the Palatinate, Baden, Switzerland, Denmark, Sweden, Norway, Central Italy, Holland, the North of Russia, Servia, and Egypt. Deficiencies of 5 per cent. are reported in Great Britain, Ireland, and Saxony. In Courland the deficiency is put down at 20 per cent., and in Gothland another Russian province, at 25 per cent. under average. In Central Russia the crops are so bad that the deficit is estimated at 40 per cent. below average. The commercial summary which accompanies the report shows that Europe will largely depend for much of her breadstuffs from America, and that there is every prospect of fairly good and remunerative prices being obtained for cereals this year.

AGRI-HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday, the 23rd September 1880.

W. H. COGSWELL, ESQ., V. P., *in the Chair.*

THE proceedings of the last Meeting were read and confirmed.

The following were elected Members :—

Rai Jaikissen, Captain W. A. J. Wallace, Messrs. Charles Ryves and A. B. Holmes.

The names of the following were submitted for Membership :—

The Maharajah of Churkaree Bundelcund,—proposed by the Secretary, seconded by Baboo P. C. Mitter.

The Manager of the Tarrapore Tea Company Burtall Division—proposed by the Secretary, seconded by Mr. J. E. MacLachlan.

James Strachan, Esq., C.E., Engineer and Secretary to the Kurrachee Municipality,—proposed by Mr. J. J. Cumming, seconded by the Secretary.

Rejoined.—D. W. Taylor, Esq., Grantee, Oorth, R. M. Daly, Esq., H. M. Bengal Marine, and Poornanund Burroah, Esq., Extra Assistant Commissioner, Deebroghur.

CONTRIBUTION.

A small collection of plants (Orchids, &c.) from Borneo. Presented by Colonel W. M. Lees, on behalf of his brother, the Governor of Labuan. These have arrived in good condition.

Five kinds of Indian corn raised from American seed. Presented by Charles Girdlestone, Esq., Resident in Nepal.

The following is a memorandum from Mr. Girdlestone respecting these specimens :—

The five different kinds of Indian corn, of which single specimens are herewith sent, were grown in the private grounds of the Nepal Residency from seed directly imported from America in the spring of this year. The seeds were sent by a Virginian planter. The smallest cob, with grains like seed pearls, is the pop corn. The other four kinds were only distinguished by the sender according to colour.

The corn has been grown in good loam, which had previously been ploughed three times by the Government plough made at the Cawnpore Farm, and fairly but not richly manured with stable and cow-house refuse. In a season which has been favourable for this crop, it took about a fortnight longer to mature than the ordinary Indian corn of this valley. The yield has been about one-fourth more than the ordinary kind grown in ground of a similar character and similarly prepared. Some of the stalks attained a height of 14 feet. The leaf is broader and the stem thicker than the indigenous kind, but I do not think that the plant covered more ground. The height of the Residency grounds is about 4,700 feet above the sea, and the average maximum temperature in the shade about 85 F.; the sun maximum *in vacuo* about 150 F., during the month that the crop has been growing.

The Secretary placed on the table specimens of four kinds of Indian corn from the supply received this season from the Society's seedsmen in Philadelphia. The Nepal raised corn contrasts favourably with them. The Secretary added that, to the best of his recollection, such fine specimens of Indian growth from imported seed had not been previously submitted to the Society.

Agreed, that these specimens be carefully preserved for trial in due season in the Society's Garden in order to ascertain, if any, and what deterioration occurs.

A small collection of plants and seed from the Nicobars. From E. H. Man, Esq.

Some plants (25) of the Ceara Rubber tree. From the Officiating Superintendent, Royal Botanic Garden, Calcutta.

A quantity of acclimatized Aster seed. From C. Nickels, Esq., (Available to Members).

Mr. George Bartlett sent for the inspection of Members a fine grown plant of *Croton Kingii*. Mr. Bartlett, affords the following information regarding this plant:—

"During a casual visit to Barrackpore three years ago, I observed a sickly plant of *C. pictum* growing under the shade of some trees, in fact, the plants appeared to be on its last legs from starvation and want of light. On examining the plant, I found one branch with the variegation of C. Kingii, although a very sickly one I secured it, and with much care and nursing it has developed to its present state. The suffusion of a delicate salmon pink over the surface of the leaf, whilst the costa being of a bright pink, gives the plant a pleasing and decided character. With the approval and permission of Dr. King I have named it after him."

PLOUGHS.

Submitted the following letter from Mr. W. Crawley of Cawnpore, regarding the report from the Committee on the plough forwarded by him for competitive trial:—

I have to acknowledge receipt of the report of your Sub-Committee on the Cawnpore plough. I must respectfully demur from the decision arrived at.

Your Committee report that the plough cut a sod 5 in. wide and 4 or 5in. deep; now this is the average work which an English plough does with a pair of strong horses. *It is unnecessary for me to tell you that* the plough was never made to do such work as this with a pair of light Bengalee bullocks.

The plough failed to turn the sod over, this is its speciality, it was made so as not to turn the sod over, but simply to raise and pulverise it (by means of its forked mouldboard) and drop it again, *without bringing any new soil to the surface.* I quote a paragraph from the *Pioneer* of 31st August, in support of the principle on which the plough is made. Mr. Mechi of Tiptree, one of the most practical agriculturists of the present day says, that though the wheat plant sends its roots several feet into the ground where the subsoil is sufficiently loose, it "uses these roots more as a means of supplying itself with the moisture necessary for its existence. It is in the surface soil that the fibres seek for and obtain the principle elements of their food, in the presence of greatly increased heat and action. In the poor subsoil there is comparatively nothing for them, but water, for Liebig has proved that the few inches of surface soil have the power to fix or retain all the ammonia, potash, and phosphate of lime applied to it, and these are the three main requisites of plant food." Mr. Mechi advocates deep ploughing or cultivation, while keeping the subsoil in its place. The subsoil should be thoroughly stirred with the "grubber" or "cultivator," which will disturb it without bringing it to the surface or mixing it with the fertile and friable top soil.

The plough being somewhat novel in shape, and in the absence of instructions as to its working, and the object for which it was made, your Committee considered, I presume, that to be thoroughly effective it should have turned the sod completely over.

BAMIEH COTTON.

Submitted a letter from the Under-Secretary, Government of India, Home, Revenue, and Agricultural Department, forwarding a collection of papers and a note regarding the cultivation of Bamieh Cotton in India, and asking for a report on the result of experiments made with the additional quantity of seed received by the Society direct from Egypt in June 1878.

The Secretary placed on the table replies from several persons, to whom portions of the seed in question had been sent, including one from Mr. Westfield, with a photograph of one of his plants laden with bolls.

Agreed, that copies of these be forwarded to Government in reply to their inquiry.

COTTON-SEED OIL.

Read the following letter from Baboo Peary Chand Mittra, V. P., on the above subject:—

"In looking recently over some old publications [the of Society, I observed a short paper, written so long ago as 1837, by Mr. Charles Lyall, of the then firm of Lyall Matheson & Co., 'on the value of cotton seed for oil.' Mr. Lyall gives extract of a letter, dated October 1836, from a correspondent in New York, on this subject, which is, I think worthy of reproduction, and have accordingly annexed it, as probably few, if any, of the present Members of the Society have a copy of the 'Transactions' (Vol. 4,) from which this extract is copied, to refer to.

"I am not aware if much, if any, cotton seed-oil is now exported from Egypt, nor what the export, if any from Bengal, may be; but it does seem strange that when there is such an abundance of the material at hand, and when the demand for all kinds of oil is on the increase, that this particular kind should not be added to the many exports from Calcutta. Perhaps the insertion of this note in our monthly Proceedings may have the effect of drawing attention to, and eliciting some information on this subject.

"Presuming it may interest the agricultural interests of Bengal, I deem it proper to mention that within a few days past, we have received orders at this Agency, from his Highness the Pasha of Egypt, for all the necessary machinery, &c., for Steam Rice Mill, for husking and cleaning rice on an extensive scale, by the improved process employed in this city and in South Carolina and Georgia: also for a Cotton Seed Oil Mill to be worked by steam power according to the patent process extensively used in this country, where the oil is now manufactured in large quantities and sells for about one dollar per gallon. It burns equal to the best spermaceti and is successfully used as a substitute for almost every other kind of oil.

"One bushel of seeds yields about 2 quarts of oil, the outer rind or pellicle of the seed supplies the only fuel used in working the steam engine; all the machinery and apparatus for an establishment capable of manufacturing about 800 gallons of oil per day, will cost about 15,000 dollars delivered on board in this port."

In connection with the above the Secretary drew the attention of the Meeting to specimens of Upland Georgia cotton-seed oil presented to the Society in 1838, by Dr Huffnagle an Honorary Member and Consul to the United States; also from Mr. C. B. Taylor of Palamow in 1845, and from Major T. Davis of Buldana in 1855. Though the subject had been frequently brought to notice by the Society at various times yet, to the present day, not a single gallon of this useful oil had been exported from this side of India, whilst from the United States of America, the export had considerably increased, as the following extract from a recent number of the *Times* would shew:—

"COTTON OIL.—The manufacture of cotton oil from the cotton seed is becoming of importance in the United States, there being at the present time upwards of 41 oil mills, of which nine are in Mississippi, nine in Louisiana, eight in Tennessee, six in Texas, four in Arkansas, two in Mussoorie, two in Alabama, and one in Georgia. The annual quantity of seed converted into oil now amounts to about 4,10,000 tons, the yield being at the rate of some 35 gallons of oil to the ton of cotton material. Moreover, each ton leaves 750lbs. of oil cake of admirable fattening qualities. A great deal of the cotton oil is imported to Italy and other countries where the olive oil is a staple; and, in point of fact, cotton oil is there superseding the olive oil, not only for utilitarian purposes, but also as an article of food. It is said, too, that the use of cotton oil in this way is gaining ground in some parts of the States. The following are the statistics of consumption:—

	Export. Gallons.	Home Consumption. Gallons.
1876-7	... 1,816,000	... 2,000,000
1877-8	... 1,457,000	... 1,800,000
1878-9	... 5,750,000	... 2,425,000

—*Times* of 13th August 1880."]

It would appear that cotton seed is also becoming one of the principal articles of export from Egypt. It has gradually risen from 1,000 cwts. in 1860, to about 3,500,000 cwts. in 1873 of the value of £777,000, and England takes nearly all this. During the last 20 years the imports of this seed into England have risen from twenty thousand tons to two hundred and thirty thousand tons. Cattle, as is well known, take readily to it and thrive upon it. In the United States it is used largely as a manure for Indian corn and indeed as a general fertiliser.

The Chairman remarked that the cattle connected with the Goosery Mills throve well upon cotton seed. Dr. Lynch observed he had been informed that it was largely employed for this purpose in the Upper Provinces.

RHEA FIBRE.

The Secretary next called attention to a letter from the Under-Secretary to the Government of India, to the Secretary to the Chamber of Commerce, forwarding samples of Rhea fibre in the bleached and half bleached state, prepared in Lancashire, and requesting a report upon the quality and value of the fibre. These specimens Mr. Wood had handed to him (the Secretary) for his opinion, and he had submitted the following memorandum in reply:—

These samples are very beautiful and of excellent quality, but the commercial value cannot be given here as it is almost an unknown article in this state of fineness. We have no machinery here to work it into cloth. The home market is the best test. There it would probably be valued as high as £2,000 per ton. Such was the value affixed on a sample similar to this in the possession of the Agricultural and Horticultural Society, which was also prepared in England from plants grown in a large glass-house.

As far as my experience extends, the parties in England interested in Rhea fibre prefer to obtain it from India in the raw state, as the cost of the after processes for preparation in the state of the samples now before me, is comparatively small, and when so prepared the fibre sells for a large figure.

I have also seen specimens somewhat similar to these prepared some years ago at Saharunpore from plants raised there; but it was I believe, a tedious and expensive process as the experimenters were new to the work and had not the necessary appliances readily at hand.

Letters were read—

From the Director, Department of Agriculture, N.-W. P., forwarding a specimen of gum, and requesting an opinion on its commercial value.

The Secretary stated that this Acacia Gum is in a very dirty state and not worth more than from Rs. 8 to 9 a maund in the local market. To contrast with it he had sent the Director a picked specimen of gum from *Acacia Arabica*, which is quoted as high as three shillings per pound in the English market.

From Colonel H. R. Wintle, applying for a small quantity of good kind of potato, and offering a quantity of acclimatised flower seed for distribution among the Members of the Society.

The Secretary intimated that he had complied with Colonel Wintle's request, and had accepted his offer of flower seeds.

From Colonel Lucie Smith, Commissioner of Chattarghur, C.P., inquiring about Reana luxurians and if the seed be procurable. (A large quantity of seed forwarded.)

From Secretary Smithsonian Institution, Washington, returning thanks for certain publications of the Society.

From Director, Department of Agriculture, N.-W. P., to the same effect.

MINERALOGY.

SOME practised gold diggers from Australia have already arrived at Madras, and are to be sent up at once to work in the Kolar gold field. A Superintendent for the same mines is also expected from Australia.

A RECENT number of the *Statist* gives a list of fifteen companies started for the purpose of working our Indian gold mines. The aggregate capital of the whole fifteen is £2,680,500, which gives an average capital of £178,700 for each Company. The Indian Gold Fieds Co-operative Association (registered April 27, 1880) has a capital of £1,200,000, while the Indian estates syndicate has a capital of but £3,000.

WE are informed that arrangements have been concluded by which the connection of Messrs. Tremayne and Co. with the "Wynaad Gold Mining Company" comes to an end, and the Secretaryship of the concern is transferred to Messrs. C. H. B. Forbes and Co., who undertake its management with the co-operation of an influential directorate. It appears that there is a concurrence of competent professional opinion, quite independent of the late agents, to prove that the reefs on the property are highly auriferous, and that, properly developed, they should prove extremely valuable.

WE have received a copy of the proceedings of the Wynaad Planting and Mining Association, held last month, from which we observe that our planting friends are about to apply for the services of a thoroughly qualified Mining Engineer to report on the whole of South Wynaad. In the Annual Report of the Committee we find the following affecting the gold industry :—

Your Committee cannot conclude their report without an allusion to the rapidly increasing development of the gold industry in South Wynaad. Since our half-yearly meeting, prospecting has been energetically pursued, and results have been better than the most sanguine dared to hope for ; gold has been found on several properties from Vythery to Teriott, on the one side, and from Vythery to Mopernaad and Cherambady on the other ; mining experts have reported favourably on the auriferous nature of the reefs, and gold has also been washed from the alluvial in various parts of our district.

We regret we have not space to publish the proceedings *in extenso*.

MR. A. INOSTRANJEFF describes in the *Neues Jahrbuch fur Mineralogie*, a peculiar variety of coal which occurs on the north-western banks of Lake Onega, Russia, in slates states to belong to the Huronian formation. It differs in its physical, as well as its chemical, properties, both from anthracite and graphite. Pure varieties show a strong metallic lustre, which remains, even after exposure to a dull red heat. Its hardness varies from 3·5 to 4, and its density at 4 deg. C. is 1·841. It is highly hygroscopic, an analysis yielding :—Carbon, 95·50 ; hydrogen, 0·40 ; nitrogen, 0·41 ; water, 7·76 ; and ash 1·01 When free from water the percentage of carbon runs up to 98·11 per cent., so that it is richer in carbon than anthracite, though it contains less hydrogen, no oxygen, and much nitrogen. The "black earth" from Olones is distinguished from graphite, which it resembles much, by the fact that it does not yield graphitic acid or "Brody's graphite" when treated with a mixture of nitric and sulphuric acids, nor does it burn as rapidly as graphite.

THE official journal of the vilayet of Yemen, *Sanâ*, announces that a gold mine has been discovered in the Sanâ district, in Arabia, and in the usual style of Oriental expansiveness, declares that this mine is "one of the richest in the world." A detachment of soldiers has been sent to guard the place against the attacks of Bedouins, and a commission has been appointed to examine and report upon the mineral prospects. A productive gold mine would be a useful acquisition just now to the Turkish Government.

IT is said that the South African diamond fields produced no less than three millions five hundred thousand pounds worth of gems in the last twelve months.

ACCORDING to the Australian papers, there has been a great rush to the newly-discovered gold field at Temora, near Sydney. The chief obstacle to the full development of the field is the want of water for puddling purposes ; unless plenty of water can be stored, the miners will soon be unable to carry on business. At present they are living on their capital.

THE mineral resources of Tasmania continue to be developed in a manner and with results which are very satisfactory. The Governor in his speech at the opening of the Tasmania Parliament said :—"The quantity of gold raised is larger than at any former period, and is steadily increasing. The production of tin may now be regarded as one of the permanent industries of the country ; and as an article of export it ranks second only to wool in the declared values shown by the statistical returns." But satisfactory as has been the progress made by the colony during the past few years, the want of more extensive communications, especial ly railways, is much felt.

WE gather from an interesting letter descriptive of Modern Brazil in the *Times*, that those wonders of the gold and diamond fields of Minas Gemes, which yielded so many millions during the last century, and part of the present, which "enable an extravagant Governor at Ouro Preto to shoe his horses with gold in solemn religious processions," which "enriched the reigning dynasty with £3,000,000 worth of diamonds, and set on the Portuguese and Brazilian diadems those two famous jewels, the Southern Star and the Abacete, rivalling the glories of the Koh-i-Noor," are in a great measure things of the past. Hardly 1,000 men are now at work in those diggings which formerly employed 80,000, and the outcome of their labours does not go for much among the items of the Budget. A few foreign companies, chiefly English, however, have taken up the abandoned shafts, and are now working the mines of Morro, Velho, Pary, and other localities, from which they extract gold to the yearly amount of £280,000 to £300,000.

GOLD MINES IN JAPAN.

FROM a consular report just issued, it appears that three gold mine. are now being worked at Shimor Aikawa, in the island of Sados They were first discovered in 1613, since which time they have been steadily worked by manual labour until 1869, in which year machinery was introduced by the Government. The main shaft is sunk to a depth of about 600ft., and two of the mines are connected by a gallery 3,000ft. in length. First-class ore contains from 50 to 2,000 yen worth of gold per ton (one yen equals 4s. 2d.). The ore is crushed at the top of the mine, reduced to powder by stamps, and ground up with mercury into an amalgam, which is distilled and afterwards made into gold and silver ingots. Silver and lead are also obtained from the ore, the latter being collected into a mass of some 20 tons, cupelled by a German furnace, and the bullion extracted and made into ingots. In 1878-79 the amount of ore reduced was 6,428 tons yielding 295 oz. of gold and 91,713 oz. of silver, at an expenditure of 85 per cent. Altogether the Government has spent 334,570 yen in erecting machinery, and the total loss during the ten years has been 240,126 yen. Upwards of 1,080 persons are employed, including 120 women for ore-picking. The daily output is 20 tons, and about the same quantity is reduced at the works, which consist of four smelting furnaces, one German cupelling furnace, six amalgam pans, ten stamps, two concentrating presses, two steam engines, one copper refinery, one assay room, and 12 coke kilns, and this plant is about to be still further increased by the present Superintendent.—(London) *Times*.

THE GOLD FIELDS OF WESTERN BENGAL.

MR. W. A. SHEPPARD writes in the *Englishman*, under date August 24th :—

In the year 1872, I issued a pamphlet on the important question of "searching for gold" and directed attention to the mineral bearing rocks of Western Bengal as likely to afford supplies of the precious metal ; since then, I have twice urged the public to move in the matter, and finally, on the 24th ultimo, I disseminated a circular carrying certain proposals on the same subject, which proposals have not been responded to, and will, therefore, be withdrawn at the end of the current month. As there are many persons residing in the districts of Western Bengal who may have opportunities afforded them of examining some of the localities covered by my remarks, I will, with your permission, furnish for their guidance—also for the information of tea planters residing in Assam and Cachar, where similar eruptive and metamorphic rocks occur—a brief summary of the modes of occurrence of metalliferous lodes and the names of the several kinds of rocks in which they are usually found, from notes jotted down while personally pursuing the interesting study, in the hope that by such means certain rock beds, hereafter described, may be carefully searched, and their hidden treasures reached and exhumed. In Australia, the Government of Victoria considered it worth their while to give large rewards to persons finding gold fields, also to supply individual prospectors with the means to go out and search for localities yielding the precious metal, and why a similar course of policy has not been obtained in India, where gold is so much needed to aid in restoring the equilibrium of exchange, has been the cause of much surprise ; and it is hoped that, when the so-called scientific frontier operations have been brought to a close, the Government of India will betake themselves to the more agreeable and sensible duties associated

with the arts of peace and render generous assistance to all who may desire to become benefactors of the country by promoting the opening up of its vast mineral resources.

Ores are of four kinds, and are thus classified; *1st*, mineralized with sulphur or sulphurets; *2nd*, mineralized with arsenic; *3rd*, mineralized with sulphur and arsenic; and *4th*, mineralised with saline substances.

Metals are always found as alloys, sulphurets, oxides of salts. Gold platinum, and columbian are found only as alloys. Silver, mercury, copper, iron, antimony, arsenic, and cobalt, in the four states; lead and zinc in the three last. Others, various, in two or three states. Tongsten, uranium, titanium, chromium and tantalium only as oxides.

Veins.—The substance forming the outer coat of a vein is often intermixed, or forms layers alternating with the ore called matrix, gangue, or veinstone. Metallic veins are found chiefly in the oldest rocks, called primitive or transition, but they occur also in lower secondary rocks, and sometimes higher. Fissure or rake veins divide all the strata for unknown depths, sometimes perpendicularly but often obliquely; they are slips of equal width or chasms wider at top—those from east to west contain ores, and those from north to south at the intersections. Cross veins of quartz, and others of earthy matter, run north and south in all lengths and depths, and disl cate the metal lodes; they also contain galena or sulphuret of lead, iron, ochre, and arsenical cobalt, and when east and west, sulphuret of sliver. In Chili, the gold and copper lodes run nearly east and west, and the sliver every way. Mineral lodes are varied by rocks and strata through which they pass, and miners speculate accordingly. Metalliferous veins originate in cracks and crevices which extend to unknown depths; they occur mostly in primary or transition formations, in places where stratified rocks adjoin crystalline, for example, near the unction of granite, trap, gneiss, and quartz, with overlying schistose rocks. Veins in hard granite seldom afford useful metal, but in those of soft granite and gneiss are found copper, tin, and lead. When veins in rocks are exposed to the atmosphere, their superficial appearance often indicates the metal they contain. When a vein has fluor spar, it is associated with metallic substances; a brown powder at the surface of a vein indicates iron and often tin, a pale yellow powder, lead, and a green colour the presence of copper.

Igneous rocks comprise granite, porphiritic granite, vein granite, protogene syenite, peogamite, porphyry, basalt, greenstone, serpentine, trachyte, and lava.

Metamorphic rocks underlie the fossiliferous series, the various members of them succeed each other without any apparent regularity, and frequently alternate with one another; they are stratified, jointed, and with slaty cleavage, which, in most instances, is perfectly distinct from the cleavage arising from original bedding and deposition. Metallic veins of copper and lead occur in these rocks, as also gold, silver, antimony, and mercury; the principal are gneiss, hornblende, slate, mica slate, talcose slate, clay slate, chiastile slate, primary limestone, and quartz rocks.

Gold.—Occurrence of. The rocks are metamorphic slates that have been crystallized by heat, and they are the talcose and argillaceous, that have been but imperfectly crystallized, rather than the mica schist and gneiss which are well crystallised. The veins of quartz which contain the gold occupy fissures through the slates and openings among the layers. The nearer that quartz is found to the igneous rock and place of irruption, the greater will be the probability that so heavy a metal as gold, or indeed any other metal, will be found with it. Accordingly, it is in the highest part of the auriferous country, indeed, in immediate contact, not with the schist, but with the trap rock itself, or with the gneiss, that gold has been found in Australia.

The auriferous ridges here (Australia) are chiefly composed of a vast mass of chlorite or quartziferous schist, a rock belonging to the primary or crystalline series of rocks, and here intimately associated with trap rock, lydian stone, ferruginous conglomerate, or old red sandstone and primary limestone, the basis of the whole being granite. The trappean conglomerate with imbedded quartz pebbles on the flanks of the granite range of Mount Cole ought to guide modern prospecting parties to the localities where gold may be found, and also the description of the country from thence eastward. At the upper sources of the Murray and of Tumut, the rocks consist of granite, schist, and quartz. The same may be said of the valley of the Tooma, where granite, trap rock, and schist are the rocks—stupendous gullies and ranges are the characteristic features.

The subject of the occurrence of gold in veins and masses is most obscure, but the general fact that they are most abundantly situated near the junction of the stratified and unstratified rocks, indicates their connexion with an igneous cause, and, in common with other veins, the two principles of simple injection and chemical segregation have, doubtless, operated in their production. "My search for gold in the matrix" (writes Sir Thomas Mitchell) "might have been limited on this principle to a very few localities, whereas the wide extent of the quartziferous schist, although only supplying auriferous deposits in the streams, was also to be ascertained. I have learned that gold is to be found in both localities, but under circumstances distinctly different. I believe it is useless to look for any prolific gold mine amid the schistose lamina whence the streams carry by abrasion small particles of gold; and that it is only where the occurrence of trap rock affords evidence of the action of disturbing forces, that we may look for gold or metallic ore in any great abundance. The occurrence of gold on the margin of the trap rock of the Canobolas, amongst unabraided fragments quartz and combined with ironstone, confirms me in these views, and has indeed partly suggested them; and when I consider the direction in which metalliferous veins have been found in the same district and the very remarkable contour of the surface where metallic ores and even pure copper may now be seen, I feel no hesitation in saying that it is very easy to distinguish the localities where the precious metal may be looked for in metallic veins from those where it is disseminated in small particles through extensive regions of territory. The "Indi" or Limestone river, is that source of the Murray nearest to Cape Howe and the eastern coast; it is characterized by the same rocks, at an elevation at which snow covers the country during many months of the year; the whole country abounds with springs and mountain torrents, and I have no doubt that, in the most elevated portion of our primary formations, the principal mineral riches of Australia will eventually be discovered. It will probably be there that gold and other minerals will be found in such abundance as may well deserve the most careful management."

Silver.—Occurrence of.—The ores from which the silver of commerce is usually obtained are the vitreous silver, brittle or black silver ore, red silver ore, and horn silver. Besides these, silver is obtained in large quantities from galena (lead ore) and from different ores of copper. Some galenas are so rich in silver that the lead is neglected for the more precious metal. The metal occurs in rocks, of various ages, in gneiss and altered rocks in porphyry, trap, sandstone, limestone, and shales, and the sandstone may be as recent as the middle secondary. Silver ores are often associated with ores of lead, zinc, copper, cobalt, and antimony; and the usual gangue, or veinstone, is calc spar or quartz with, frequently, fluor spar, pearl spar, or heavy spar.

The Potasi mines in Buenos Ayres occur in a mountain of argillaceous shale whose summit is covered by a bed of argillaceous porphyry. The mines of Kongsberg occur in gneiss and hornblende slate in a gangue of calc spar. The ores of Hartz are mostly argentiferous copper pyrites and galena, yet the red silver, vitreous silver ore, brittle silver ore, and arsenical silver, occur. The rock intersected by the deposits is mostly an argillaceous shale. Carbonate of lime is the gangue, though sometimes quartz. In the Tyrol, sulphuret of silver, argentiferous grey copper, and mispickel silver, occur in a gangue of quartz in argillaceous schist. In Hungary, silver mines occur in syenite and hornblende porphyry in a gangue of quartz, often with calc spar. At Danwin in Russia, it is found in argentiferous galena in a crystalline limestone, and at Altai they occur in silurian schists in the vicinity of porphyry, which also contain gold copper, and lead ores.

Tin Ore.—Occurs in veins in the crystalline rocks, granite, gneiss, and mica slate. The Cornwall veins mostly run east to west, the gangue is quartz with some chlorite. In the Ramgurh district native oxide of tin is found disseminated in gneiss; the ore is found in nodules of imperfect crystalline form, from a few grains to an ounce and upwards in weight, intermixed with gravel. The place where this tin occurs is elevated 1,500 feet above the level of the sea, about 100 yards in width, and of indefinite length.

Lead.—Occurs in primary and transition rocks, except trap and serpentine, also in porphyry, syenite, the lowest sandstone and occasionally in coal-strata. The mountain limestone is the chief depository of lead ores. Of the presence of this ore, the principal indications are fragments of calc spar in the soil; the red colour of the soil on the surface arising from the ferruginous clay in which the lead is often imbedded, fragments of lead (gravel mineral) along with the crumbling magnesian limestones and dendritic specks distributed over the rocks, also the depression of a country or an elevation in a straight line or a peculiarity of vegetation in a lineal direction.

Copper.—Is found in primary and transition rocks: lodes of copper are generally covered with brown ochre, friable quartz (gossam) with tin on one side and gossam on the other. The copper, in such case, is a bi-sulphuret, and the tin a peroxide. Sulphurets of iron, zinc, and lead abound in the lodes likewise. The sides of lodes are generally quartz, school, and friable rock.

Mercury occurs mostly in connexion with talcose and argillaceous shales or other stratified deposits, both of the most ancient and those of more recent date, including coal strata.

The north-western and western districts of Bengal, namely, the Sonthal Pergunnahs, Monghyr, Ramghur, and Chota Nagpore, are very largely represented, by metalliferous rocks. The Rajmahal Hills are composed chiefly of basalt, and adjoin the extensive crystalline beds, gneiss, and quartz, of the Ramghur district; immense mountain ranges of granite with bold and imposing peaks form the western boundary of that district. Schistose formations are also largely represented and are found invariably super-imposed on beds of either quartz or gneiss. It is known that in the vicinity of Deoghur (Sonthal Pergunnahs) silver, copper, lead, and iron mines exist, and that copper, tin, lead, mica, and iron deposits are largely distributed throughout Ramghur Division. The Toondee and Kurruckdyah Hills in the Ramghur Division, and the Curruckpore Hills in the Monghyr Division, offer very promising fields for exploration. Moreover, the entire country around Hazareebagh presents indications of the presence of mineral wealth, and I may add, by way of stimulus, that the only good specimen of gold on view in the Indian museum is a small nugget found a Jaspur in the Hazareebagh district.

FORESTRY.

THE influence of man upon climate has been a favourable subject of late years, and it is now well known that by cutting down forests and draining the soil man can materially change the climate of a country. Some recent experiments conducted in Germany confirm this belief by showing the extent to which woods will affect the rainfall. Two observatories were established for the purpose of comparison—one over a clump of pine trees forty feet high, and the other over a bare sandy plain about three hundred and thirty yards from the wood. Both of the observatories were built at the same height from the ground. Twelve months' observation showed that of the total rainfall within that period ten per cent. more rain fell over the trees than over the bare land, distant three hundred yards from them. Further, the air over the wood was found during the whole year of observation to be charged with aqueous vapour to the extent of ten per cent. in excess of the air over the barren open soil. The ground, too, under the trees retained far more water than the exposed earth, the evaporation from the surface, thanks to its shade of trees and moss, being only one-sixth of that outside their friendly shelter. These results are valuable in that they point out a possible means of improving the condition of sterile tracts, *i.e.*, by the planting of trees.

THE ever-increasing destruction of Russian forests is fast becoming, says a Russian paper, one of the leading questions of the day. Droughts, and their necessary result—famine—are now denuding more than one hitherto fertile and wealthy district of Russia. The Government has at last opened its eyes, and repressive measures are being adopted. The Department of Public Domains sent several officials to investigate and report upon the extent of the mischief done; and now that the reports are all in, it is issuing new statutes which must put an end to greedy speculation, even on private domains and among forest owners. It has also adopted the following severe measures to prevent depredations in Government forest:—"No one, unless he is furnished with a due permit, whether he be on foot or in a vehicle, is allowed to enter a State forest. By trespassing on the forbidden ground, he makes himself liable to the severest punishment, even though he can prove that he had no criminal intentions; the cutting of wood, or even the simple damaging of a tree, is to be henceforth classified as theft in the first degree—burglary—and subject to the severest penalty permitted by law." It is quite time, says the authority quoted, that the authorities sought a remedy for the evil. The hills are stripped of their vegetation, the forests decimated, the springs are fast drying up, and wealth disappears.

WE have received a copy of the Forest Administration Report of the Central Provinces. The area of the Government Forests is as follows:—

	Acres.
1st Class Reserves	16,22 454
2nd " "	107,82,991
Unreserved Forests	1,44,416
Total ...	1,25,49,861

While attention is paid to ancient forests, we are pleased to note that large extensions are made in the direction of putting out young plantations. During the year under notice 282 acres were sown with teak, 106 acres with teak and bamboo, and 540 with bamboo alone. Extensive bamboo nurseries were also made to supply stock for future plantings. Prosecutions for breaches of the forest laws were very numerous, having amounted to 1,408 cases, as against 367 in the preceding year. In 92·5 per cent. of these cases convictions were obtained, which points to carefully got-up cases. The financial statement shows well. The total expenditure amounted to Rs. 5,22,573, while the income from all sources aggregated Rs. 10,06,723, leaving a surplus of Rs. 4,84,150 as against Rs. 4,59,147 during 1878-79. We observe the officers of the department have been trying their hand at farming with the usual result. It is admitted very naïvely that "the crop raised nearly covered the expenditure." We wonder how long ordinary cultivators could continue to keep themselves and their families by crops which "nearly covered the expenditure." It is little wonder that the expenditure was not covered when we read that the produce was 252lbs., and grain 210lbs. per acre. It is scarcely worth while for these officers to waste time in experiments of a nature in which they are sure to be worsted by the common cultivator.

THE Chief Commissioner of Burmah observes, in a recent official paper, that the early enactment of a Forest law for British Burmah is very desirable. A draft bill was circulated in the province some while ago, and full opinions on it obtained from civil and forest officers, in accordance with which the Bill was revised by the Inspector-General of Forests. It was then thoroughly discussed by a special committee presided over by the Chief Commissioner, and in its amended form has been submitted to the Government of India. The measure, if passed into law, is likely, says the Chief Commissioner, "to introduce into forest administration a precision and definiteness—which are at present somewhat lacking—and generally to be of much benefit, both to the people and to the officers concerned in the administration of the law."

LAST year, the area of reserved forests in Assam was increased during the year by 32 square miles and 200 acres, raising the total at the close of the year, to 2,015 square miles. The additions were in the Goalpara and Tezpur divisions. An area of 108·16 square miles, in the Kamrup, Darrang, and Sibsagar districts, is under settlement as reserves, and the Forest Settlement Officers are now conducting their enquiry into rights in the area gazetted. Besides these, about 145 square miles, in Goalpara, Kamrup, Sibsagar, and Darrang, have been inspected and proposed for settlement as reserved forests. The work of completing the selection and demarcation of the Government forest property in the province is thus being vigorously pushed on, and the progress made during the year is satisfactory.

JHUMING has been kept well in check, in Assam, during last year. In the Nambar forest, in Sibsagar, it was completely excluded, and in Cachar, where, owing to the habits of the people, it is difficult to keep them under sufficient control, great success was attained. The Chief Commissioner has recently called the Deputy Commissioner's attention to the question in this district, and has asked for a report on the sufficiency of the areas allowed to the jhuming tribes in the neighbourhood of the reserves. Sir Steuart Bayley is, we fear, too scrupulous on the point of possibly injuring or inconveniencing itinerant cultivators. Deliberate destruction of useful timber should be made a subject of severe penalty, such as would prove exemplary in its enforcement. In Cachar, which is at present the one district where the operations of the Forest Department proper are remunerative, and on which the teeming population of the Surma Valley and the adjacent districts of Bengal mainly depend for their supply of timber and forest produce, proper conservancy is of the highest importance.

DR. BRANDIS ON "THE DISTRIBUTION OF FORESTS IN INDIA."

FEW, we think, would deny the value or importance of the lecture delivered recently in the rooms of the United Service Institute, (Simla) by Dr. Brandis, the able chief of the Forest Department in India. Dr. Brandis' discourse was profusely illustrated with various specimens of wood, in their varied phases; taken from the time, say, a tree was a mere infant; after, a stripling, up to its attainment of the position of a 'full-grown.' The lecturer sketched the birth and growth of trees, particular kinds and in a general way; how they looked when they attained the first 'ring,' or say, as 'two-year olds;' and what they seemed at the not very patriarchal age, arborically, of two hundred years or so. Most curious and intensely interesting it must have been to many present to note the beautiful, fantastic, and singularly diversified surfaces of samples exhibited of various trees, especially two, severed off at the base; how one, the *teak*, "that most useful, honest, and valuable tree," had only accomplished a diameter of eighteen inches at the base, at the tolerably mature age of ninety-five years; then came the *deodar*, a more promising member of arboreal society, which, as to growth, nearly matched its rival on attaining its 58th year, or thereabouts. There were various other samples of woods fashioned into small blocks, which a young forester handed round to the doctor's hearers, and very curious and very interesting were many of these specimens. The great home of the *teak* tree is Burmah, where it flourishes. Several instructive features, in connection with the soil and temperature in which this tree thrives, and the conditions under which it does not, were pointed out. The *deodar* seemed more in favor with the lecturer and those listening to him too, and he handled its nether extremity, the sample block of the tree's base, with the affectionate manipulation that one would expect to see bestowed on a promising bantling. The tree is found in all soils, or, more correctly, thrives in sandstone, limestone, everywhere, save in the soft alluvial soil so favourable to many orders of vegetation. The trade statistics of the wood export were exhibited, and formed not altogether the least attractive of Dr. Brandis' illustrations. A great variety of foliage of trees of home and indigenous families, was exhibited; likewise varieties of acorn fruit, of that comparatively "useless tree" the Himalaya oak, a block of which was amongst the larger specimens displayed: it was sawn off at a diameter apparently of about fifteen inches, or when it was calculated to have counted some two hundred winters. It may be interesting to some persons to know the comparative production as regards indigenous trees in India and in Europe. Thus, taking, say Great Britain, France, Germany, Russia, and Turkey, with some few other continental countries, it is pretty accurately calculated that there are, in their whole extent, some 600 varieties of arboriculture; while in India, having about the same area as the several countries enumerated, there are four thousand varieties. One of the most formidable foes that the forest department has to fight against in India is fire—perennial, destructive, devastating fires which denude almost incredibly large areas every year. But their recurrence has been, or is likely to be, considerably checked, if not to be altogether stopped by operations of the Forest department, now being perfected; and these arrangements are meant also to provide against the wholesale forest denudation existing from causes unconnected with fires

Perhaps some slight conception of the magnitude of the descriptive history of arboriculture may be arrived at from the simple fact that, after an hour's uninterrupted and unusually agreeable converse, the lecturer had sketched, and that admittedly incompletely, the domestic history of *two* only, out of the formidable family of four thousand indigenous trees! Dr. Crawford, Surgeon-General, who presided, happily observed, in his concluding address, the essayist had "put tongues in the trees," which, if not an originaly *bon mot*, was at an rate most appropriate.—*C. and M. Gazette.*

RECLAMATION OF WASTE LANDS.

ONE of the most valuable branches of modern enterprise is the reclaiming of waste lands, and the last Paris Exhibition contained, in the division devoted to Forestry, some interesting relief plans of works and plantations, by means of which the great waste dunes lying south of the mouths of the Gironde had been redeemed and brought under cultivation. The solidification of dunes by means of the growth of grass and planting of trees, is a work of much difficulty. The problem is to "fix" the sand hills and sand heaps. The work must be very gradual. A whole series of dunes is marked out, the line being drawn as nearly as possible over their crests. The parting off is effected by means of a strong fencing over the crest of the dunes towards which the smaller cross fences lean, herring-bone fashion. The result of this construction is the accumulation of ever-increasing masses of sand in the places thus protected, which eventually form a bulwark for the space behind, against the rush of the waves. The area thus enclosed is first planted with meadow grass, and next with coniferous trees, the latter being at first protected against sand-drifts by means of brushwood. Sedges, broom, and esparto grass have also been found useful for first cultivation. The dunes lie partly below the level of the sea, and the soil reclaimed already amounts to many thousand acres. Where, a century ago, there was only a desolate and marshy expanse, the eye now ranges over splendid forests in which deciduous trees are growing up in ever-increasing number; while prosperous villages and large herds of cattle and gardens and vineyards, are dotted all over a tract of cultivated country which was formerly a silent, dreary waste. Perhaps, in time, those dreary wastes between Paris and the coast, which produce so depressing an effect on the traveller, and remind the Anglo-Indian of the too familiar sandy wastes of the land he has left may be turned also into a beautiful wooded district. And in this way civilization may compensate for its devastation of some of the loveliest parts of Europe, by creating beauty where there was desolation before. The experience gained by the French Department of Woods and Forests, with regard to the acclimitization of foreign, and especially of trans-oceanic forest trees, is particularly valuable. The blue gum-tree imported from Australia prospers in the south of France; and by its plantation at the mouth of the Var, the marshes surrounding it have been drained, and the fevers formerly so prevalent there have been banished. The trees prosper wonderfully in Algiers, the diameter of the trunk attaining to one foot in less than fifteen years. But the wood is white, light, and brittle; and is not to be compared to the durable ship timber which the same tree produces in Australia It is the same with the American oak, which thrives in poor soil, grows rapidly, and forms beautiful tops of foliage. But the wood is poor and the bark contains less tannin than that of the European oaks. These trees consequently, can only be planted in certain cases—principally to prepare the ground for better kinds. Very valuable relief plans were also exhibited of places where afforestation had checked recurring floods In 1868 there was a broad desolate gorge near the Barallounette in the Basses-Alpes, a rocky sterile tract of rubble below the Torrent du Bourget. The hollow is now half-filled up by the construction of high dams of stone; trees, and bushes, and turf have been planted and thrive to the very edge of the gorge, and what was a fierce forest torrent has been reduced to a steady quiet brook, and the valley has never since been desolated by inundation.—*Pioneer.*

AFFORESTATION IN JAPAN.

UNQUESTIONABLY afforestation is of great importance in Japan, where the active demand which has of late years arisen for timber is having the effect of rapidly denuding of trees very large tracts of country. On several occasions we have urged upon the authorities the necessity of protecting the forests and providing for future requirements. We propose to further stimulate their energies by reference to what has been successfully accomplished in Hong-Kong where afforestation is evidently conducted upon scientific principles, and therefore with due regard to the circumstances of soil and climate. In a recent Hong-Kong *Gazette* appears the report of the Superintendent of Gardens and Plantations, on Afforestation in the colony. From this document we learn that there are ten Government nurseries situated in Hong-Kong and on the Kowloon peninsula, which comprise about 150,000 two-year old trees, and small seedlings raised this year to supply about 250,000 trees for planting in 1881. The 150,000 two-year old trees now in the nurseries will be nearly all planted during the next two months; 60,000 trees have already been planted this year, and sites sown on the hills, where the seedlings will remain, for 60,000 more, which will make a total for this year's work of 270,000 trees covering an area of 245 acres. In addition to *Pinus sinensis*, which has hitherto been chiefly used for the endowment of the hills with forest vegetation, seeds of several of the indigenous trees of other kinds, such as the oaks, tallow tree, &c., several species of *Eucalypti*, and other Australian trees, and the Japanese *Pinus Massoniana*, have been sown in the nurseries, so as to afford more variety to the future plantations, as probably many kinds of trees not yet used may be found to succeed, and render the plantations more valuable and beautiful in years to come. If the experiment which is being tried of sowing the seeds *in situ* proves successful, which it promises well to do, the cost of afforestation of the Island will be much reduced and the operations greatly accelerated. The Superintendent estimates that with the like sum of $7,680 which was granted for each of the last two years, he will be able to sow, *in situ*, seeds to cover 600 acres, that is, about four or five times as large an area as could be accomplished by rearing trees in nurseries and then transplanting. Mr. Ford is also of opinion that the work of afforestation can no doubt, be greatly advanced by the co-operation of Chinese, who would, if suitable encouragement be offered by the Government, undertake to plant large areas for the return of being allowed to use the thinnings of the trees, under certain regulations, for a certain number of years, say 15, when the plantations might revert to the Government, or be leased for an extended period, under such a regulation, or modification of it, as Clause No. 28 of the Mauritius Ordinance No. 12 of 1872. Three or four of the small market gardeners at Kowloon have expressed themselves willing to plant 100,000 trees next year under such an arrangement as the above, and one of the chief contractors in Hong-Kong says that he would like to plant trees if the benefit could be secured to him for 50 years. With such results before them the Government of Japan should lose no time in following the example of nearly every civilized community.—*Japan Weekly Mail.*

GARDEN.

THE London correspondent of the *Manchester Guardian* learns that the scheme for a complete botanical survey of India, for which subscriptions in aid of a prospective Government grant are being raised, both in India and in the United Kingdom, is likely to be so extended as to include geology and zoology. The general conduct of the expedition, as well as the superintendence of the special botanical department of it, will be entrusted to Mr. George King, of the Botanical Gardens, Calcutta, should his health permit him to travel over India for ten years, before which time, at the very earliest, the work of the survey will not be completed. With Mr. King will probably be associated several *savants*, both British and Indian. The details of this part of the scheme have not yet been settled.

WE notice that the Shillong Experimental Farm was made over to the charge of the Forest Department during the year, as a nursery of fruit-trees. Sir Steuart Bayley hopes that, in their hands this may become a useful centre for the diffusion of European fruits, many of which would probably do well, through the Khasi and Jaintia Hills.

AN experiment in the cultivation of the Carob seed is to be tried in the Botanical Gardens, Calcutta, under the orders of the local Government. On the requisition of the Government of Bengal, some samples of those seeds have been sent down by the North-Western Provinces, with the necessary instructions for sowing. Autumn is the proper season for growing this plant.

A BOOK on tropical plants by Baron Fred. Von Mueller, is advertised by the Superintendent of Government Printing, Calcutta, in a a recent *Gazette*. The author is (or was, for he may have joined the majority) Curator of the Botanical Gardens at Melbourne.

A VERY useful catalogue of plants in the Botanical Gardens, at Bangalore, and its vicinity, has been prepared and published by Mr John Cameron, F.L.S., the zealous Superintendent of the Lal Bagh with a view to facilitate the interchange of plants with kindred institutions at home and abroad. Mr. Cameron justly remarks that "Bangalore is celebrated as one of the chief horticultural stations in India, and this circumstance is due to its geographical position, which commands a genial climate. But, independent of natural advantages, the British residents have done much to encourage horticulture by their influence and example. Useful plants and industrious habits have followed their footsteps, as is always the case in the march of civilization." An index of eighteen pages, containing upwards of 1,500 genera, is appended the catalogue.

THE latest accounts from the continent of Europe speak favorably of the prospects of the grape harvest. The month of October is the one for gathering in the produce of the vine, and those who have once witnessed the process, will readily recall to mind the bright, happy, bronzed faces of the reapers, young and old; as different in their bearing, as they are in their costumes, to the English farm labourer. The ravages of the *Phylloxera*, which threatened to devastate the vines, have been stayed, and the weather has been favorable to the continental harvest, as it has been to the English; and the scientific wine makers pronounce the chemical properties of the new grapes to be satisfactory.

THE Americans having discovered that their delicious apples, the "New Town Pippins" do not command so good a price in the English market as they ought to do, on account of the bad condition they arrive in, have as usual, set their busy brains to work, to discover something that shall preserve the fruit. They have found what they required, and find that three or four folds of paper steeped in salicylic acid solution, and afterwards dried, and wrapped round the apples preserve them perfectly. The

best preparation for the purpose is an alcoholic solution prepared from the strongest spirit. The system is cheap and efficacious, and some of our readers may like to try the experiment of preserving fresh fruit by this method.

FRENCH GRAPES IN CASHMERE.

THE growth of French grapes in Cashmere has proved a signal success. Major P. D. Henderson and Mr. Chapman of Umritsur, with whom the scheme originated—his Highness the Maharajah, by whom the scheme was adopted—and last but not least, Monsieur Ermens, by whom the scheme was so ably worked and carried out, all contributed their share towards bringing to a successful issue one of the best—if not the best—and most useful development of the resources of this famed and beautiful valley. Monsieur Ermens having been chosen by the *Société Horticole* to select the land for the planting of French grape cuttings, was not long in accomplishing the task allotted to him, although he had to surmount many difficulties before he adapted it to his plan. He had to cut regular terraces on the side of the hills, and also to make a canal run all along the tops of the vineyards, so as to keep up a regular and plentiful supply of water. In January 1877, he imported a lac of cuttings from Margaux and Chateau Y Quem. These were *Raisins Blancs* or white grapes, for Sauterne, and Chateau Y Quem. For Bordeaux wine he imported four kinds of *Raisins Rouges* or black grapes. These he planted in beautiful order on no less than a hundred terraces, 100 × 20ft. These terraces flank a road eight yards wide, which runs the whole breadth of the garden, and which is hedged with plants bearing two hundred varieties of table grapes. The walls of the terraces also have table grape vines creeping on them. When these grape cuttings were first planted, the Maharajah, who showed great interest in the matter, requested Monsieur Ermens to give him an idea of the crop he expected. Monsieur Ermens said that after three years he would guarantee three clusters per plant, after four years six, after five years ten, after six years fourteen, and after seven years only, a full crop. Matters have, however, turned out very much more successful, and the crop which has just been gathored has far exceeded Monsieur Ermens' expectations. On some trees there were as many as thirty and forty clusters. Some time ago the blight among the grapes in Europe, known as Phylloxera was disastrous, and the Ministry in France communicated with Monsieur Ermens through their Consul-General in Calcutta with the view of ascertaining the state of the plants in India. Monsieur Ermens in his reply, which is published in the *Revenue Horticole* of July last, gives some very interesting and important facts. He says that there are two kinds of grapes in India. These are classed under the following names:—Opimam and Kawauree. The Opimam is a magnificent white grape: very sweet, grows in large clusters, and the fruit is scattered, not close together, on the bunch. The Kawauree is a beautiful red grape, not so sweet, but larger than the Opimam and with the fruit close and in large clusters. In Cashmere the vines trail on the poplars and sometimes grow over sixty yards in height. Although wild, they produce abundantly. These grape vines, in the hands of French cultivators, would bear magnificent fruit. Although not of *première qualité* for wine making, they are vigorous and thus most suitable for grafting with the delicate plants of Europe. Monsieur Ermens informed the Maharajah of the communication he had received, and his Highness at once requested him to despatch two hundred plants to France; and also showed his good will, stating that for future supplies he would give his share by defraying the expense of conveyance from Cashmere, to Wazirabad Railway Station. The cost of the transit of these packages to France is only 12 annas per lb. In sending the grapes Monsieur Ermens gave some very useful hints regarding the future export of cuttings from India for grafting purposes in France. The best means of sending them is not by post, but by coolies to Lahore, from thence by railway to Bombay, and on by steamer to France. The best time to send them is October, so that they arrive in good temperature. The best and most economical way of increasing the cuttings on arrival in France is to first plant them in a hot-house; from each and every eye in the cuttings sent, healthy and vigorous plants can thus be raised. Monsieur Ermens then speaks of the different methods of packing grape cuttings for import to India. He says this is a most important item, and the various ways of packing having all been tested by him, he cannot but speak with great positiveness on this subject.

First.—Vine cuttings packed in sandust. These have all died.

Secondly.—In damp moss. This is equally bad, for all the cuttings take root and thus lose sap. This injures all prospects of a crop, even if the plants reach and attain any growth at all.

Thirdly.—Packed in dry moss—favourable result, but also a little risky.

Fourthly.—Cuttings in powdered charcoal—the *best* manner of packing. The charcoal absorbs the dampness, at the same time maintains temperature and requisite moisture, preserving the whole plant.

Regarding the export of cuttings from India to Europe, Monsieur Ermens thinks the best time to send them is from November to March. In dry cases, they can travel safely. Tin boxes invariably injure the seeds.

The fruit plants sent out, which comprised apples, pears, nectarines, and plums, were packed in earth and did not only reach Cashmere safely, but were sent on to Gilghit where they were planted by Major Biddulph, and are now luxuriant trees. The cuttings, when they reached here, were put into running water for forty-eight hours and then planted in the nursery stores. From thence good healthy cuttings were taken to the terraces. Monsieur Ermens got his table grape cuttings from Antonne Bepon and M. Auguste Roy. M. Roy also furnished the other fruit trees, viz., apples, pears, plums, &c.

The wine grape cuttings were from M. Paul Skavenski of Margang. M. Skavenski is the Manager of Chateau Brown Cantenne and various other extensive properties in Medoc. In order to get the cuttings into India by January and February, M. Skavenski had to cut them in the depth of winter instead of the usual time in March. He also supplied the Bordeaux cuttings, and even procured the valuable ones of Chateau Y Queen from the Marquis du Sur Sulluce. The Macon wine cuttings were furnished by M. Pulliat. With the generous purse of the Maharajah to support his undertaking, and with the knowledge Monsieur Ermens possesses of these matters, it is no wonder that such a grand success has been achieved. The cutting of the first cluster of French grapes in Cashmere was, under the circumstances, a great event. But, in consequence of the bad news from Candahar and the disaster to General Burrows' force, both the Maharajah and the Political Officer, Mr. Henney, were absent. The gentlemen who did assemble to witness it, took a lively interest in it, however, and among the matters of importance to record on that auspicious occasion is the fact that sparkling wine made from Cashmere wild grapes was drunk.

The machinery hitherto used for making the wine above-mentioned is only on a very small scale, but the new machinery, which has just been received, will enable Monsieur Ermens to manufacture what he desires to do, to his heart's content. The Maharajah is laying out a good deal of money on the buildings of the manufactory, which in a short time will form in itself a pretty village and also a great industry for the people in Cashmere. Cuttings will be given to all the surrounding zemindars, who will plant and sell their fruit to the wine manufactory, getting more profit than they would do by the sale of rice and grain.

At Rugonathpore, where Monsieur Ermens lives, sauterne is being made from the French grapes grown there. The *modus operandi* is pure and simple. The best wine is made from unpressed grapes. After the fruit is gathered it is brought to the manufactory. The process of picking here goes on, and after it is finished the grapes are taken to the pulping house and pulped. The pulping process is a delicate one, as great care has to be taken not to bruise the seed, which contain oil that would retard the process of fermentation, in addition to according a bad flavour to the wine. From the pulper, the juice and pulp are both transferred into baskets which strain only the natural juice (without pressing) into an immense wooden vat built on an incline, so as to run the contents into another tub or vessel, from which they are taken and placed in casks in sufficient quantities to permit fermentation taking place without any loss of liquor. The casks are all kept open until fermentation is over; they are then filled and closed. The time for opening them again is determined according to the temperature and climate.

The above is a description of the first quality of wine, *i.e.*, from the juice of grapes without any casks pressing whatever. The liquor goes direct to the casks after the pressing process is over. To show that no wastage whatever is incurred, it is well to mention that after being pressed for 2nd quality wine, the pulp is placed in casks of clear water, and after fermentation the liquor is distilled for the produce of pulp brandy *eau de vie du Mar.*

In a year or two, Monsieur Ermens purposes to send table grapes—packed in clusters similar to those now so largely exported from France to England and America—to all the principal towns in India.—*Cor., Bombay Gazette.*

THE CULTURE OF THE GARDEN RANUNCULUS.

THE numerous varieties of the garden ranunculus are all the offspring, by selection, of the species known to botanists as Ranunculus asiaticus. They do not engage the attention of florists now so much as they did a generation or more back, though why this is so would be difficult to say. The marvellous beauty and symmetry of the flowers are in no way lessened, and their culture has not become more difficult. We presume the immense variety of flowers that has been introduced during the last twenty-five or thirty years, many of which cost less both to buy and cultivate, has operated to bring about the partial neglect of these most beautiful ranunculi, as well as many other old-fashioned things. There is, however, an occasional indication of a revival of interest in these fine old flowers, to be met with in gardens, which is very gratifying to see.

The culture of garden ranunculus in past times, was made somewhat of a mystery by the old florists. Those who excelled in their culture maintained that their success was due solely to the compost they made use of; and they endeavoured by every means to prevent their neighbours from getting a knowledge of the component parts of this compost, and of the relative proportion of the different parts and the manner of mixing them. But all of them made one ingredient the base of the compost, and that ingredient was the best turfy loam they could possibly obtain. This was usually cut from some piece of rich meadow, and laid on the surface of the ground loosely in the beginning of winter, for the purpose of having it exposed to frost, which had the double benefit of driving the dormant worm out of the sod to greater depths for better protection from cold, and also

the ameliorating effect on the texture of the soil which frost only can give. To such soil as this, after it has been stacked for a year, a fourth part may be added of horse or cow manure after it has been mellowed by turning it over frequently. If the soil should be inclined to heaviness, mix some sharp sea or river sand with it, and thoroughly incorporate the whole together. If possible, a moderately moist and shady position should be chosen for the bed in which the roots are to be grown, but avoid a wet bottom. In that case, the bed should be raised above the surface level, so as to insure the thorough drainage of all superfluous water. The practice of the old florists was to excavate the whole of the old soil, and wheel it away, filling up annually the space thus excavated with new compost. No doubt this should ensure complete success, but we do not consider it in any degree necessary, except where the soil is apt to become surcharged with moisture, and thereby deteriorated. In that case, we should certainly say renew the soil annually, but in no other would anything but partial renewal be necessary.

The time of planting may be any time from October to April, at intervals, so as to secure a good succession of flowers from spring till autumn. The roots may be planted at from 5 to 9 inches apart each way, according to the strength of the tubers and dry weather; and a dry state of the ground should always be chosen for the work of planting.—*N. B. Agriculturist.*

TEA.

THE China tea crop is said to be 20,000,000lbs. short, and the reports from Indian tea districts are somewhat unfavourable. "Unreasonable cold, and heavy rains have interfered with the growth of the leaf, and also with the manufacture."

WE extract the following from Messrs. Marsden and Walker's monthly Indian Tea Report for September, to hand by the last mail:—

A large trade has been done during the past month, and prices have, under the pressure of the quantity offered, gradually given way for all kinds except teas under 10*d*. We quote a fall of 2*d*. to 3*d*. on Pekoes and Broken Pekoes over 2*s*. Medium kinds have declined 1*d*. to 2*d*., but the lowest grades of Pekoes, say from 1*s*. to 1*s*. 2*d*., remain unchanged. Fine Pekoe Souchongs have declined fully 1*d*., while inferior kinds from 10*d*. to 11*d*. have been steady throughout. Darjeeling teas of good quality have not been affected in price, and command high rates. Since the close of the month the auctions have become flat, and prices are further drooping, which would seem to arise from the very heavy auctions (averaging 3,600 packages per day), and not from any want of demand from the country. Deliveries for the month have not been so heavy for eighteen months; Imports are unusually high, being only exceeded in October 1877. Bank Rate 2½ per cent. September Public Sales comprised 52,750 packages, against 45,100 packages in 1879.

THE efforts to introduce the culture of the tea-plant into America do not apparently meet with unanimous approval. It is alleged that there is nothing startling in the statement made by the Commissioner of Agriculture that tea can be produced in the Southern States, but what the tea itself will amount to when tested by the palate and digestion, remains to be proved. Tea, like tobacco, varies greatly according to soil and climate; the seed from some of the most fragrant and harmless Cuban tobaccos has been planted in various parts of the United States and yielded leaves larger and more beautiful than ever were seen in the West Indies; but in most cases the odour is execrable and the proportion of nicotine several times greater than in the Cuban leaf. Occasional tea plants have been seen in the South for years, but to experts in tea a single swallow of the infusion prepared from these plants has been remembered, it is said, as long and unfavourably as a whiff of a full flavoured Louisiana or Michigan cigar. Our informant adds that "as only a little of the best imported tea can be taken with safety, the prospect of the American market being flooded with native teas from all sorts of soils is not a pleasant one to contemplate, for our national habit of disguising tea in sugar and milk makes it probable that in the event of lively American production millions of digestions and nervous systems will be ruined by the terribly astringent and stimulating properties of the native leaf. The probability of successful tea culture, therefore, cannot be regarded with unmixed satisfaction. The only safeguard of the private consumer will be in taking his beverage in Chinese fashion—that is, without sugar or milk. Even now this habit, easily learned and never afterward willingly abandoned, would drive out of the market three-quarters of the vile mixtures sold and swallowed as tea." If the opinion of the writer we quote from is at all prevalent in the United States, it is very evident that China and Japan have little to fear from the competition of American grown tea. But, as will be seen from our leading article on the subject, we are not of opinion that tea as an industry will succeed in America.

THE English market is generally so overstocked with Indian teas, that planters are driven to seek other markets for the rapidly increasing produce of Indian tea gardens. Australia now promises sooner or later a large demand for the pure article supplied from India; but the countries across our frontiers should afford an almost inexhaustible demand, if the kind of tea most in demand in those parts can be turned out by Indian growers. Mr. O'Connor's recent reports have shown how large a quantity of Chinese tea (rubbish, as much of it is) find its way *through* India to Central Asia; and it is only necessary for the Government of India to take decided action, to promote arrangements for supplying, with Indian tea, the vast demand that already exists in Tibet. In that as yet little known country, tea is almost universally imported in the form of bricks, and is used as a currency as well as a beverage. Certain kinds of brick tea form the principle money of Tibetan, not however reckoned by weight but by the brick; the weight of which, and presumably the quality, is more or less constant. Thus a sword may be worth three bricks, or a horse may be worth twenty bales of bricks, the bale containing four bricks. The price of brick tea per lb. avoirdupois runs at Lhassa from six to nine annas per pound for second quality, and nine to twelve annas per pound for better qualities. The tea is sown in hides, with the herring-bone stitch. Nothing can of course be done till the prohibition against the import of Indian teas into Tibet is removed through the action of Government. But the Kumaon and Assam planters should exert united action in moving Government in a direction of such vital importance to their interests.

AMONG the general indications of returning trade, at home, is the demand for Indian tea shares, and a growing interest in other products, such as tobacco. Large as it is, the Indian tea trade with Europe is only a faction of the China traffic. There is, therefore, a good deal of ground to be occupied in the West; but the principal field is in Australasia, where, unfortunately, owing to the nefarious tricks of Chinese dealers, and the bungling of Indian agents, Indian tea enjoys as indifferent a reputation as Manchester clay-cotton does in Canton. The first step to an improved trade lies in the prevention of imposture. As for the second product mentioned, it is very well known that tobacco has satisfied all the tests of the experimental stage. Only capitalists, careful growers, and skilled curers are required. The reports submitted to the Madras and other Governments, and the blue books written on the subject, by Mr. O'Connor, establish this fact beyond doubt. We also know that Burmah specimens sent to London dealers have been pronounced by them to be equal, if not superior, to the best produce of Havana or Manilla.

THE unsatisfactory state of the tea market during 1879-80 is seen in the fewer number of coolie labourers imported under the provisions of the Emigration Act into Assam. From the report issued by the Chief Commissioner, it appears that in 1879 only 34,712 coolies were imported against 43,061 in 1878, and 31,897 in 1877. This great decrease is certainly in a measure due to a difficulty in inducing labourers to emigrate from the plains, in consequence of the good harvests and cheapness of food. But the main cause is to be found in the fall in the price of tea. Every garden has been worked in the most economical manner, and as the price of labour has risen, instead of diminishing, there has been a natural tendency to restrict importations as far as possible. The Chief Commissioner, however, does not take a gloomy view of the future of tea cultivation in Assam. He hopes that the ominous signs of the past season will pass away, without leading to any permanent contraction of the operations of this most important industry. It is improbable, however, that tea cultivation will extend at the rapid rate of the last few years. The low price of tea, and the small returns of existing companies, will check the eagerness of speculators. Much of the best land has already been taken up, and sites for gardens, otherwise good, are at present useless, in consequence of the badness of the communications. Sir Steuart Bayley well says that the most important measure which Government can adopt in furtherance of the tea interest is to improve the communications. A quick passenger service is greatly needed on the Brahmaputra. It appears hopeless to expect that private enterprise will supply this want, and the provincial funds at the disposal of the Assam Administration cannot meet the cost. The Government of India refused to help the struggling province in consequence of the financial pressure, and Sir Steuart Bayley is now in the cheerful position of one who hopes that something may turn up. He has applied for aid to the Lieutenant-Governor of Bengal, and in the interest of Bengal Sir Ashley Eden will doubtless cooperate in improving the communication on the great water highway of the two provinces.

THE subject of labor in Sylhet is discussed in the *Indian Tea Gazette*, No. 80, and attention is drawn to the fact, that the plantations in the southern districts of Sylhet have only 2,000 Act VII. coolies, out of a total of 20,000; and this is ascribed to the managers of those gardens having enticed the difference, say 18,000 men, from Cachar and the northern gardens of Sylhet. This is a sweeping charge. May not a more charitable and more correct explanation of the circumstance be found in the fact that Sylhet is one of the richest agricultural districts in the Assam Chief Commissionership, and that the south gardens being in proximity to the Tipperah Hills, are exceptionally well placed as to a class of local labor that does not object to enter into short engagements, under the ordinary Contract Act at present in force?

MR. POWER, the Deputy Commissioner of Lohardugga, in the Chota Nagpore Division, has lately suggested that tea-planters should try to persuade the ryots to cultivate tea on their uplands, and pay them a liberal price for the produce. The Commissioner of the Division, however, believes that such a system could never be worked with success, and the Lieutenant-Governor of Bengal is disposed to agree with him. There are at present twenty-three

tea gardens in the Loharduggа district, with an acreage of 434 under mature plants, and 1,135 under immature plants; the average yield per acre being, last year, 189lbs., and 248lbs. the year before. The outturn of last season was seriously affected by the long drought and hot winds which came before the rains. Both in the Lohardugga and Hazareebagh districts, a large number of plants were either much injured or wholly destroyed. Mr. Power says, with reference to the comparative failure of the tea industry in the district hitherto, that there has been "a want of experience in the mode of opening out and treating a garden." The planters, on their side, complain that the supply of labour is getting short; and the hands, just as they have learnt their work and are beginning to be usefull are tempted away by emigration agents. The Deputy Commissioner adds that "if any great extension of the tea industry takes place, tea planters will have to import labourers from other parts of the country, and the additional expense will counterbalance the only advantage they possess at present over gardens in Assam and other tea districts."

The quantity of tea exported from China to the United Kingdom from the 1st June to the 18th September this year, was 98,060,027 lbs., as compared with 105,999,906 exported in the corresponding period of last year. The exports to America from China and Japan during the same period were 42,386,538lbs., as compared with 35,484,577lbs., last year.

The Japan papers contain a translation of an article from a local vernacular on the propects of the Japanese tea trade. The writer takes a gloomy view of the future of the industry and gives the following as one of the principal causes of its decay. "Recently," says the writer, "some clever, but dishonest, people have taken to mixing the leaves of other plants with the tea prepared for foreign countries, the result being that Japanese teas have deteriorated in value, and Chinese and Indian teas have ruled the market. It may be urged that there are many who simply mix an inferior with a superior class of tea and then pass it off as superior tea only; but there are many others who mix such things as wisteria and honeysuckle leaves with the actual tea, and both foreign and native buyers, having become aware of this practice, declare they will purchase Japanese teas no longer."

The following on Java tea is from the Consular Report:—"The greater portion of 1879 production was prepared especially for the London Market, and shipped *viâ* Holland to that port: English rolling machinery has been introduced on several estates with satisfactory results. The China plant is still the only species cultivated to any extent by Java planters; trials are being made with the Assam shrub, but as yet they are on too small a scale to warrant an official report.' The quantity of tea exported from Java for the year ending 30th June 1879, was 67,052 cases, or about 5,699,420lbs., against 86,208 cases or about 7,327,680lbs. for the twelve months ending 30th June 1878.

COFFEE.

We see that the Directors of the Date Coffee Company announce that owing to the disturbed state of the country at Bussorah, and for other reasons, Mr. Mare, the company's engineer and manager, has, with the approval of the Board, made arrangements to manu facture at Kurrachee. Mr. Mare has secured the requisite premises at a cheaper rate than Mr. Henley calculated, and he stated that he is satisfied he can manufacture at a less cost than that estimated by Mr. Henley. The whole of the works are progressing rapidly, and the first consignment, the whole of which is sold, will probably arrive in November. The Directors are further in a position to state that every day the demand for the coffee increases. The change of the place of manufacture from Bussorah to Kurrachee will, no doubt, be equally satisfactory to the shareholders as it is to the directors; for the latter place is nearer England.

The coffee exporting season in Ceylon closed on the 30th September, the exports during the season were 670,000 cwts., of which 620,000 cwts., were plantation, and the remaining 50,000 cwts. native coffee. The *Ceylon Observer* says that the exportation of native coffee is steadily on the decline.

A Commission is not likely after all to go from Java to Ceylon to inquire into leaf disease. Mr. Moens has reported that at present there is very little to be learned there, apart from what has been published, and we now read in the *Straits Times*:—

"The permanent committee (in Java) in the matter of the coffee leaf disease has found that sending out a commission of 4 persons to Ceylon will cost thirty thousand guilders."

The Samarang *Vaderland* of the 8th September indicates as follows the cause of the coffee disease:—

"A native coffee planter of many years' experience has informed us of his opinion that the coffee leaf disease is caused by the practice, very general of late, of using fresh stable manure too soon when planting coffee in holes dug for that purpose. In proof of his theory he points to an estate where there are splendid coffee trees from 30 to 40 years old which bear fruit abundantly and are free from disease. These trees, says our informant were planted by him, no manure whatever being used on the occasion. He does not believe in ascribing the disease to mere exhaustion of the soil."

COFFEE CULTIVATION IN TRAVANCORE AND COCHIN.

The following table, illustrative of the state of coffee cultivation in Travancore, for the calendar year 1879, has been drawn up by the Dewan of that State:—

District.		Plantation.	Acres Total.	Approximate yield, in lbs.	Ave. yield in lbs. per acre of mature plants.
Thovallay	...	19	4.462	721,476	294
Culcolum	...	22	6,291	670,601	191
Velavencode	...	6	769	60.976	225
Nedoovengaud	...	12	4 055	246 708	126
Kottaracurray	...	17	6,816	891,362	114
Pathanapuram	...	1	6,400	33,600	336
Chenganore	...	1	450	33,600	336
Shencottah	...	5	793	32 384	64
Neyattencurray	...	1	229	12 000	150
Meenachel	...	28	6 329	508,089	257
Chenganacherry	...	9	1,211	195 014	281
Total	...	121	37,805	2,905,810	192

There are mature plants on 15,084 acres, and immature plants on 2,429 acres. The remaining 20,292 acres have been taken up for planting, but have not yet been planted.

In the state of Cochin there were 19 plantations last year in the Chittoor district, at an elevation of about 3,000 feet, and covering an area of 8,492 acres, of which 1,256 acres were occupied by mature, and 658 by immature plants, leaving 6,578 acres to be planted. The approximate yield was 378,684 lbs., or an average yield of 301½ lbs. per acre of mature plants.

MEMORANDUM ON FROST AS IT APPEARS ON COFFEE ESTATES.

From the tenor of reports which reach us from time to time, we gather that a somewhat general misapprehension exists as to the causes of frost on coffee estates, with a consequent misdirection of the efforts made to counteract it. With a view, therefore, to a more correct appreciation of the causes of frost and the appropriate remedies for it, we submit, for the information of those who have not hitherto given the matter their particular attention, the following remarks embodying what we believe to be the true theory.

We propose to consider:—

1. What frost is *not* caused by.
2. " " is due to.
3. The remedies.

First.—Frost is *not* caused by dampness of the ground or moisture in the atmosphere. It is no doubt true that frost generally attacks coffee grown on flats or in hollows. It is equally true that it is in such situations that damp ground and aqueous vapour are found, but it does *not* follow that the former is the effect of the latter. On the contrary, the presence of aqueous vapour has a direct and powerful effect in preventing frost, and as a consequence any effort directed to the reduction of the amount of aqueous vapour held in suspension, such as deep draining, &c., with a view to the prevention of frost, must fail of the desired effect. Draining flats and swampy ground may and does benefit the trees in other ways, but as a preventative of frost, it is not even neutral; it positively tends to an opposite result.

Secondly.—Frost is an effect of chilling by radiation. In other words, the ground, the trees, and the atmosphere by which they are surrounded radiate or give off, during the night, the heat which they have absorbed during the day, until, by a series of actions and re-actions, which will be explained further on, the trees are chilled to a point at which frost is formed. The formation of dew is an earlier stage of the same progressive lowering of temperature.

Certain conditions are essential to the full development of this radiative energy. They are princi pally as folllows:—

A clear sky free from clouds.

A dry atmosphere free from aqueous vapour.

A perfectly still atmosphere.

The absence of any one of these conditions will generally be sufficient to check radiation and prevent the temperature falling to the point at which frost is formed.

We have not personally had many opportunites of inspecting cases of frost-bitten coffee, but we believe the following are facts:—

1. Frost occurs only on bright clear nights when the sky is free from clouds.
2. Frost occurs only during dry weather.
3. " " when there is no wind.

4. Frost only attacks coffee on flats and in hollows; it does *not* occur on slopes or on hill-sides except sometimes just at the bottom.

5. Frost is apparently formed near dawn.

6. High-topped coffee is less liable to be frost-bitten than low-topped, other conditions being similar.

7. Frost occurs at high elevations only.

We will trace the progress of the radiation and then consider the observed facts above enumerated.

In dry hot weather, as soon as the sun is below the horizon, earth, vegetation, and atmosphere immediately begin to radiate into space the heat which they have received during the day, not all with equal energy, nor are all equally *free* to radiate, were their energies equal, but all in some measure. The vegetation, or say the coffee trees—as it is these we are now considering—are the best radiators, and before long the external parts (for it is only the external parts open to the sky that are free to radiate, the upper primaries, forming a screen to the lower ones) become colder than the surrounding atmosphere owing to their greater radiative energy.

The air, already partly chilled by its own radiation, is further chilled by contact with the colder leaves, and sinks by gravity to the surface of the ground, being heavier than the surrounding atmosphere. This displaced cold air is replaced by warmer air, which, in its turn, is chilled by contact with the leaves, and sinks as before, to be again replaced by warmer air; and so the process continues until a stratum of chill air rises above and envelopes the trees, as it were in a cold aërial bath.

If this were all, however, we should know nothing of frost-bitten coffee, for the air so chilled would only sink to the temperature which corresponds with the radiative energy of the trees, and this temperature is far above the point at which frost is formed. A series of actions and re-actions between the chilled air and the tree now however commences, and it is this that eventually reduces the temperature to the frost point.

It was found by Melloni that, whatever the temperatures of the radiator (in this case the coffee tree) and its surrounding atmosphere, there is always a thermometric *difference* between them remaining pretty constant over a long range of temperatures. In the case we are considering this difference amounts to about 7° Fah. (the tree being the colder of the two), and there is a constant tendency on the part of both tree and atmosphere, to maintain this difference. If the tree be 43° the atmosphere will be about 50°; if the tree be 33,° the atmosphere will be about 40°, and so on.

When, therefore, the tree by its greater radiative energy has chilled itself 7° below the surrounding air, and then by contact has chilled the air to a point below that which corresponds with its own radiative energy, the tree seeks to re-establish the difference of 7° which previously existed, and in so doing sinks lower.

The air is then further chilled by contact with the tree and sinks in its turn. The tree again endeavours to maintain the constant difference of 7°. It is again followed by the air, and so by a series of actions and re-actions the entire stratum of air and the tree itself become lowered to a temperature far below that which is due to their own radiation, and the result is frost-bitten coffee.

Having now traced the progress of the chilling, let us see how it explains the observed facts before enumerated.

Frost occurs only on bright clear nights when the sky is free from clouds, because this is a condition essential to active radiation. Dr. Wells once observed a thermometer placed upon the grass rise 10° Fah. when it came under the shadow of a passing cloud.

Frost occurs only during dry weather, because at other times the aqueous vapour acts as a screen and prevents radiation. " On a day of average humidity in England the atmospheric vapour exerts 100 times the action of the air itself in checking radiation." " The aqueous vapour wraps the earth like a warm garment and protects its surface from the deadly chill which it would otherwise sustain." (Tyndall).

The absence of wind is essential to the proper chilling of the atmosphere, for, if the air chilled by radiation were constantly replaced by warmer air, the action and re-action already alluded to could not proceed.

A little consideration will show why frost occurs on flats and hollows, and not on hill-sides. On a flat the chilled air sinks to the surface of the ground and there remains. When the accumulations have formed a stratum of about 8 feet in thickness, sufficient to envelop the tree, the action and re-action between the tree and the air commence in the manner already described. On a hill-side, on the contrary, the chilled air does not remain on the surface where it immediately falls, but glides gradually down the slope and finally rests at the bottom, or in the hollow to which it naturally gravitates, there tending to swell and hasten the formation of the cold stratum already accumulating in those situations. The chilling on hill-sides does not therefore proceed to a point sufficiently low to form frost. We do not know if the fact has been observed, but we should think it probable that coffee in hollows is some times frost-bitten, while coffee on adjacent flats at the same elevation escapes, the chilling of the former being aided by the flow of cold air from the hill-sides. The descent of the cold air falling on the surface of the slope corresponds so closely with the flow of water falling on the same surface, that the circumstance of frost and damp being found together finds an additional explanation in the analogy.

Frost is apparently formed near dawn, because, the process of chilling being a gradual one, it is towards dawn that the coldest point is reached.

High-topped coffee is less liable to be frost-bitten than low-topped, because it takes a longer time to envelop the high trees in a stratum of cold air. If the chilling were continued, of course the high-topped coffee would eventually become chilled to the frost point.

At first sight it might appear that the lower primaries of both low and high trees would sometimes be frost-bitten while the higher primaries would escape, but it must be borne in mind that effective radiation can only take place from those portions of the tree quite open to the sky, and that the lower primaries are screened by the upper ones. We have, therefore, as regards the lower primaries, early envelopment in a cold aërial bath, but very little self-radiation; as regards the upper ones, late envelopment in a cold aërial bath but active self-radiation. In the result all parts become chilled to the frost point about the same, though it is quite possible to conceive circumstances, and in point of fact they do sometimes occur, under which parts of a tree may become frost-bitten and not others. The " conducting " power of the tree is so small that it hardly forms a factor in the question.

As we write, a report from a well-known visiting agent has come before us, and in it occurs a very instructive remark in the above connection :—

" There has been another visitation of frost which has settled on the same trees that were attacked last year. It is curious how the frost has not injured the sucker which was left to grow, but has blackened the top primary of the original tree."

Now it is easy to see how this has occurred.

Both the sucker and the top primary of the original tree, were free to radiate their own heat into space, neither being screened by the other. The top primary of the original tree, however, came under the influence of a cold stratum of air when it accumulated to the height of two feet or less. The chilling was not sufficiently prolonged to envelop the sucker in a cold aërial bath, and there was consequently only the one cause at work in its case as against the two in the case of the primaries. If, of two trees, side by side, one was cut down to half the height of the other, it will probably be found that, provided the chilling was not too long continued, the low tree would be frost-bitten, while the high one would escape.

It is only at high elevations that frost is formed, because it is only at these elevations that all the conditions are fulfilled which allow of the lowering of the temperature.

As a rule, the air is more humid at low elevations and acts as a screen to intercept radiation. At high elevations too the air is more attenuated and more easily chilled while it has less heat to radiate into space. The range of temperature is greater at low elevations, and radiation must, therefore, be longer continued to produce the same effect. All these causes combined tend to check radiation and maintain the temperature. If two nights could be rolled into one, radiation would be sufficiently prolonged to bring under the influence of frost estates at much lower elevations than those now subject to its attack. Bearing in mind that frost is an uncommon occurrence even at high elevations, it is easy to conceive that it will never occur under conditions even only a little favourable to its development.

Remedies.—Covering the trees with a matting or screen of any sort would effectually prevent radiation: even a screen of cobwebs would have a perceptible effect (Tyndall). Sprinkling the trees with a thin covering of mana grass appears to be the most practicable way of giving effect to this remedy.

Kindling fires when frost is anticipated and on the spots subject to its attacks, would tend to prevent it, not so much on account of the heat imparted to the atmosphere as because a movement of the air would be produced, preventing the formation of a chilled stratum.

The smoke also would interpose a screen between the trees and the sky and check radiation.

Topping the trees high seems advisable even though it lead to the loss of the lower primaries. There is nothing to prevent high trees being frost-bitten if the period during which chilling proceeds is sufficiently prolonged, but practically this will rarely be the case, except with trees in hollows, which require to be topped even higher than those on flats. Where trees have been already topped, a sucker should be allowed to grow up to be topped at 4, 5, or even 6 feet.

J. M. ROBERTSON & Co.

Colombo, 1880.

CINCHONA.

IT seems that although the Government manufactory at Mongpoo turns out 200lbs. of cinchona febrifuge a week, the supply is not quite equal to the demand. We hear that Mr. Gammie's improved febrifuge has been most favorably reported on by more than one medical officer. The improved febrifuge is almost equal to Howard's quinine in appearance.

A FEW Santa Fé cinchona plants, from the supply grown at the Royal Gardens at Kew, are being sent to India by the Secretary of State, to be tried at the cinchona plantations at Ootacamund. These plants were originally introduced from South America. To avoid risk in transit the Secretary of State arranged to send the plants under the care of Mr. Cross who, it was decided, should leave Southampton on 1st September. Mr. Cross will go to Ootacamund *via* Bombay. His passage to India and back will be paid by the Government of India.

A MADRAS correspondent writes:—You will, no doubt, be glad to learn that a trial consignment of Nilgiri cinchona bark is going to Australia, with a view to test the market for this article in the Southern continent. Messrs. Dymes & Co. have obtained 50 bales of bark from the Government Plantations by purchase. The bark will contain a fair proportion of trunk branch and twig bark. It is also to be partly original bark, partly mossed, and partly renewed. Messrs. Dymes & Co. will pay the average price realised at the latest sales of similar bark in England. In making this concession, the Government are anxious to avoid creating a precedent, and state that they are not prepared to depart from the general principle of open competition in the sale of Government cinchona bark.

IN regard to stripping cinchona and mossing in Bogawantalawa (Ceylon), a planter writes:—"I have been mossing my trees here after stripping, but am not at all satisfied with the result. 'I have taken from large trees three strips and from small ones two strips of bark, and have used moss and grass, not mana—the latter by its coarseness and sharp edges injures the cambium if not *very* carefully put on. I find very little difference between moss and grass in the results, though I think the moss, absorbing the moisture from rain better than grass, and not having a tendency to rot, keeps the wound cleaner, and therefore *in a measure* obviates the chance of decay, or possibly fermentation (?), of the cambium setting in." Let our correspondent try the experiment of leaving some of the strips bare, and report the result, but the trees ought not to be too young.

MR. D. MORRIS, the Director of Public Gardens and Plantations in Jamaica, has drawn up a report upon the sale of the fourth consignment of cinchona, which appears in a recent *Jamacia Government Gazette*. He remarks:—"The most encouraging feature in the present sales is the fact that all the bark despatched in April was 'sun-dried' bark. Considerable discussion has taken place during the last six years in India, Java, and Ceylon, with regard to the proper method of drying cinchona bark. Some maintain that under exposure to strong sunlight the bark deteriorates and loses some of its valuable alkaloids. On the other hand the advocates of 'sun drying' affirm that, in order to preserve the chemical components of the bark intact, it should be dried as rapidly as possible before any internal fermentation takes place. As cinchona bark could not be dried here artificially except at a considerable cost, it was most necessary to test its value, when dried by full exposure to the sun. The result, as shown by the present sales, is most conclusive. In competition with artificially dried and other barks, it is satisfactory to find that Jamaica 'sun-dried' bark obtained the highest prices. It may therefore be safely assumed that cinchona bark cannot be dried too quickly or too thoroughly. To this might be added that it should be packed perfectly dry, and despatched with as little delay as possible."

MR. GAMMIE ON CINCHONA CULTIVATION.

WE publish elsewhere a letter from Mr. Gammie, on the above subject, to the *Ceylon Observer*. The following comments on this letter are extracted from an article in the Colombo paper:—

The splendid success which has attended Captain Cox's *Ledgeriana* enterprise shews what can be done in Ceylon, under similar conditions, and his remarks about hybrids should afford consolation to gentlemen who, discouraged that they have not the "Simon pure" in *Ledgeriana*, may yet find in a vigorous growth, some compensation for a lower percentage of valuable alkaloids. From this point of view, we call attention to the letter of Mr. Gammie who, in Northern India, is rapidly securing for himself the prominent place which the late Mr. McIvor held among the cultivators of cinchona. If Mr. Gammie's discovery of a cheap and ready mode of extracting sulphate of quinine, even from some of the less valuable barks, stands the test of being applied on a considerable scale, his name will be associated with an immense forward step in the history of the Indian Government enterprise. * * * * * * * * His surmise, that the powdered bark from Java which proved a commercial failure was of inferior quality, is correct. Mr. Moens told us that in further experiments he had got as good a price for powder and shavings as for quill. In respect of bark for manufacturing purposes it is, we suppose, once for all settled now, that whether in powder, shavings, pieces, or quills, the mode of packing is quite immaterial. The product is valued and bought by analysis according to its inherent quality, and with little or no reference to outward appearance. Both in respect of the "scraping" and "grafting" processes, Mr. Gammie's experience stands in contrast to that of Mr. Moens, who is thoroughly well satisfied with the result of his grafting of *Ledgeriana* on to *succirubra* stocks. In reference to Mr. Gammie's remark about the Sikkim *Ledgeriana* reproducing itself truly by seed, Mr. Moens has called our attention to a paragraph in a report he wrote in March 1877, as follows:—

"In British India the propagation of *calisaya* by seed is not ventured upon for fear of degeneration. This is almost tantamount to abandoning the cultivation of it for the Calisaya generally. With *Ledgeriana*, specially, the propagation is so difficult, and so many cuttings afterwards die, that the prospect is not encouraging. I believe the fear to be exaggerated. It is true that among seedlings for the self-same tree, there are always found a few differing in form or in colour of leaf, though the greater part closely resemble the parent. But this is also the fate of other species of *officinalis*, and, in a lesser degree, of *succirubra*. And now experience has taught that both *officinalis* and *succirubra* are richer than before, instead of poorer, in alkaloids than the American parent plants. Again, our trees of this species are seedlings of British Indian plants, and it is already above all doubt that the bark obtained here is certainly not poorer in alkaloids than that of the stock of plants in Ceylon and Madras. The plants which have been cultivatd from the original American seed of Ledger differ also very much among themselves in form and even in colour of leaf, and in form of fruit and flower—and yet they are all very rich in quinine. I have many grounds for thinking, and hope also to be able to prove it in a couple of years, that the fixed yield of a plantation, raised from seedlings of cinchona *Ledgeriana*, shall agree with the yield of the parent plants, and that in such a plantation not only shall be found trees which are poorer, but even many which are richer in quinine than the original plant. As for fearing the decay or the deprivation of the whole there reallѕ exists no reason for it."

Our planters, therefore, who have received *Ledgeriana* seed direct from Mr. Gammie, as well as from Mr. Moens, should have little fear of the result; for bark yielding 7 per cent. of crystallized quinine at four and five years old may well be accepted as true *Ledgeriana*. In reference to the Carthagena bark, Mr. Moens' experience is not favourable. He says the rapid growth is all that Mr. Gammie describes, but the result by analysis, at least in Java, was unsatisfactory. The more reason therefore why our planters should follow our correspondent's example in not despising their old friend *succirubra*. Mr. Gammie's prophecy that 'common' red bark will yet be *the* species to yield a cheap and efficient ferbrifuge requires to be carefully noted, for he himself may yet be the agent through whom the prophecy will be fulfilled. We refer to the experiments he is now conducting in which we and the Ceylon planters may well hope he wil have a full measure of success.

MR. JOHN HOWARD ON CINCHONAS.

THE following is a copy of a paper on cinchonas contributed by Mr. Howard to a recent number of the *Gardeners Chronicle*:—

In a previous communication (last May) I dwelt upon the success of the cultivation of cinchona in Java, reserving what I had to say respecting the British plantations. I am now able to speak with certainty as to the yield of these latter for the year 1879, having before me a table compiled with great care by Messrs. Woodhouse, Mincing-lane, for private circulation, giving all particulars of the importations from every estate in India and in Jamaica. The total number of packages from the Government plantations at Ootacamund amounts to the following:—From Dodabetta, 429; from Nediwuttum, 779; from Pykara, 241. From Jamaica 16 bags are next recorded. From private plantations on the Neilgherries, 577; from Darjeeling, 1,050, and from Ceylon, 6,229.

The compilers say:—"In handing you the accompanying tables, we think it well to call the attention of planters to the following features:—In the first place, the extreme rates realised by the renewed bark, both crown and *succirubra*; the prices, as compared with the natural bark, being in most cases nearly double, and in red bark frequently more. This is to a great extent accounted for by the analysis. * * The highest price paid during the year was 12s. 8d. per pound for eleven cases renewed crown marked W. R. A. Prospect. } The largest private estate appears to be in Darjeeling, which sent out 944 packages. . . These realised full prices, the long selected quills being especially suitable for druggists. The chief feature in Ceylon descriptions is the very large proportion of twigs and shavings amounting to 3,089 packages out of a total 6,229."

The prices obtained for the bark from Ootacamund ruled much higher than those obtained for the Darjeeling lots, none of which fetched more than 2s. 10d., but some of the Ceylon bark brought from 7s. to 8s. We may safely conclude that the introduction of the red bark (*C. succirubra*) has been quite a success, especially when the bark can be renewed according to the process of the late Mr. McIvor. The tree retains its peculiar properties as to chemical constitution under all circumstances.

The true *C. officinalis* var. *Uritusinga* has also prospered well at the Dodabetta plantation. A large portion of these trees, represented in my *Quinology of the East India Plantations*, are also producing excellent bark. They had attained an average height of 28 feet, with a girth of 22 inches in 1878, or fifteen years' growth (*Ceylon Observer*, January 16, 1879) having been planted in 1863; and, according to the Government report, yielded 38,801 lbs. of bark in the year 1877-78. The prices obtained were—for the natural bark 7s. 1d., mossed bark 9s. 8d., and renewed crown 10s. 11d.

A considerable number of these trees were the descendants of a plant, about 5 feet in height, which I presented to the Indian Government, having received the seed from the mountains of *Uritusinga*, near Loja, in South America. This small tree arrived in April 18, 1862, at Ootacamund, in a languishing condition, but thanks to the skill and care of Mr. McIvor, it began to recover; so that by May 31, it was possible to obtain some cuttings, and by December 31, 1863, this one plant had produced 6,850 new ones. At a subsequent period Mr. McIvor told me these had multiplied to more than 60,000, so that a considerable portion of the Dodabetta plantation must consist of its descendants. The bark of these tree

given me by Mr. McIvor yielded 7·40 per cent. of fine sulphate of quinine. I have, therefore, recommended those who wish to plant crown bark, to obtain seed from this Dodabetta plantation. The habit of the plant may be seen from the accompanying woodcut (fig. 73) of one of the plants which I obtained from its native habitat, and have described in the *Nueva Quinologia*. According to its discoverer, Pavon, it grows to the height of 60 feet and more.

The narrow-leaved form which re-appeared in India, and produced nearly 10 per cent. of quinine, appears to have been considered by Pavon to be identical with this; so in my Pavon MS. it is written *olim angustifolia*. The *Urituisinga* is described finally as *foliis lanceolatis*, and "*angustis* is (rightly) erased. I have seen the leaves vary on the same plant. The other variety (fig. 74), photographed from a plant in my conservatories, of the var. Amarilla del Rey, now called Bonplandiana, does not rise beyond the dignity of a tall shrub. I cut down the leading stem, and this yielded, on analysis, quinine and cinchonidine in nearly equal proportions, also cinchonine. It is therefore a variety less adapted for cultivation—at least when the soil is rich, though it may be suited (as in Ceylon) for some exposed situations with shallow depth of earth. I have figured it in plate XI. of my *Quinology of the East Indian Plantations*

It is very difficult to say what are the predominant species in cultivation in addition to those above-named, especially as we have no satisfactory report of the amount of hybridization that may have occurred. All the *Calisayas* introduced by Mr. Markham perished owing to the salt water having penetrated to the roots of the plants in passing down the Red Sea, and a like fate, though not from the same cause, befell most of the *Ledgerianas* raised from seed at Ootacamund. The climate may be too severe as the neighbourhood is described (in the *Ceylon Observer*) as in the language of one of our northern countrymen the very "trysting place of the winds." The Pitayo barks have been introduced, and it is very desirable that their cultivation should be extended. I do not think that the rue *C. officinalis* ever existed at Darjeeling or in Ceylon. The attempt to grow crown bark at the former place has been (as I understand) a failure; from the latter I have specimens of the *angustifolia* form, but not of the *C. Uritusinga*. *C. Calisaya* from Darjeeling, (as far as specimens have fallen under my notice), is very poor in quinine.

It is to be regretted that since Mr. McIvor's death and the (not so very mysterious) disappearance of Mr. Broughton, there has been so little scientific guidance afforded to the cultivators. We are indebted still to Java for this.

Whilst I am writing there comes to hand the following comparative analyses obligingly sent me by the Dutch authorities from the same tree of *C. Ledgeriana* :—

Bark dried in sunshine.

Quinine	11·66
Cinchonine	0·32
Amorph. alk.	0·45
Total	12·43

Bark dried by artificial heat.

Quinine	11·68
Cinchonine	0·31
Amorph. alk.	0·51
Total	12·50

I have under my eye a botanical specimen, sent by a planter in Ceylon, with bark for analysis. He says that it is pronounced by Dr. Thwaites "pure *Calisaya*, with which definition I quite agree, but the flowers are said to be white, which shows variety (in so far) from the a vera of Weddell. They are quite unlike those of the variety *Ledgeriana*. The bark gives a produce equal to 3·4 per cent. of sulphate of quinine. I think that this may be the same as the Darjeeling sort existing under more favourable circumstances in Ceylon.

It appears from Dr. King's issued report on the Government plantations in Sikkim (*Ceylon Observer*, February 4, 1880), that the number of trees there planted out amount to more than 4,000,000. In Ceylon and other parts of India the cultivation is also being carried on with great vigour. Some of the planters are becoming alive to the necessity of care in selecting the best species, and the measure of success already attained with the *Ledgeriana* in at least one quarter, encourages the best hopes.

We find in the report of the Commissioner of Neilgherries (no successor to Mr. McIvor having been yet appointed) much interesting information (*Ceylon Observer*, December 18, 1879.) Under the head "nurseries" Mr. Barlow states that "604,855 plants, were distributed to the public during the year, against 187,850 in the previous year. [The question arises, of what kind, or form, or species were these.] The quantity of seed distributed was 1,822lbs. against 826lbs. in 1877-78. Most of this seed was sent to Ceylon where I believe it is sown broadcast amongst old coffee."

The editor of the paper from which I quote, remarks further :—"We have seen it stated that 80,000 seedlings is a fair average number to be expected from 1lb. of cinchona seed; although a planter at Kandapoola tells us he has got 250,000 from 1lb. of *C. officinalis* seed from an estate in Dimbula. Practically, he reports every seed grows. . . . . . To return to the enormous quantity, 1,648lbs, distributed from the Neilgherry plantations, in India and Ceylon, in two years! At the moderate average of 80,000 seedlings to lb., the result would be no fewer than 131,84 ,000 plants from this source, apart from seedlings from private plantations in India and Ceylon. This would probably raise the total to 200,000,000 of seedlings—about enough, one would think, to stock the whole of the hill countries of India and Ceylon."

Your readers will bear in mind that this is all theory, except, indeed, the fact that every seed placed in favourable circumstances may be expected to germinate. Fortunately for the planters themselves, no such calculation as the above holds good in reality. The world is in no danger for some time to come of being inundated with bark from India. The whole supply from all quarters probably would not suffice to keep the quinine manufactories at present existing in full operation.

But another factor in the calculation has to be taken into account—that in more than one quarter (as I have reason to believe) highly successful efforts are being made to cultivate the best sorts in their native climes in South America.

I will not add to the length of this paper by furnishing deductions which your readers can supply for themselves. I have sought to present facts as far as space would permit for the formation of a judgment on the whole subject.—*John Eliot Howard, F.R.S.*

SERICULTURE.

THE recent attempt to re-introduce the silk industry into the Kangra Valley is meeting with considerable success.

We take the following from a Japan paper, the *Nichi Nichi Shinbun* :—"The silk crop in Italy is very bad this year, and only amounts to one-third of the usual year's outturn, so that she must seek her supply from other countries. The foreign silkworm merchants who lately arrived here, gave orders for the purchase of large quantities of silk, but they offered as low prices as before. The amount of silk manufactured in the province of Shinshiu is so small that it will not suffice even for home consumption. On receipt of the news of the bad crop in Italy, the native manufacturers raised their prices, and foreigners having now experienced these unexpected difficulties, intend making different arrangements this year. On the other hand, the native silk manufacturers fearing that when the goods are sent to Yokohama, very low prices will be offered, intend sending them up to Tokio. A report from Yokohama says that about nineteen Italian silkworm merchants arrived here on the 18th instant."

TASAR SILK PRODUCTION AT LAHORE.

IN our last issue we gave an extract from "Mr. Morgan's account of his attempt to domesticate Tasar silkworms in the Madras Presidency. We now give the following account, taken from the local print, of the operations that are being conducted at Lahore :—It may interest some of our readers to know that Tasar silkworms are now being reared in the gardens of the Agri-Horticultural Society at Lahore. Mr. Spooner, the Superintendent, has a number of cocoons from which the very handsome Tasar moths (called now *Anthœrea Siwalika*) are being daily hatched. The moths are kept in a large cage of split bamboo, and the eggs, as they are laid, are collected and hung on to a *bér* tree in the garden in small leaf baskets. The worms hatch out in nine or ten days after the eggs are laid, and the tiny brown insect, a few lines in length, climbs out of the basket on to the branches of the *bér* and begins to eat voraciously. The quantity of green leaves devoured by these small creatures is extraordinary, and in a few weeks the small brown worm has developed into a large caterpillar, of a bright pea green color, from three to five inches in length, adorned with remarkable spiracles, like small round pieces of looking glass inserted into the sides of the animal. The caterpillar spins its cocoon in 35 to 40 days, and during last month (August) several small *bér* trees in the gardens, on which the previous generation was reared, were covered with cocoons. These cocoons are now developing a second crop of moths, for the worm is bivoltine, that is—the animal goes through all its stages of caterpillar, chrysalis, and perfect insect, twice in the season in the Punjab. The cocoons produce a harvest of moths in July, and the worms developed from the eggs of these moths spin cocoons again in September and October. Thus it is the second crop of the season which is being reared now, and the cocoons which will be all formed by the end of October will hang on the trees throughout winter and spring, till the first rains in June and July, when the moths will again burst forth from their long slumber in the chrysalis or cocoon state. Tasar silk is now so much in demand that the experiment of domesticating the Tasar silkworm is one of much interest. The worm is indigenous in the Punjab, as in many other parts of India, and the facility with which it may be reared on the *bér* tree in the open, without the expense and trouble of daily cutting and collecting leaves for its food, which is entailed in the case of the common silkworm, the *Bombyxmori*, gives hope that the cottage cultivation of the worm in a semi-domesticated state may yet become a remunerative industry in the country. The experiment is well worthy the attention of the intelligent members of the native agricultural community.

TOBACCO.

ALTHOUGH India produces good tobacco, last year she imported 88,082 lbs. of manufactured tobacco, valued at Rs. 2,73,388. Of other sorts she received from foreign countries 621,243 lbs., worth Rs. 3,52,568. The exports of unmanufactured tobacco from this country reached 10,874,623 lbs., and was worth Rs. 11,67,025. Manufactured tobacco was exported to the value of Rs. 97,633, and other sorts to the value of Rs. 33,439.

THERE appears to be no doubt says the *Ceylon Times*, that the soil and climate of the Cottiar, district near Trincomalie, is extremely suitable for the cultivation of tobacco, but to render it independent of the long spells of dry weather which prevail in that part of the island, artificial irrigation will be absolutely necessary, and this involves outlay of capital to carry it on upon a suitable scale. About 3 cwt. of excellent tobacco grown from Sumatra seed has been cut and cured, but not grown by the gentleman who has settled in the district from Sumatra where he was most successful: he has been but a short time in the island, and has not yet essayed the cultivation of the plant. During the rains of November a good extent of land will be planted up with seedlings raised from Sumatra seed. The quality of the cured leaves is said to be unexceptionable, and should the sample about to be consigned home for report and valuation answer the expectations of the growers, the cultivation will be still further extended.

TOBACCO AND SUGARCANE MANURES.

A WRITER in the *Madras Athenæum* has the following:—The excrement of cattle and sheep is not favourably thought of in South America, as a manure for tobacco or sugarcane. It is used however for coffee and other crops. I will give you the opinion of that great chemist Baron Liebig on the best manure for sugarcane.

Baron Liebig gives the following example, he says "I took three acres of the best land I could find, in the first, I planted sugarcane without manure, it produced a good crop. The second acre manured with farm yard manure and city sweepings well mixed; the product was much more than the first acre. The third acre I manured with "Poudrette," one ton to the acre, the produce of the third acre over the second was some several (the writer has forgotten the exact figures) tons." Does not this then prove that Poudrette, is the best manure for sugarcane? The Japanese use night-soil in preference to any other manure, and say that "Man more than any other animal, consumes more from the earth; and should therefore return to the earth what he took from it."

Below, the writer gives Baron Liebig's receipt for making Poudrette, but will say "He has himself grown splendid crops of sugarcane, manured as follows":—

1 Ton good farm yard manure.
2½ Cwt. night soil.

Mix well, but do not use any lime, as the lime being very caustic would cause all the ammonaical salts to evaporate from the night soil.

Poudrette.

1 Part night-soil.
1 Part burnt wood or vegetable ashes.
1 Part good common earth.

Mix thoroughly (do not sift it) and let it lie in a shady place for one week, mix once more and apply one ton to the acre.

Any good farm yard manure (sheep dung excepted) will suit for tobacco, but it requires to be well ploughed into the ground, or, if manure be scarce, you can work it in, at every intersection of the row, where you set the plant. Do not be too sparing if your land be poor. Farm yard manure mixed with night-soil will bring splendid crops of tobacco. For top dressing grass lands you can use cattle manure, *viz.*:—

4 Parts cattle manure.
2 do. good earth.
1 do. lime (chunam.)

Mix thoroughly and scatter evenly on the surface before rain, it will sweeten and improve your grass.

TOBACCO CULTIVATION IN VICTORIA.

THE SOIL AND ITS PREPARATION.

A DRY warm soil (loam or sandy loam), rich, deep, and containing lime, is most suitable for tobacco. The more sandy, to a certain degree, the soil is, the better will be the quality of the tobacco. The nearer the soil is to clay, the poorer will be the crop, under similar circumstances, although the yield may yet be satisfactory. Wet and stiff soils are not, under any circumstances, suitable for tobacco. Old or poor land must be well manured; the land must be ploughed deep, ten or twelve inches, and harrowed thoroughly until it is as fine as garden soil.

This is best done by ploughing early in the autumn, exposing the rough and hard furrows to the weather. After the soil is dry, it should be harrowed thoroughly, then ploughed across, and harrowed a second time, and rolled before planting. The different ploughings, &c., should ofcourse, be done at intervals long enough to allow the land to settle and mellow.

This is the treatment of soil which has been cultivated with the plough, before tobacco is grown on it. It is somewhat different wit newly-turned (virgin) soil which the tobacco particularly likes. Deep and thorough workin is the rule here also, but it is done in a different way. In the virgin soil all the roots must be picked out, because they would make the soil too loose for the secure insertion of the plant, and then they would hinder the grower with the hoe and plough to a great extent. The land is broken up, about three weeks before planting, 10 to 12 inches deep, taking care that the furrow is entirely turned, so that the grass is placed at the bottom. After from eight to 14 days, when the soil is settled, it is thoroughly harrowed in the direction of the furrows, to prevent the sod being turned up again, which must remain below, undisturbed.

Shortly before planting the soil is harrowed again, and, if necessary, rolled; this time it may be done crosswise. This treatment has these advantages—the newly-turned sod prevents the weeds from coming up, and the under-turned grass acts as manure. I must here caution all intending cultivators of tobacco not to attempt to grow it on poor land, without well enriching with animal manure.

In Virginia and the Western States of America, where tobacco cultivation has become a science, they think it is not too much to plough in 40 loads to the acre, their maxim being, the richer the land, the heavier the crop. And on no account plant the same land with tobacco for three consecutive years. Guano, sheep dung, or stable manure are all suitable.

TRANSPLANTING.

As soon as the seedlings are of the size of cabbage plants—that is, having four leaves, and being four to six inches high—they are ready for transplanting. The first thing is to lay out the land in lines with a one-horse plough. These lines are either furrows or ridges—according to whether there is little or much rain expected, or as the soil is more or less porous—the furrows give the young plants shade, and protect the soil from drought by sun or winds; the ridges absorb the sun and protect from dampness. In this respect the planter must be governed by experience. Ridges and furrows may be omitted in small plantations; a strong cord is stretched over the whole width of the field by stakes at each side, and one in the middle; alongside this cord the plants are inserted at regular distances, which are shown by some mark on the cord. When one row is planted, the cord is removed to the next, and the planting done in the same manner, and so on until the field is done. This method has the advantage that the soil may be made fine with the hoe shortly before the inserting of the plant, if it has not been done sufficiently by horse labour. However the rows may be made, they must be equally far apart, and so with the plants in the rows. The distance apart depends somewhat upon the richness of the soil, for very rich soil will grow larger leaves than poor, and then it must be considered whether the after cultivation is to be done entirely by manual labour, or partly by horse power. The farthest distance for Virginia, Kentucky, and Connecticut is with the rows four feet, and the plants three feet in the row; but I think that on most lands in this colony, three feet between the rows, and two-and-a-half between plants, would be the best distances.

When all is ready for transplanting, watch must be kept for rain, or for one or two cloudy days. If the weather is favourable, the planter must lose no time, but go to work with all the hands at his disposal. Notwithstanding the hurry, everything must be done methodically, and in proper order, for all carelessness in transplanting tobacco is severely punished by the necessity for renewing plants which fail. After thoroughly wetting the seed-bed, proceed in the following manner to remove the plants:—Take a common two-pronged dinner fork, or a stick, sharpened to a flat point at one end; run this down by the side of the largest sized plants (which should be always planted first), with the other hand gather the leaves carefully, and gently lift them out of the ground, so that the roots will not be hurt, and the earth not disturbed around the remaining ones, and only take out as many as can be planted in a short time. As soon as taken up they are laid straight in a basket, and the roots covered, and transplanted at once. This is best done by having two persons to plant, one (a boy will do) to drop a plant at the requisite distance, the other to insert them in the soil. This latter is done by taking plants by the leaves, near the roots, in the left hand, and with a dibble, or with the hand, make a hole where the plant is to grow, by running the dibble down straight; withdraw it, and place the roots of the plant, held in the other hand, in the hole, taking care that the roots are not doubled up, and with the aforesaid dibble push the dirt up to the side of the roots, finish off by pressing the dirt in and around the plant. If the weather is favourable, this must be continued until all is completed, but if there is no rain, nor cloudy days, and trasplanting cannot be postponed any longer, the grower must water the plants at time of transplanting, and cover them immediately after; this requires the additional help of three persons, namely, one who waters, one that puts dry earth around the watered plants so that no lumps will form there, and a third to shade the plants. Transplanting, under these circumstances, can only be done mornings and evenings, and should even be done *only* towards evening. Shading is done with leafy branches, straw, bark, or shingles. After the transplanting, care must always be taken that the plants, until they are rooted, are not suffering from want of moisture, and it may be necessary that they be watered a second time. Dead or weak plants must be removed, and replaced by healthy ones.

In some of the tobacco-growing districts of the United States, the young plants are attacked immediately after transplanting by a large brown or black worm, called the cut worm, and though I have not seen them in this colony, it would perhaps be as well to keep a look-out for them;

you can tell where they have been by seeing a plant with the leaves eaten off and drawn down into holes about the roots, like small ant hills. By poking about a little in the dirt you will find the worm very near the mouth of these little holes. This fellow is quite distinct from what is called the tobacco worm.

WORK UNTIL HARVESTING.

This work is done partly for the benefit of the soil, and for that of the plants themselves. The working of the soil is for keeping it open to the influence of the atmosphere, and to destroy the weeds; experience has proved that only soil that is open and free from weeds will fully develop the plants. Loosening and stirring the soil from time to time is, therefore, not only beneficial but necessary, especially when the soil is hardened by heavy rains, or a crust has formed through other influences, when weeds appear. It is important that the soil should be kept open with the plough, scarifier, or with hand-hoe.

In the rows between the plants, where the working is even more important, it must be done with the hand-hoe. Care must always be taken not to damage the roots, and at the second, and especially the third hoeing, the soil must be drawn towards the plants partly to protect them against storms, and give them a stronger hold, and partly to absorb excessive moisture.

The soil must never be worked while wet. When help is plenty, it is better to dispense with all horse work, the plants can be put closer together, a larger crop is gained, less damage is done to the plants, and, in closing up the accounts, the cultivator with manual labour will not be the loser.

WORMS.

The tobacco having got up to 10 or 12 inches high look out for the green worm which eats the leaves; they are often found earlier. You will see a small round hole, oftentimes no larger than a pin-hole, in the leaf; if you turn it up you will be very apt to discover on the under side a small worm of the diameter of common thread-needle, and half an inch in length; kill him and all his kind, for if left, he will grow to the size and length of your finger, and would not make much of a breakfast of a third of a full-grown leaf. These worms are hatched from eggs deposited by what is called the tobacco fly—it is a large dusky brown-winged miller. The eggs will hatch out in 24 hours. Look out and destroy these eggs; they will generally be found on the underside of the leaf, and near the edge. Much of the value of the crop depends on the care and attention in performing this part of the work; the plantation therefore, should be gone over carefully at least twice a week.

A flock of turkeys, if given access to the tobacco-field, is a very valuable help. A negro from South Carolina told me, some time ago, that a solution of blue vitriol in water, sprinkled over the plants, will kill the worms. The remedy may be worth trying—of course, the solution must be made weak enough so that it will not destroy the plants as well as the worms.—*Australasian.*

ADVERTISEMENTS.

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.
Proprietor.

Calcutta, 1st Feb. 1876.

CONTENTS :

NOTICES TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

CORRESPONDENCE.

THE CENTRAL PROVINCES TENANCY BILL.

TO THE EDITOR.

SIR,—In your issue of November 1, 1880, you have noticed the attitude taken by me with regard to some provisions in the Central Provinces Tenancy Bill ; and you regret that I should have pleaded the cause of the landlords.

It is far from my desire to assist either party to the unjust detriment of the other. Experience has shown me that if the law interferes at all it must make its work complete and effectual. To give a tenant an occupancy right without fixing his rent, is like giving a man a property which is in chancery. The landlord will use the law to enhance the rent, and he will win in the long run. No cultivator can stand the expense and loss of time caused by constant litigation.

This was proved by one experience of Act X. 1859, in the North-West. When the rent law of the N.-W. P. was revised in 1873 I endeavoured in concert with Mr. C. A. Elliott and others to get a provision inserted fixing the rents of all occupancy tenants for the term of settlement. A measure of that kind would have placed some seventy per cent or more of the cultivators in comparative security. The dense population of the North-West, the keen competition for land, and the pitch to which rents had already been raised, justified, I think, if they did not necessitate this measure.

The advocates of this proposal were not strong enough to carry it against the high authorities who opposed it. A compromise was effected which prevented the tenant's rent from being enhanced more than once in ten years, except under certain conditions.

I have not changed my views on this matter since 1873. But the proposal in the Central Provinces Bill, while giving the five-year tenant the embryo as it were of an occupancy right, leaves him open to suits for enhancement of rent every year. In other words it enables the landlord who is so disposed to ruin him ; according to law, it is true, but to ruin him all the same. At the same time it makes him an object of hatred to the landlord. He is the beginning of a more independent being, the twelve-year occupancy tenant, who will be open to little enhancement. He is like a pawn who is being pushed down to the end of the board. In a few moves more it will become a queen.

The Bill certainly meets one of the great evils of the twelve-year rule, by only requiring residence in the village, cultivation of some, not the same land, and independence of the landlord's assistance, The five-year occupancy cannot be stopped by making a tenant change his land. But it can be stopped by making him give up his land altogether for a year, and no doubt there are landlords who will do this It can also be stopped by forcing the tenant to take "assistance"—whatever that may mean. Before he comes to his fifth year, he is at his landlord's mercy. He will be told in his fourth year to take "assistance" or go. For the "assisted" the law has no protection. Another important consideration is this. Heretofore in these provinces the landlords or malguzars, as they are here styled, have very generally supplied their tenants with seed, and also with food in time of need. They take very much the same interest for advances as the money-lenders task. If the advance of seed or food grain at the usual rate of interest is to be called 'assistance,' then this provision of the Bill will have little effect but to excite a mass of litigation. The tenants will claim protection, and the malguzars will win by proving "assistance."

On the other hand if a malguzar who assists his tenants is to gain nothing, in bad seasons these tenants, who cannot stand by themselves will suffer or come upon the State for support.

Even putting out of consideration the facilities which the bill leaves to the landlord for contracting himself out of these provisions, the sections appear to me to breed strife without any corresponding benefit.

Then it must be remembered that some consideration is due to the landlord's view. But a few years ago we took him, only a farmer or thikadar, and made him into a proprietor of land with much sound of trumpet and loud songs of triumph. There is room for thinking that the transformation was a mistake. But has he grossly abused the power we gave him? Do the safety of the State and the needs of justice demand, as they loudly call elsewhere, that his powers should be withdrawn? I think not. In fact land is too plentiful and men too few in the Central Provinces, to give him the opportunity of oppression. The provisions of the Bill savour of an attempt to destroy as much of the settlement with proprietors as it is possible. It would perhaps have been a good thing to make a ryotwar settlement. If it is shown to be a good and necessary thing to revert to that system, I am prepared to support it, on just terms to the landlords. But I do not think it can be said that the present arrangement in the Central Provinces has proved a failure. Are we then justified in passing measures which, if they are to be effectual, must necessarily encroach on the rights and profits which the proprietors as created by our own Government have hitherto enjoyed?

The circumstances of the Central Provinces differ materially from those of the crowded parts of the North-West and Lower Bengal. Malguzars still have to take care of their tenants, and endeavour to get their land brought under cultivation. In order to prevent oppressive practices from growing along with the increase of cultivation, some measures may be needed. Perhaps if an exacting and tyrannical malguzar were made liable to suspension or removal by the Executive Government it might be possible to maintain an efficient check over the avaricious and unscrupulous. It may be doubted whether any good will arise from the fanciful and half-hearted proposals of the Bill.

I remain, yours faithfully,

C. H. T. CROSTHWAITE.

ABOUT PAPER FIBRES.

TO THE EDITOR.

SIR,—In my last letter I proposed to point out some few of the fibres enumerated in Mr. Liotard's Memorandum (Indian Blue-book) which offered a reasonable prospect of success to supplement the supply of paper-making material for our English requirements.

After carefully reading and considering the very voluminous lists of fibres and fibrous products furnished by the various authorities in Mr. Liotard's compilation, I fear there is but faint prospect that any single one of the fibres therein referred to can be imported into England *in its purely raw or natural condition*; and this simply from the fact of the heavy cost for freight alone from any port in India to Europe to say nothing of cost of transport from the locality of production to the port of shipment.

All raw fibres in their natural condition as grown or produced are extremely bulky, and from my present experience I do not believe that any raw fibre can practically speaking be compressed into less bulk than 60 cubic feet, say 1½ ton measurement, and this for freight alone.

Many years ago I erected the first hydraulic presses in Spain for baling *Esparto*, and I then thought I did well in compressing the grass into from 70 to 80 cubic feet to the ton; lately, by employing the costly compound hydraulic presses similar to those used for cotton and jute in India, *Esparto* grass has been compressed into nearly 50 cubic feet per ton.

Assuming such presses to be adopted for any *purely raw fibre* from India, we have still to face the outlay for *freight alone* of from £4-10 to £6 per ton, leaving no margin for cost of collection, internal carriage drying, baling, and other charges to say nothing of profit—I mean little or no margin, unless such raw fibre should be much superior in quality to *Esparto* grass, or Alfa, which now rules the market, the lower grades indeed I may say the greater portion, selling at from £5 to £7 per ton; thus it will be obvious that it is extremely difficult to indicate *any purely raw fibre* that can comply or compete with these onerous conditions.

That there are abundant raw fibres that will meet Indian requirements I doubt not, but so far as supplying the English market is concerned, to ensure commercial success, my conviction is that *any raw fibre* must be subjected to some preliminary process of preparation or treatment to reduce it into a carrying or economically transportable condition.

The only fibrous product from India that as yet has come into the English market, available as a paper-making material, is jute:—known as "jute butts or jute ends," these being the waste ends nearly fiberised, but with fragments of the bark, attached, resulting from the preparation of the long cleaned jute of commerce. I have bought jute butts at £8-10 per ton, but they at present command from £10 to £12 per ton, and being as it were, a waste or by-product, and reduced by compound hydraulic pressing to nearly their weight, secure the minimum of freight, and thus no doubt leave a fair margin of profit to the exporters. These butts are used for a variety of coarse textile purposes, and enter very largely into the manufacture of paper, both in this country and the United States, but, being costly and difficult to bleach, are but sparingly employed for white papers.

Now it is well known in India that long clean jute sells in the market from £16 to £24 per ton, but there are many fibres referred to in Mr. Liotard's Memorandum, which, as long clean fibre fit for spinning purposes, fetch far higher prices than jute, such as Manilla and Sunn hemps aloe, fibre, &c., &c., ranging from £25 to £40 per ton. The tow waste resulting in the preparation of these fibres, if clean and of fair quality would, if available in quantity, fetch a higher price than "jute butts," being superior paper-making materials.

At page 3 of Mr. Liotard's book, reference is made to the crushing rolls I sent out to India for crushing bamboo, and it is suggested that the same, or a machine of reduced size could be applied for crushing plantain stems. No doubt these or indeed any rolls would crush plantain stems, but, unlike the bamboo, the plantain stems would have to be submitted to some subsequent treatment to free the true fibre from the mucilaginous and pulpy mass in which it is embedded. The same treatment would be required for aloe leaves, and other *endogenous* plants of a similar character, and so far as I know the apparatus has not as yet been invented that will perform this operation—to produce the fibre at a sufficiently low cost and sufficiently clean to come into the market as paper-making material. In point of fact all the Manilla hemp, aloe, pita pine apple, and similar fibres have hitherto been produced or prepared entirely by hand labor.

For the *exogenous* fibres, that is, those derived from the *liber* or inner bark existing outside a reedy or woody interior stem, some mechanical arrangements have been adopted to supplement or assist purely hand labor; but these have been confined to the production of long clean fibre suited for textile purposes, the tow waste *only* being available for paper material. To treat such plants purely for paper-making material much more simple mechanical and other means with less labor must be employed to produce the fibre within remunerative limits as to cost.

In most plants the really available fibre represents but a small portion of the bulk of the plant, and, somewhat similar to the gold existing in the quartz veins of India, requires mechanical and other appliances to disunite it from combined extraneous matter, as the pure metal gold is separated from its component matrix.

With the exception of the grasses, reeds, or sedges, very few fibrous plants, either *endogens* or *exogens*, yield more than from 9 to 15 per cent (of pure fibre. For example, neither the plantain stem nor the aloe leaf (both *endogens*—inside fibre producers) will yield more than from 9 to 12 per cent pure fibre, while hemp and flax, illustrating *exogens* (outside fibre growers), yield only from 12 to 15 per cent. In other words it requires on an average 7 tons flax straw to produce 1 ton flax fibre.

It will be obvious, therefore, that—putting on one side the yield to the acre if cultivated, or, if a wild plant, the cost of collection—considerable expenditure must be incurred even to reduce any *raw fibrous plant* into a condition to enable it to be transported economically to Europe from India, whether it be for textile purposes or paper-making. And equally clear is it that, as the selling price of such prepared fibre for paper-making material must be low in order to compete favorably with the existing materials employed, such cost of preparation, with freight and carriage added, must not exceed the value the said fibre will realise in the market.

The question therefore is while describing such fibrous plants as will yield *paper-making material* to point out those from which resulting fibre can be prepared at a cost likely to command commercial success, that is, to pay both the producer and importer,

THOS. ROUTLEDGE.

Claxheugh, 27th October 1880.

THE *SORGHUM SACCHARATUM*.

TO THE EDITOR.

SIR,—I am anxious from the description given of "A New Cereal" in your July issue of the *Indian Agriculturist*, to make a trial of it here. I should feel greatly obliged if you will kindly tell me where and to whom to apply for a small quantity of *Sorghum Saccharatum* or "A New Cereal," and also any information regarding it.

O. G. S.

Mysore, 18th November 1880.

NOTE.—We believe the seed of the *Sorghum Saccharatum* is not to be had anywhere here, but doubtless our correspondent would be able to get a small supply by applying to the Superintendent of the Saidapet Farm, Madras. Some useful information regarding the growth and culture of the *Sorghum* will be found in "The Saidapet Manual," p. 40.—ED., *I. A.*

INFORMATION WANTED.

TO THE EDITOR.

SIR,—A correspondent in Switzerland writes to me for the seed of the "Dschugara" or "Schugara," a forage plant for cattle. Could you inform me where it is procurable, or if it is known under that name in this country. Apologising for troubling you—

H. W. N.

NOTE.—So far as we are aware the plant is not known in this country by that name, and unless our correspondent can give us the botanical name, it is impossible for us to trace it.—ED., *I. A.*

DATE COFFEE.

TO THE EDITOR.

SIR,—With reference to a paragraph in your last issue about Date Coffee, will you kindly explain what is Date Coffee, and why was Bussorah selected for its manufacture? I thought dates grew only in Arabia.

AN INQUIRER.

NOTE.—The date tree is abundant in Persia, Arabia, Egypt, Barbary, and the adjacent countries, wherever there is sufficient moisture. The coffee is made from the stone or kernel.—ED., *I. A.*

JUTE.

TO THE EDITOR.

SIR,—Glad I am to see that Jute Mill shares are going up after their long depression, which must be giving comfort to the hearts of those holders who bought at or near par years ago.

But although there has been a marked advance with regard to the Barnagore, Budge-Budge, Seebpore and others, yet it is not so much as might have been expected in view of the great demand that must arise for gunny-bags consequent on the passing of the Grain Shipping Bill at home, whereby grain must be loaded in bags and not in bulk, as formerly. This must surely cause an immense sale of the stocks, and I should think keep the Mills fully employed at good paying rates.

I never doubted the ultimate success of such Jute Mills as were resting on good foundations, and now that they are emerging from their trials and troubles, they are showing that life which I was certain was in them, and which only wanted an opportunity to burst forth.

A. W. B.

November 23rd, 1880.

RED ANTS IN COFFEE.

(To the Editor of the Ceylon Observer.)

DEAR SIR,—Could any of your numerous correspondents suggest an effectual remedy for red ants in coffee? At low elevations and in fine coffee they establish themselves and rapidly spread from tree to tree, and entirely prevent the coolies doing any work in the neighbourhood of the trees affected. I have tried syringing the trees with carbolic acid and water almost strong enough to burn the leaves, but the ants do not seem to mind this in the least. I am frightened of fire, or I would try smoking them out, but I doubt whether even sulphur would do.—I am Sir, Yours truly,

INQUIRER.

Trevandrum, Travancore, October 14th, 1880.

II.

SIR,—In answer to your correspondent from Travancore who asks the best way to get rid of red ants in coffee, I advise him to put a blazing wisp of straw under the nests. I don't mean that a fire should be kindled, but the blazing wisp of straw be held for a little time under the nests. Unless in very dry weather there can be no danger in the above plan. I have tried burning sulphur, kerosine, carbolic acid, and hot water. Smoke is no good. Flame is the only thing. They can't stand a good flame. They find that uncomfortable.

PURE FLAME.

III.

SIR,—In answer to your correspondent from Travancore, unslaked coral lime thrown into the trees by hand, a couple of handfuls to a tree, will disperse red ants,—Yours faithfully,

H.

MANURING CINCHONA.

(To the Editor of the Ceylon Observer.)

DEAR SIR,—Referring to the subject of manuring cinchona and its results, there can be no doubt about it that digging in bulk (with half b.of artificial manure, poonac, castor, and bones per tree) has a wonderful effect upon the *growth* both of young plants which were "sticking" and the more mature four and five years old.

And the digging in of lime alone shews very sensible results; whether an increase of alkaloids accompanies the quickened growth can, I suppose, only be *proved* by analysis. Can you judge at all by the *taste* of a strip of bark? For I have found that covering of the stem of a *succi-rubra* cinchona tree with gunny bags to the height of five and six feet, has a marked effect. By taking a narrow strip of bark, half from below the sacking and half from above, and tasting both ends, you can tell which was under covering by the increased bitterness. Does this show an increase of alkaloids?—Yours faithfully,

TASTE AND TRY.

October 22nd, 1880.

[Certainly, the taste is a fair indication so far as it goes: in very poor, or worthless barks there is scarcely any bitterness perceptible.—ED., *C. O.*]

MANURING CINCHONA AND CINNAMON.

(To the Editor of the Ceylon Times.)

SIR,—I have noticed in one of the local papers some remarks on the subject of manuring cinchona with an attempt to draw a comparison between the effects of that cultivation and similar experiments with cinnamon. The writer of those remarks laboured under the disadvantage of not being aware of the very different conditions under which the formation of the properties of the two barks takes place. In the one those properties consist of alkaloids deposited through the action of the roots and the sap in the other case the qualities for which the bark is valued, consist of an essential oil, in the formation of which the action of the solar rays is absolutely necessary. In the case of cinchona the de, ont of the alkaloids is hindered by too great an accession of light, whilst in the other case the formation of the essential oil of cinnamon on which the value of the bark depends, is only carried on by means of the solar rays. Cinnamon grown under deep shade possesses little if any flavour, for this reason that the absence of the action of solar light has deprived it of the essential oil in question. It is for this reason that what is known as jungle cinnamon is of so little value, that description of the spice is of precisely the same variety as the plants grown in the preserved plantations, having been propagated by means of seeds dropped by birds in the jungle, but having grown in the deep shades of the forest the bark has acquired no essential oil, and is therefore flavourless.

Now this being the case, it follows that the larger the surface of cinnamon bark exposed to the action of solar rays, the more essential oil will be formed within it, hence the use of suitable manures to aid the growth of cinnamon, tends to extend the surface of the plant, and the idea that manure produces a coarse bark, can only be justified where the soil is unsuitable to rapid growth, even with the help of manure. It is well-known to those few cinnamon cultivators who have given any attention to the subject that a great deal of the effect of high cultivation depends upon the kind of manure employed and the description of soil in which it is used. I may mention for instance that it is a great mistake to use stable mannure or the manure of pigs or any of the phosphates upon cinnamon grown in heavy stiff soil; on the other hand the greatest advantage will arise from using cattle manure, ashes or decomposed poonac on cinnamon growing in light or even sandy soil. In such cases the effect of manure is certainly not to produce a coarse bark, but on the contrary by causing the sticks or shoots to grow rapidly upwards to encourage the formation of a thin and delicate bark of highly aromatic property, provide it be grown away from heavy shade.

Not only is the use of manure of a proper description very beneficial to cinnamon, but I have seen the greatest advantage derived from loosening soil about the roots of cinnamon bushes.

CULTIVATOR.

SELANGOR AS A FIELD FOR PLANTERS.

(To the Editor of the Straits Times)

SIR,—I have often wondered why the sister State "Perak" should be more sought after as a field for planters than the State of Selangor, with its great, if not superior, advantages and its acres of beautiful virgin soil, and that, a great part of it, of a fine black and red loam nature and I should say certainly adapted to the growth of tobacco sugar, tapioca, &c. Inspection will, I am sure, do away with any question as to the land being suitable for the successful culture of the above-named products; the intending planter has only to be careful in his selection. As to that most important item towards the success of a planter, that is, the means of conveying goods to and transporting produce from his estate to a suitable market or for transhipment, I submit that the district of Klang, and the vicinity of its town Pencalian Batu, (Klang) the former head-quarters of the Selangor Government

offers the most, to say the least of it, encouraging advantages to intending planters. There are three steamers weekly keeping up a regular service between Singapore and Klang and *vice versa*, and every alternate week the *Pyah Pokhet* makes her usual trip from Singapore to Penang and *vice versa*, calling at all ports in the Native States. I am further informed that the Salangor Government is making a road direct from Pencallan Batu (Klang) to its present head-quarters at Kwala Lumpur; such a praiseworthy movement as this cannot be too highly estimated.

Labor and the means of procuring it may become a question with the intending planter; but I should anticipate no scarcity under this head as coolies arrive at "Pencallan Batu" by every steamer, and it would be a matter of very little difficulty to obtain through an agent in Singapore any quantity of coolies (Sinkies or new arrivals) from China, and who by the way, I think, are most useful men on an estate. Most of them are good gardeners in their own country, and from my little experience I am convinced as to the superiority of the Chinese as labourers, but would suggest a gang of Javanese and Klings working with them as having a most decided effect to keep them orderly. So much for the labor question. The intending planter has, I submit, only to keep his coolies under strict and just control, which will be effected in a great manner by paying their wages at stated and regular periods, to reap the benefits incumbent upon a well managed estate.

As regards materials for building purposes, &c., I can only state that the district of Klang offers peculiar advantages. The intending planter can put up his various sheds at quite a moderate cost as compared with Deli and other places in Sumatra. I have only to mention the low price of Attaps, $6 00 per 1,000, to prove the above. The Land Regulations issued and at present in force under the Selangor Government appear to be fair in their construction, but I should advise the intending planter to place himself in direct communication with H. B. M.'s Resident at Kwala Lumpur, and that gentleman will I feel sure be only too pleased to give every assistance to and encourage the legitimate and intending planter.—Yours faithfully,

CASSAVA.

Singapore, 29th September 1880.

THE SOIL OF FIJI.

(To the Editor of the Ceylon Times.)

SIR,—To those desirous of information about Fiji, the following analysis of a sample of soil, recently received from Mr. W. Fullingham Parr may be interesting. It is from Great Amalgam Estate where leaf disease first made its appearance in Fiji. The sample was taken from different depths, and represents the composition of the soil [illegible] surface to a depth of three feet.

		Per cent
Water expelled at 212 F.	... .	3 990
* Organic matter and combined water	... ...	12·848
Peroxide of iron and traces of oxide of Manganese	...	6·020
Protixide of iron	... ...	·887
Alumina...	... ...	11 090
Lime ...	... ...	·199
Magnesia	... ...	·065
Potash ..	... ...	·096
Soda ...	... ...	·063
Phosphoric acid	... ...	·128
Sulphuric acid	... ...	·008
Chlorine	... ...	·026
Carbonic acid	... ...	Trace
Soluble Silica	... ...	·194
Insoluble silicates	... ...	64·386
		100 000
* Containing nitrogen	... ...	·201

The chemical composition of the portion extracted by acid is, on the whole, very similar to that of our Ceylon soils. The percentage of lime is low; but higher than in most of the Ceylon soils that have been analysed. The amount of potash is about the average of that in our own soils, while the phosphoric acid is higher than our average. The percentage of nitrogen is fair. The insoluble residue, freed from organic matter, differs from that in Ceylon coffee soils. In the latter there is a large percentage of quartz crystals, while that from Great Amalgam estate consists of white clay with no admixture of quartz crystals. Although there is less alumina in the acid extract, the soil is nevertheless more argillaceous than any of the Ceylon soils submitted to me.

In making this comparison, however, it is to be remembered that the Ceylon soil analysed within the last three years have been chiefly if not exclusively surface soils.

In the loose state of sample, the soil required nearly 40 per cent. of its weight of water for complete satisfaction, six samples of soil, from Windsor Forest Estate and neighbourhood, varying from very quartzy to fine dark earth, took respectively 17·7, 26 1, 30 1, 33 5, 35 6, and 37·1 per cent. of water for saturation.

The reaction of the soil was distinctly acid, the sourness probably being chiefly in the subsoil. For acidity an application of lime is the remedy, assisted by more efficient aëration of the soil by tillage.)

M. COCHRAN.

Gas Testing-rooms, Colombo, October.

PAPER-MAKING INDUSTRIES IN CHINA; AND CEYLON WASTE PRODUCTS.

(To the Editor of the Ceylon Times.)

SIR,—The Commissioner of Customs at Wuhu (China) in a report recently issued, states that paper is very extensively manufactured in the numerous little villages situated in the valleys among the hills about eight miles to the south-east of the city of King-hein. It is made from the bark called T'an Shu-p'i, the paper-mulberry tree bark, and wheat straw, which, after having been well washed and boiled with a certain proportion of lime is again washed, and then exposed to dry on the side of the hills. After this exposure, it is washed once more, and then pounded on a stone with a large wooden hammer. It is supposed to require 1,400 blows from this hammer to reduce it to the necessary consistency; after which it is removed to another building, and left to soak until it becomes quite a pulb, in a large eathenware vessel containing liquid glue made from boiling the branch of a tree called Yangkowt'eng, a species of hooked vine. This pulp is then put into a cistern of water, and well stirred up with a stout stick. A finely made bamboo frame, or a sort of long oblong sirve, is taken by two men, one at either end, and dipped twice into this liquid, which is made to run equally over the whole surface, somewhat after the manner in which a photographer allows the developing solution to run over his plate. By these means a tolerably even layer is left, which soon partially dries and forms the sheet of paper, which is removed by simply reversing the frame; as soon as a sufficient number of sheets have been made, they are taken to the drying room. This room contains a large brick oven, coated on the outside with lime, and built up to within a few feet of the roof. Upon the top of this oven the paper is placed in parcels of about a foot in thickness, until perfectly dry; after which sheet by sheet is damped once more, and while still moist is, by means of a soft brush, made to adhere to the sides of the oven for a short time, to undergo its final process of drying. It is then taken away to the packing room, and made up into bales weighing from 80 to 120 catties each, the catty being equivalent to 1⅓lb. avoirdupois. The largest sized paper is one *chang* (11⅔ feet) long, and is worth one dollar a sheet. This particular size of paper is made entirely from the "Tan-shu-p'i," but the smaller sizes are composed of a mixture of the above-named bark, or the bark of the paper mulberry tree and wheat straw. This paper is known by the name of "Suan-chih," and is considered a good quality paper in the Chinese markets.

Why should not a similar process answer with the waste products of Ceylon, such as:—managrass, cinchona, and cinnamon sticks, &c., &c.

YANGKONT'ENG.

Colombo, October 6.

The Indian Agriculturist.

CALCUTTA, DECEMBER 1, 1880.

TEA STOCKS: INDIA A MARKET.

FEW subjects are of more interest to those concerned in tea, than that of the state of stocks in London. Stocks which were 13,300,000lbs. on 31st October 1879, were 17,000,000lbs. on the same date this year; deliveries for consumption during the first ten months of the present year were 33,000,000lbs as against 29,500,000lbs for the corresponding period of 1879, an increase of 3½ million pounds or nearly 12 per cent while imports were 34,023,941lbs in 1880, against 27,8[illegible],554lbs in 1879, an increase of 6,167,387lbs or over 22 per cent. Hence the unhealthy state of stocks. It is no doubt a gratifying fact that consumption has made such strides, and it is re-assuring as regards the future: but there is another

feature which we shall notice by and by. The following table gives the average consumption of the first ten months of each year from 1878 to 1880, and the number of month's stock on hand on 31st October :—

	Average monthly consumption. lbs.	Months' supply in stock.
1878	3,000,000	3½
1879	3,000,000	4½
1880	3,300,000	5½

The average increase in consumption would appear from this to be at the rate of 5 per cent. Taking a longer series of years into consideration, however, we find that consumption has steadily increased at the rate of about 12½ per cent. This is very encouraging, and there are not wanting signs that this average ratio is gradually increasing. When we come to look at production, we find the true clue to the present depressed state of the market. The imports in London during the last three years have increased at the rate of over 16 per cent per annum, thus much more than keeping pace with the consumption; and until consumption exceeds production, we need not look for any material change in prices. There are two ways whereby stocks can be reduced, *viz.*, by confining manufacture for a few years to the very finest qualities only, and by finding new markets for our produce. Both are within the reach of possibility, and both are calculated to effect a cure for the present state of the tea market. On the first mode we have on a former occasion offered a few remarks, and shall therefore now look into the second. Efforts are being made, and not without fair prospects of success, to open out a market for Indian tea in Australia, and a local contemporary has a letter suggesting Canada as a new field; and doubtless other places will gradually be considered as within the reach of Indian tea. We, however, desire to draw attention to a market much closer to our doors, and that is India itself.

The caste prejudice which prevents natives of this country indulging in European diet, is entirely wanting in regard to tea. Our servants all use it, and so do all natives when they can contrive to get it cheaply or for nothing. We are all familiar with the request for a little tea when any of our servants are sick. We have therefore a good basis on which to go. The only obstacle in the way of this stimulant becoming a common article of diet is the poverty of the people. From this we do not wish to argue that we should offer them our tea at half price because they cannot afford to pay the full price. There are other ways of meeting the poverty of the people. Tea is a luxury to them, and so it would be to the great bulk of the people of England if they could only purchase it in large quantities. If this be true with reference to the people at home, how much more true is it of the poorer classes here, who for all practical purposes constitute the entire population. Now to meet this difficulty at home, tea is sold in small quantities. The poor people who cannot afford to purchase this article in large quantities would never taste it were this concession not made. And they can purchase as small a quantity as a quarter of an ounce. This is exactly what we want here. We could not very well sell such infinitesimally small quantities, but there is no reason why a cheap class of tea should not be made up in one ounce packets to meet this demand. Large quantities of China tea arrive in India every year, the average annual imports being over 2,000,000lbs., and if the Indian tea business were only conducted so as to meet the wants of the poorer classes very little tea would come from China. This latter tea is freely purchasable in 1 and 2 ounce packets, but if one wishes to buy Indian tea he must purchase at least one pound. At first, broken teas and dust might be placed on the Indian market in this way, and as these low qualities represent about 10 per cent. of the total export to Europe, it will easily be seen what a relief this would afford the London market. If Congous could also be disposed of in this way, the relief would be equal to about six or seven million pounds per annum. The tea could be sold at three pice per ounce, which would more than cover value of tea and cost of wrapping up in small packages. Congous could be sold at one anna per ounce, in the same way. If the mass of the people would only be induced to turn their attention to tea, the consumption would be enormous, one ounce per annum per head representing fifteen million pounds. We trust the tea interest will think well over this, as nothing would bring such certain and speedy relief to their financial position.

TEA COOLIES IN ASSAM.

THE Resolution of the Government of India on the Assam Labour Immigration Report for 1879 has just been published, and as it contains much matter of interest to a number of our readers, it may be worth while briefly to review it. The total coolie population of Assam on 31st December 1879 amounted to 148,104 souls. Against this the figures for the three previous years (1876-78) were 135,807; 157,074, and 178,095 respectively. These three years show a steady increase in the total labouring body, though the importations during 1879 were far below those of the preceding year. The total importations for the year, including coolies not under the Act (VII. B.C. of 1873), were 24,712 persons as against 43,061 in the previous year. This gives a decrease of no less than 42 per cent., and we are told it was large under every class, including contractors' coolies, those recruited by garden sirdars, and adults and others not under the Act. This circumstance is attributed to—(1) the good harvests in the recruiting districts, which made the coolies unwilling to emigrate; (2) the reluctance of managers to accept recruits from the North-Western Provinces, owing to the mortality amongst this class in the previous year; and (3) in some measure, to the more economical working of all gardens consequent upon the fall in the price of tea. But, viewed in the abstract, this heavy decrease is apt to mislead, and it is therefore worth mentioning that it appears generally o have been the case that the importations of the year fell short of the demand. What is sadly wanted in Assam, however, at present is, as we have often urged—improved communications. Probably nothing will do more to cheapen, and therefore to increase, immigration into Assam than this. The subject has been discussed on and off for the last eight years, but as yet no practical results have ensued. Still, we live in hope, and the past year has perhaps brought us nearer to a tangible solution of the difficulty than has ever hitherto been the case. The subject of improved communications has, in fact, received considerable attention from the Chief Commissioner, and we see that Sir Steuart Bayley has recently submitted to Government a comprehensive review of the whole question of establishing an accelerated steam service on the Brahmaputra; and in the event of such a service being set on foot between Dhoobree and Gowhatty, he has asked the Government of India for aid so as to enable him to extend it higher up the river. This request, we are told, is "still under consideration." It will be remembered that the members of the Assam Tea Districts Association memorialised the Government in the course of the year, on certain matters connected with their industry. We now learn that on receipt of their petition the Government of India consulted the Chief Commissioner of Assam and the Government of Bengal on the desirability of appointing a Commission to investigate both the limited question of the working of Act VII. and the more extensive subject of free immigration generally. Concerning these the Report tells us :—

"It has been determined that these two questions shall be kept entirely distinct, that a Commission, whose duties will be confined to the first question, shall be appointed; and that this Commission shall be required to frame a draft Bill for the amendment of the Labour Law. The precise constitution of the Commission, and whether it is to be a stationary or a peripatetic body are points which have yet to be determined."

But this is not all. There are several other matters which may appropriately be brought to the notice of the Commission when it has assembled; such, for instance, as the importation of coolies under verbal engagements, the proposed extension of the term of contract from three to five years, the suspension of the contract during imprisonment, the provisions of the law regarding the diet and wages of immigrants, the operation of Act XIII of 1859, &c., all of which are referred to in the present Report. As we stated a day or two ago the Commission will sit during the present cold season.

We now turn to matters relating to the general welfare of the coolies during the year under review. We are glad to note some improvement in the matter of desertions, though the figures are still very high. The number of desertions in 1879 were 5,885, as against 7,515 in the previous year. Upon this subject we are informed that—

"The Secretary of State has expressed his concurrence in the view stated by the Government of India in remarking on last year's Report, that no special proceedings need be taken by the Government to check desertions so long as the tea-planters do not seek its intervention. But the Governor-General in Council agrees with the Chief Commissioner that the systematic enticement of coolies, alleged to have occurred in south Sylhet, is a very different matter from mere ordinary desertion, and that, if it be true, the offenders should be punished according to law."

It is difficult to assign any particular reason for the desertions, beyond the comparative ease with which they can be effected and the relative difficulty of detection. But we suspect there is also some connection between the death-rate and the percentage of desertions though the affinity probably is not close.

As regards the mortality it is satisfactory to observe that in the labour districts generally there was a very considerable decrease amongst adults. The total deaths were 6,695 against 8,072 in the previous year. But the actual improvement was confined to the Act VII. coolies, who shewed a diminution in every district. Among non-Act coolies the death-rate, though not in itself high, shewed a slight increase, owing to a somewhat greater mortality in the districts of Cachar, Durrung, Nowgong and Luckimpore. A comparison of the death-rate in the different districts with the proportion borne by newly imported coolies to the total labouring population, indicates, as was the case last year, a general connection between recency of arrival and mortality. The first four districts (excepting Kamroop which is comparatively insignificant) both in respect of mortality and importation, are Nowgong, Durrung, Sibsaugor, and Luckimpore, and the last two Sylhet and Cachar. Looking at the statistics it is noticeable that the exceptional mortality which occurred amongst the Madras coolies in 1877 has not recurred, and that the death-rate amongst Act VII. coolies from the N.-W. Provinces and Oudh and Behar has greatly diminished. In the case of coolies from the last-named localities the improvement is no doubt due to the order passed by the Chief Commissioner (in consequence of the very serious mortality which occurred in 1878), prohibiting the introduction of unacclimatized coolies into certain gardens in Cachar. This measure seems to have had good effects in various ways, and the Government of India agree with Sir S. Bayley that the province of Assam "is not unsuited to labourers from Madras and the valley of the Ganges, provided that due care be taken to prevent the emigration of coolies reduced by want, and to supply new arrivals with a suitable diet."

But notwithstanding the general improvement in the death-rate amongst coolies from the N.-W. Provinces, the mortality in particular districts (Durrung, for instance) and in certain gardens was lamentably great. It is presumed that the causes of this will be fully investigated, if not already ascertained. In two gardens, in the Nowgong and Luckimpore districts, the death-rate of the second half of the year was 16·52 per cent. and 39·21 per cent. respectively, the explanation given in both cases being that the coolies received were "inferior in physique." We do not think this explanation by any means adequate or satisfactory, especially as regards the extraordinary figures (39·21 per cent.) for the Seelonee garden. We have but to compare it with the average mortality of the district, 5·73 per cent., or, even with the average of the whole of the seven districts, which was under 6 per cent., to see how anomalous the figures are. The matter should be inquired closely into. There have been complaints recently of the importation into Assam of an inferior type of coolies but we think the Government are right in repudiating any responsibility therefor. As the Chief Commissioner of Assam expressed himself, in a recent report on Inland Emigration, "the responsibility of selecting physically fit labourers ought not to rest upon any Government officer, but on the agents and representatives of the Employers," and we observe from a recent Calcutta *Gazette* that Sir Ashley Eden entirely concurs in this view.

From deaths we turn to births. The total number of births reported was 4,996 or a decrease of 510; but there is reason to doubt whether all the births have been registered. Even admitting that, however, it seems almost certain that the births are largely exceeded by the deaths amongst the general coolie population. The average number of women in the province increased during the year, but the proportion of births to the number of women varies so much amongst different classes and different localities (from 4·13 to 10·01 and 15·78) that, we are informed, no certain inference can be drawn from the figures. Infant mortality was less severe, falling from 1,776 to 1,472.

The number of tea-gardens during the year rose from 913 to 1,040, though the greater part of this increase is nominal, being merely the result of a revised classification. The duty of official inspection of gardens seems as a rule to have been sufficiently performed, there having been in all 804 inspections against 636 in 1878. These figures appear more favorable when we remember that they refer only to gardens employing Act VII. coolies. There are a large number of gardens in the districts of Nowgong and Durrung employing coolies not under the Act, and which, therefore, were not inspected. But "the Governor-General in Council concurs in the opinion of the Chief Commissioner, that opportunity should be taken to visit such gardens, even though the law does not at present make their inspection compulsory." During the year 2,457 acres were taken up for cultivation by time-expired labourers in the different districts, excluding however Sylhet and Kamrup, where, for reasons not stated, no information is available. This tendency on the part of the coolie population to settle down in the province is of interest and importance, and we are glad to see it is receiving attention. The Governor-General in Council asks for statistics to be incorporated in the next Annual Report. The Resolution we are noticing concludes with a paragraph on the Dhubri Immigration Report on the desirability of collecting statistics regarding the free immigration into the province. It is, we are told, necessarily a matter of much difficulty to ascertain the number of labourers emigrating to Assam otherwise than under supervision; but it is intended during the current year to attempt to register the free immigrants at Dhubri for the Assam Valley, and at Bhoirab Bazar for the Surma Valley. If the attempt prove successful, we are promised details in the next Report.

THE FIVE YEARS' AGREEMENT.

It is matter of regret that the proprietors of tea in Cachar, Assam, and Sylhet, cannot contrive to agree as to what they want done with Act VII, of 1873 (B.C.). For years they have been agitating in a spasmodic and disjointed fashion, letters now and again appearing in the Calcutta papers. But no sooner did a letter appear complaining about a grievance, than a rejoinder, also from a planter, appeared disputing the ground taken up by the former writer. Commissions have from time to time been appointed to bring all these matters to a focus with a view to submit a united memorial to Government, but the result has usually been *nil*, principally from want of agreeance among those interested in tea. Notwithstanding the protest of our esteemed correspondent in our October issue, we must adhere to the view that we have taken—that there is a diversity of opinion on most of the points considered grievances. On none of these does there seem to be such divergence of opinion as on the propriety of adopting the five years' agreement. At present the term of agreement is three years, and a large majority of those interested in tea are in favor of extending this term to five years. There is, however, a minority who manage to make themselves heard and who do not approve of the proposed change. To us it seems indisputable that the five years' term should work more satisfactorily for the planter, while being equally fair to the coolie. The great stock argument against the proposed change is in speedy process of being annihilated. It was said that the length of the term would tend to frighten labourers from coming to the tea districts at all; but this—never a good argument—is absolutely without point in the present day. The improved communications between the recruiting districts and Assam, are leading to large numbers of labourers finding their way up the valley without any recruiting at all. During the last five years, from 1875-76 to 1879-80 inclusive, the numbers of this class registered at Dhubri each year have been 2,888; 3,719; 9,870; 10,270, and 7,957 respectively. This will very speedily place the planter in a position to dictate terms, and will make a more lengthy engagement quite possible. Cachar and Sylhet will by

and by have their communications improved in like manner, and hence this objection against the five years' agreement falls to the ground. We do not argue that the planter should insist on it, because he is now in a position to do so. This would be unfair. We are, however, convinced that it would be better for the coolie as well. It may be urged that the bonus he gets for re-engaging at the end of his term of three years, would under the new arrangement not be at his disposal for five years. This is beside the question, as the bonus system is itself an anomaly and will speedily have to be abolished if the industry is to survive. Under the present depressed state of the industry, all such unnecessary expenses will have to be excised. The advantages of a five years' term as against a three years' are many, the principal one being that during the long currency of the agreement the labourer gets attached to the estate and as a rule will settle down on it as a permanent labourer. There are of course many other advantages which are self-evident and need not be enlarged on here. It is worthy of note that the five years' term is in force with regard to coolies forwarded to the West Indies and to other colonies, and the only difference between the two forms of agreement lies in the fact that the Colonial Government is bound to bring the coolies back to the port from which they started. Such an arrangement is unnecessary with reference to inland emigration, as the labourers can easily find their way back to their homes if so disposed.

RICE MILLS IN RANGOON.

THE rice trade may be fairly called the most important, and perhaps the most lucrative trade in Rangoon ; there being no fewer than eighteen firms engaged in milling rice, while four new mills are being built. Those at present working are as follows :—

Messrs. Bulloch Brothers & Co., who own four rice mills.		
" W. Strang, Steel & Co., " "	1 " "	
" Rowet & Co., " "	2 " "	
" Mohr Brothers & Co., " "	2 " "	1 building & 1 working.
" Todd, Findlay & Co., " "	1 " "	
" Schumacher & Co., " "	1 " "	
" Bosworth & Co., " "	1 " "	
" Gerber, Chestien & Co., " "	1 " "	
The Bombay and Burmah Trading Corporation, Ld.,	1 " "	
" Kruger & Co., " "	1 " "	
" Stohman & Co., " "	1 " "	
" Mower, Burn & Co., " "	1 " "	
" Dickmann, Burckhausen & Co., " "	1 " "	
" Burjarjee & Co., " "	1 " "	
" Leak Chin Seng & Co., " "	1 " "	
" Kho Khin & Co., " "	1 " "	
" Koo Kwet Nee " "	1 " "	
" Moung Pho Mien & Co., " "	1 " "	
NEW MILLS BUILDING.		
Messrs. Halliday Brothers & Co., " "	1 " "	
" Mohr Brothers & Co., " "	1 " "	
" Ainsley, Warren & Co., " "	1 " "	
" Hashimariff Brothers & Co., " "	1 " "	

With the exception of three at Kemendine, and one at Dalla, all these mills are situated at or near the Poozoundoung creek which is the great market for paddy. The paddy brought to Rangoon is divided into three principal kinds known as *Ngatsaing*, *Nghchouk*, and *Boyoot*. Of these the *Ngatsaing* paddy is by far the best ; it has large broad grains, dark in colour with a fine pearly kernel. The *Nghchouk* has light coloured grains, long and narrow ; often the husks are only partly filled which makes it less profitable to mill than the Ngatsaing paddy. The *Boyoot* has small grains, in appearance like *Ngatsaing* only smaller, and has a beard-like barley. The Burmese prefer the rice made from *Boyoot* paddy to any other.

The paddy is brought down the river in boats by Burmese boatmen, who being shrewd fellows, and delighted at the opportunity of doing a little cheating, require no small amount of tact in dealing with them. In this respect, however, some of the merchants are not much behind them, and altogether the paddy trade cannot be considered a very straightforward business, as may be gathered from the remarks of the late Chief Commissioner when commenting on the evidence adduced in the case of Mower, Burn & Co. *v.* Burjarjee, in which he strongly deprecated the practices of using spring bottoms to the baskets, scooping, &c., &c.

The paddy is always sold by measure at so much per 100 baskets. A basket is supposed to contain fifty pounds weight of paddy, and should be 15 inches diameter by 15 inches deep. The price per hundred baskets varies from Rs. 90 to Rs. 120 ; generally it is about Rs. 95. The paddy is measured by Burmese measuremen who are paid so much per hundred baskets by the boatmen ; but the former are appointed by the mill-owner, who sometimes exacts a certain proportion of the earnings as payment for the privilege. During spring tides when paddy is plentiful, the boats generally come direct to the mills to sell their paddy ; but when paddy is scarce, the boats are met some distance up the river by cargo boats, and the paddy when purchased is transferred to the cargo boats and by them brought to the mills. In all these transactions Burmese brokers are employed and paid so much for every hundred baskets of paddy they obtain.

Now, to understand how the paddy is made into rice, let us suppose that a boat of paddy has arrived at the mill, and follow it through the different processes. After being measured by the measuremen, it is carried by coolies into the godown, or, if the paddy is coming in slowly, directly into the mill. At the commencement of the year these coolies contract to land all paddy for that year at so much per 100 baskets. The paddy having been emptied into a hopper in the lower floor of the mill, is, by means of an elevator, lifted to the top storey of the building, where it is generally sifted either in a reciprocating or revolving sifter to free it of any dust, stones, sticks, &c., which may be mixed with it ; sometimes this preliminary sifting is omitted, but it should always be done as it greatly saves the mill-stones. After being sifted, the paddy passes through wooden pipes to the hulling stones on the floor below, for the purpose of getting the husk removed. Till lately this operation consisted of passing the paddy between two circular pieces of hard gritty stone, about four feet six inches in diameter, and about four or five inches thick, the bottom stone being fixed, while the top one, being suspended by a rynd on the top of the spindle, revolved over the bottom or fixed stone, at a speed of about 200 revolutions per minute. The paddy being run into a hole about one foot in diameter in the top stone, found its way between the two stones, and before escaping at the edges most of the grains thus had the husk removed. Within the last three years, however, a great improvement on the old plan has come into use, which, although not at all popular at first, has now proved itself to be far superior to the old method in every respect. It is much cheaper in first cost, turns out a larger quantity of rice, and much better quality, and gives much less trouble as it will run for three or four weeks without attention, whereas the old stones had to be dressed every three or four days.

In the new plan the stones are replaced by cast iron discs, and instead of the bottom stone being fixed and the top one made to revolve, the reverse is the case, for the bottom stone revolves and the top one is fixed. The bottom disc being firmly secured to the spindle, is much more steady in its action than the old-fashioned plan where the top stone merely rested on the spindle and depended entirely on its own weight for steadiness. The working surfaces of these discs are covered with a layer of a sort of artificial stone known as Carbutt's cement which consists principally of a mixture of emery powder and magnesia, applied in a soft state ; when dry, it forms a very hard durable material much superior to stone, which indeed it excels in every respect but one, *viz.*, that it is affected by damp and is apt to warp and come off if not protected and kept warm when not in use during the rains. The surfaces of the stones used in hulling rice are flat, not grooved as in mill-stones for making flour. In passing between the two stones, the husk of the paddy is rubbed off, and the rice and husk come out at the edges. This is next elevated to the top of the mill by means of another elevator, and passed over a winnowing machine to remove the husk. The winnowing machines usually consist of three sets of revolving fans, placed one above the other, the rice passing in front of each : any rice which may be blown out is collected and passed over another set of fans.

The rice after coming from the farmers, is what is known as "five part" or "cargo rice." It consists or is supposed to consist of five parts of rice to one of paddy, and contains a little broken rice. In some mills this is removed by sifting, but since the introduction

of the new hulling stones, the proportion of broken has been so much reduced as to make it hardly worth taking out. The rice, if intended to be shipped as cargo rice, is next run into a hopper which opens into the bagging shed where it is weighed into bags of 225lbs. or 230lbs. each; these on being removed from the scales are examined by the party for whom the rice is being milled, and, if not rejected, are sewn up. The sewing is generally done by Burmese women and girls who are paid so much per 100 bags. The bags if not intended for immediate shipment, are now removed to a godown and stowed away; this work is done by coolies who contract by the year to stow away and ship into cargo boats when required at so much per 100 bags. So much for cargo rice in which the operations are few and simple. Not so however in making white rice, *i.e.*, removing the inner skin of the grain and making it fit for table use.

If the rice is intended for white rice, instead of running down to the bagging shed after being winnowed, it is again elevated to the top floor of the mill where it is passed through two, three, or even more sifters to remove as much of the paddy as possible. The sifters used in this operation are generally reciprocating and the wire netting of different degrees of fineness. After leaving the sifters the rice passes to the white rice stones, of which there are two kinds in general use. One kind, perhaps the more used of the two, consists of a conical drum of wood or iron about three feet deep and five feet diameter at the top, and four feet nine inches diameter at the bottom; this is fixed on a vertical spindle. The sides of this drum or stone as it is called are covered with the Carbutt's cement before described. Round this drum and fixed concentrically with it is a framework of wood or iron to which is fastened a fine network of steel wire; this forms a "casing" which is "set" so as to leave a space of about ⅛" to ¼" between the stone and the network all round. This outer drum or "casing" is a fixture, but the stone revolves inside it at a speed of about 200 revolutions per minute. The rice is fed in on to the top of the stone, and, finding its way down between the stone and the casing, is spread out and rubbed as the stone revolves, the skin, in the form of dust, escaping through the network and the rice getting out below. This operation is generally repeated twice, to bring the rice to its proper degree of whiteness. The other description of white rice stone is much the same, only the stone is made about eight feet in diameter while not more than twenty inches deep, and parallel instead of conical, and on the whole they appear to be the best. The wire netting only lasts a short time and is the most expensive item in working white rice stones. Some parties have tried the plan of making the casings of alternate segments of Carbutt's cement and wire netting, and even leather has been tried, but it is believed that this plan causes more rice to get broken, though it makes the stones more easily driven. White rice stones require great power to drive them, probably not less than from 150 to 120 Indicated Horse-power each. Generally, a mill will make about 500 bags of white rice per day, while of cargo rice, with twelve hulling stones, from 2,500 to 3,000 bags can be made per day. The white rice after leaving the second stones is again elevated to the top of the mill, and sifted to remove the broken grains which generally amount to from ten to fifteen per cent. This broken rice is winnowed and bagged separately. The whole rice is then passed through another sifter to remove any grains of paddy which may be left in it. It is next passed over a winnowing machine to clean it from dust and bagged.

White rice is generally known by three qualities, 1st and best Europe, 2nd Straits, 3rd Bombay. The quality depends on the degree of whiteness, the kind of paddy from which it is made, and the amount of "broken" which it contains. In some mills the rice before being bagged is passed through a polisher of sheepskin to smooth the surface and give it a pearly appearance. The dust or skin of the rice, which passes through the casings of the white rice stones, is sifted to remove any broken rice it may contain, and is then sold for feeding cattle, pigs, &c., and, by the Burmese for curing fish. It appears to be the most nutritious part of the grain, and generally fetches from Rs. 20 to Rs. 45 per 100 baskets. In making white rice, a considerable amount of skill is required in getting the necessary whiteness without breaking too much. The engines employed in driving the rice mills in Rangoon are with a single exception horizontal and generally arranged to work condensing or non-condensing; in most of the large mills the compound principle has been introduced.

The husk of the paddy after being removed by the farmers, has been, and in most mills still is run into the creek or river by means of a shoot in order to get rid of it. For some few years past attempts have been made to utilize it for generating steam, but till lately they have met with only partial success in practice. Of late, however, great improvements in its use have been made, and it probably will not be long before it is universally utilised. The great difficulty in burning paddy husk is not the trouble of getting it to burn, but of getting the ash removed from the fire. The first attempts attended by anything like success were made by Mr. C. R. Cowie, whose apparatus was at first a modification of the "Regenerative Gas Furnace" invented by the famous Mr. Siemens, in which the fuel is first converted into gas and then burnt by mixing it with air. But after an explosion of gas, by which Mr. Cowie himself was injured, the gas principle was abandoned, and the more manageable plan of burning the husk on a grate inclined at an angle of about 45° was adopted. In this apparatus, for which Mr. Cowie holds two patents, the fresh husk is fed by a hopper into the furnace at the top of the slope, and as it burns it slides to the bottom and is there raked away. This apparatus was erected and tried at several mills, but owing to proper precautions not having been taken in protecting with brick-work the fronts of the boilers from the impact of the fierce flame, many boilers were burnt, and the mill-owners having taken a scare, the apparatus was condemned and discredit brought on a deserving invention. Since that time Mr. Cowie has employed egg-ended boilers where his apparatus is used, and probably from this cause alone his invention seems to have made little or no headway. The small proportion, and inefficiency of heating surface, compared with the weight and bulk of egg-ended boilers, together with the large quantity of water they contain, must always place them far lower in the scale of efficiency than boilers of either the Cornish, Lancashire, or multitubular types. Besides high pressures seem now to be the rule, and to save weight, it is of course desirable to keep the heating surface as large as possible in proportion to the bulk of the boiler.

Shortly after Mr. Cowie's patent was taken out, two other plans of burning husk were patented, *viz.*, that of Mr. Leybourn of Messrs. W. Strang, Steel & Co., and that of Mr. Pitt of Messrs. Mower, Burn & Co., Dalla Rice Mills; but as both of these employ inclined grates set at an angle of about 45°, Mr. Cowie considers them to be infringements of his patent, and Mr. Leybourn has submitted to him, while about the other the question is still pending. Mr. Leybourn's patent consists in using inclined grates set like the capital letter V inverted inside the flue of either a Cornish or Lancashire boiler. The husk has to be shovelled in by hand, and the ash is raked away at the bottom of the two slopes. So far as generating steam is concerned it seems to give good results, but the great labour in firing which has to go on incessantly, is the great obstacle to the success of this or any other plan by which the husk has to be thrown by hand into the furnace. In Mr. Pitt's patent there are two inclined grates set like the letter V under a Lancashire boiler; the husk falls into the furnace at the top of each slope through a space left for the purpose between the grate and the boiler. The two inclined grates do not meet at the bottom, but are about ten inches apart, and under them, so as to form a trough, is an arrangement of revolving grates by turning which the ash is allowed to fall through into a wagon placed to receive it, and is then thrown into the river. This plan seems to have been pretty successful, but is objectionable on account of the fire being placed under the boiler so that the greatest heat strikes the shell and causes great risk of burning. This indeed once took place at Messrs. Mower, Burn & Co.'s mill, where one of the shell plates was burnt and a disastrous explosion narrowly escaped.

A great improvement, which however has not been patented, was made on this apparatus by Mr. Coath, who, in order to avoid the objection of firing the shell of the boiler, built a fire-brick chamber at one end, and placed the inclined grates inside this chamber. The top is formed by a fire-brick arch, and the husk is fed into the furnace through a number of holes in this arch, about four inches square and six inches apart, arranged so as to deliver the husk on to the top of each inclined grate. This furnace is the most successful which has yet been used. Its success however is mainly

due to the use of the fire-brick arch; for, after the fire has been burning a short time, the bricks become a white heat the radiation from which at once ignites the fresh husk as it comes into the furnace, and so entirely prevents the fire from burning dull through being smothered with fresh husk; for this reason the fire-brick chamber seems essential to success. Mr. Coath also employed a multitubular boiler like a locomotive boiler without the fire-box, the only heating surface being the tubes through which the flame passes once and then up the chimney. This boiler is seven feet in diameter and eight feet long, and contains 250 tubes, two-and-a-half inches diameter outside. It gives as much steam at 100lbs pressure as a Lancashire boiler seven feet diameter and twenty-five feet long does at 60lbs pressure. For burning paddy husk this boiler possesses many advantages; for, by splitting up the flame, as is done in passing through the tubes more heat is utilised and little passes into the chimney. Besides, the metal of the tubes being very thin, allows the heat to pass through more freely than through a plate. The first cost and freight of a boiler of this description is very much less than for a Lancashire boiler of equal power, and, where fresh water can be always obtained, these boilers give no trouble; but where river water has occasionally to be used, they are not to be recommended. Boilers like this, but fired under the shell, have been in use at Messrs. Gerber Chrestien's mill at Poozoundoung since the mill was built, and appear to be very efficient. This year Mr. Murdoch, of Messrs. Rowet & Co., has erected a furnace for which he has obtained a patent. He uses a fire-brick chamber built in front of the boiler and flat grates; the husk is fed into the furnace through holes in the arch, in the form of a shower, and becomes ignited as it falls, the ash being discharged through doors in the bottom which may be opened at pleasure. From the highly satisfactory results obtained and the elaborate manner in which Mr. Murdoch is carrying out his ideas, it is probable that, as a thoroughly practical and manageable plan, this will surpass all the others. If this plan of using a fire-brick chamber and holes to feed the husk thoroughly were adopted in Mr. Leybourn's patent, the firing difficulty would have been overcome and probably as good results obtained as any other.

The mills at Rangoon are generally managed by engineers who are as a rule well paid and, considering the importance and somewhat arduous nature of their duties, this is necessary. Some firms employ a miller in addition to an engineer, but this plan can hardly be considered as good as having an extra engineer; for, after becoming acquainted with the milling, the one can take the other's place,—a very important matter in the busy season when night work has to be done. The mills generally start at day-light and, all going well, continue working till nearly dusk. The labourers are nearly all natives of India, the firemen, engine-drivers, and mill men who have anything to do with machinery are generally from Chittagong, and the stone-dressers, paddy coolies, and boatmen from the Madras coast. On the whole they are well paid, the firemen getting from Rs. 18 to Rs. 25 per month, the engine-drivers from Rs. 35 to Rs. 50, and the stone-dressers from Rs. 20 to Rs. 40, while ordinary mill men get from Rs. 14 to Rs. 18 per month: all are provided with houses. Many of the mills are built of brick, but of late years iron and timber have become more common. Unless the mill-owners intend to ship the rice themselves, the rice is generally sold before it is milled, nearly all business being done by contract.

EDITORIAL NOTES.

IN consequence of the many holidays, the usual monthly General Meeting of the Agri-Horticultural Society of India did not take place in October. The November meeting, however, was held as before, in the Metcalfe Hall, last Thursday. A report of the proceedings will be given in our next number, as usual.

AGRICULTURAL prospects throughout the country may be said to be generally good except in some districts of the N.-W. Provinces and Oudh which we must refer to in a separate paragraph. In Bengal harvest operations are now progressing and the yield will be perhaps above average. No rain, except a slight shower in one district, is reported as having fallen throughout the week ended 20th ultimo, and the cold weather has everywhere begun. Crop prospects continue good all round, and prices are falling in many districts. The last accounts from Bombay report slight rain; the autumn harvest is still being gathered and the spring crops are in good condition. In Madras and South India generally prospects remain satisfactory, and standing crops are doing well. The monsoon in most parts has set in with a heavy fall of rain. The rainfall this year is anticipated to be above the average, and ryots are busy in their fields. The want of rain is however felt in parts of the Deccan. Rain was wanted in the Punjab in the first half of November, but the heavy falls that have since taken place in Upper India generally, have had a beneficial effect, and prospects are reported to be fairly favourable. In the Central Provinces the *kharif* crop has been pretty generally gathered in and the yield is considered fair. *Rabi* sowings are now over, and the weather has been favourable. In Assam and in most other provinces and states prospects remain satisfactory.

As regards the North-West Provinces and Oudh the state of the weather during the past month has been anything but favourable, and the outlook for the crops is gloomy. The future prospects of the *rabi* crop now depend entirely upon the Christmas rains. If these are good and general, the cultivators, except in certain districts, may yet pull through, but if these fail there must undoubtedly be widespread distress. It is satisfactory to see that the local Government are alive to the danger. Last month we mentioned that *kutcha* wells were being dug for the benefit of the ryots. Further measures to alleviate distress have since been undertaken, and all the sanctioned masonry and earth-works on the various main and distributory channels of the Lower Ganges Canal is being pushed on vigorously, thus affording employment to labourers seeking work. In Rai Bareilly, where the distress is worst, it was estimated that only one-third to two-fifths of the ordinary area would be sown. A fortnight ago an Allahabad contemporary wrote:—

In the bad tracts the people distinctly declare that the situation is worse than in 1877. Throughout the district the cattle are being foddered on *babul* and *sirsa* leaves, and withered rice, though this will not hold out much longer. The water in ponds is scarce and foul, and the cattle have to be watered from the wells. The condition of the people is gradually getting worse. Severe distress is probably imminent, and the people will not be able to manage much longer without the relief-works, which the local Government has sanctioned in advance.

Since the above was written, however, there has been some rain, which, though not nearly as much as is required, has not been without effect. A "competent authority" wrote to the *Pioneer* a few days ago, with reference to the recent fall of rain:—

"If we get about as much more, and it is general, we should go up to nearly the full *rabi* area, and three-fourths probably of the threatened distress would disappear. For it comes just at the right time, when a really good effort is being made by people and owners, and Government itself, to get the *rabi* in. Sowings can go on well to about twelve days hence, and will be carried on, though exceptionally late, to the middle of December."

But we are not inclined to place much faith in the roseate view taken by this "competent authority." He is probably a Government official, and in that case it is easy to understand his writing thus. There is no doubt, however, that the late heavy and pretty general rains in Upper India—which, it may be worth remarking, were synchronous with a fall of snow along almost the whole range of the Himalayas,—have resulted in an altogether more hopeful feeling for the fate of the winter crops, and *rabi* sowings are still being attempted. But it must not be forgotten that except in Kairagarh, parts of Arail, and parts of the trans-Ganges Pergunnahs there has been no *kharif* to speak of. In the best tracts we hear there will not be more than a six-anna crop all round. Distress in a greater or less degree is therefore inevitable, and indeed is already taking place. It remains to see how far Government will exert themselves to successfully combat the evil.

CHEESE-MAKING is a branch of agricultural industry altogether unknown in the majority of districts, and but imperfectly understood in any part of India. Yet there seems no reason why it should not be successfully practised. Looking over the lately issued annual report of the Government Experimental Farm at Khandesh, we observe that Mr. Stormont, the Superintendent, recommends that an experiment in cheese-making be set agoing on the farm. The only outlay, he tells us, seeing that they already have cows, would be the purchase of a few buffaloes and goats; whereas if the results were satisfactory the industry would readily be taken up. The suggestion is, we see, strongly supported by

Mr. Robertson, Commissioner, C. D., in his letter submitting Mr. Stormont's report to the local Government. And indeed, Mr. Robertson's support of the proposed experiment must carry no little weight, seeing that he has himself had some practical experience in the matter.

"When Collector of Dharwar," says Mr Robertson, "I had some 8 milch buffaloes, and as I did not require all their milk, I determined to make cheese. I worked under great difficulties, as I knew nothing about it and had no presses or other appliances. I learnt what I could from books, and eventually made some 50 or 60 cheeses of different kinds. Some were, as my friends know, very bad; some, as my friends also know, were excellent,—especially the attempts at Stilton, some of which were equal to good Italian or 'Gorgonzola' cheese. From my experiments, commenced without any practical knowledge and carried out with such appliances as I could make, I was fully convinced that the very best descriptions of cheese could be easily made in India. I beg to support Mr. Stormont's application. If successful he will, I have no doubt, open out a new industry and will enable the cultivator to add to his farm receipts to no inconsiderable extent."

Mr. Robertson tells us he is "*convinced that the very best descriptions of cheese could be easily made in India*," and, after adding that Mr. Stormont should obtain from England two or three proper presses, the Commissioner goes on:—

"Another point of importance, and regarding which Dr. Lyon might be able to give information, is that cheese to be saleable amongst the natives of this country, should be made with some vegetable rennet. Natives would not touch cheese made with ordinary rennet, and I am convinced that good cheese cannot be made without the use of some rennet. If a good vegetable rennet could be procured, the curd cheeses could be made; they would be cheap and ryots would soon find a ready sale for them."

We are glad to see that the Bombay Government are disposed to encourage the suggestion. "Government," the Resolution tells us, "have no objection to Mr. Stormont's proposed experiments, and an estimate of the cost of the few buffaloes and goats required should be submitted." This request would seem to have been suggested by a clause in Mr. East's letter to the Commissioner, when forwarding the report, in which he expresses a doubt as to the "sufficient importance" of the object in view. But the Collector of Khandesh would justify the expenditure on totally different grounds. He thinks that a few goats and buffaloes might be purchased in order to make the farm complete in the cattle department and with the object of introducing improved breeds of both animals. We ourselves do not think this question of cost deserving of much prominent discussion. It certainly should not be allowed to stand in the way of such an important experiment—if indeed experiment it may be called—as that proposed. Besides, the cost, at highest, cannot be large, and it would be made up for by many corresponding advantages. Stall feeding of the animals, for instance, would have to be practised; but this again would encourage the cultivation of green crops, and thus the available supply of good manure would be largely increased and agriculture generally advanced. Government, however, require to know the cost, and the information will doubtless be forthcoming. After noting acquiescence in the proposed experiment, the Government Resolution proceeds:—"But cheese-making on the English system should not be attempted. In good cheese-making temperature is an essential feature, and it will be well to study the system in use in Italy and similar warm climates, and to procure thence such vats and presses as may be required." This and all other matters of secondary importance will doubtless meet with due consideration when once the cost of the animals has been sanctioned. We hope this will be accorded without delay, so that no time may be lost. The cheese-making industry has within the last few years taken gigantic strides in America, and we see no reason whatever why something should not be done in this country.

The *Madras Athenæum* notices a short paragraph in our last issue on paper-making from sugar-cane fibre, and in doing so in a kindly spirit, we fancy he has missed the point of our remarks. We did not recommend the scheme, as, on the data we had at our command, it would have been folly to have done so. We simply suggested the advisability of looking into the question. Our contemporary says we have ignored the cost of machinery; by no means—only we did not take that into account as a special charge in connection with paper-making from sugarcane fibre, because, let the fibre or raw material be what it may, machinery will be needed, and we do not imagine that in the case of the cane fibre the machinery will be specially expensive. Should the fibre from sugarcane make good paper, the great advantage is that the raw material, being at present almost a waste product, will practically cost nothing. Hence, other things being equal, paper from this fibre ought to be a profitable industry for India. We have the raw material at hand, the only cost of which would be the difference in price between it and the substitute which the farmer would have to purchase for his cattle, the sugarcane waste being at present utilized as cattle food. We are pleased to have the subject alluded to by our contemporary, and see in the article another illustration of the fact that however "benighted" the Madras Presidency may be generally considered, it has always taken an intelligent and active interest in such subjects as have for their object the amelioration or improvement of the condition of that unfortunate but indispensable factor in Indian economic politics,—the ryot.

Our contemporary has also a few pregnant remarks on an even more important matter—that of the re-afforestation of India—and promises to return to the subject at on early date. We question if any subject exceeds this in interest both to the Indian cultivator and to the statesman. It affects the one as much as the other, and in a country like this, where agriculture may be said to be the sole occupation of the people, and where so much depends on the rainfall, anything bearing on this latter must have an absorbing interest.

The total amount of printing paper imported into India last year, was 52,263 cwt. valued at Rs. 12,57,528. Bengal received 31,857 cwt., and Madras but 3,776 cwt. The value of the writing paper and envelopes imported was over fourteen lakhs. Other kinds of paper were received to the value of Rs. 4,99,214. Thus, India pays Europe, chiefly England, over thirty lakhs of rupees annually for her paper. Is there no enterprising individual to start a paper mill, for turning out texture equal to what is imported? With the raw material to manufacture from at our doors, it seems a disgrace to the energy and speculative spirit of this country that she cannot compete with a costly industry that has to import its wares across the ocean. We know the experiment has been partly tried in India, but we do not think it has had a fair trial, and we believe great things may be expected from a paper industry in this country when once it is properly established.

A Company in Florida, according to a contemporary, has been for some time past, making paper from the palmetto leaf; and so great has been its success, that measures are being taken for the establishment of twenty other paper mills in such places as the palmetto leaf may be found in sufficient abundance. "Are we to wait, as in some other cases, until our friends the Yankees come and show us how all this is to be done," he asks. Perhaps so. Material is abundant in India, but we lack the necessary skill and capital.

Part IV. of the present volume of the "Records of the Geological Survey of India" has been published, and contains much matter of interest including, among others, two articles entitled "Note on Reh or Alkali Soils and Saline Well waters", and "The Reh Soils of Upper India," respectively written by W. Center, M.B., Chemical Examiner, Punjab Government, and H. B. Medlicott, M.A., of the Geological Survey. A correspondent, having seen the notice of Dr. Center's paper which we quoted in our October issue, recently wrote to us requesting us to publish the paper itself when it appeared in print. Much as we should like to comply, we regret our inability to find space for the article which extends over twenty pages of the "Records."

Attention has of late been called to the steady increase in the growth of opium in Persia, and from a Mozambique correspondent of the *Times of India* we now learn something as to the prospects of the opium-producing fields of Eastern Africa. As compared with Indian opium, both the Persian and African opiums are virtually untaxed, and, in spite of their inferior quality, which may probably be improved, this freedom from export duty gives them a great advantage with the Chinese customers. It is not difficult to imagine a time when they may seriously affect the most important branch of the Indian revenue. In Persia the new industry has taken firm hold, in Mozambique it is still something of an experiment. The Mozambique Opium Company was formed in Lisbon three years ago with a capital of £100,000 sterling. The Portuguese have granted the directors 20,000 acres of picked land at a nominal rent, and given them the exclusive right of cultivating opium in Mozambique for ten years free of

any tax, and thereafter for a further twenty years on the payment of a duty of £5 per chest only. Judging by the letter of the inspecting engineer, which we publish elsewhere, the land and the water-supply seem all that could be desired, and the present crop seems to be quite up to an Indian standard. From another letter, written by one of the directors of the company three weeks later than the letter we publish, we learn that the plants had then attained a height of nearly three feet, and had commenced to yield opium. Five and one-third beegahs had yielded 170lbs of opium, equal to the rate of 32lbs per beegah.

ATTEMPTS have at various times been made to introduce the cultivation of Carolina paddy into parts of India, without, however, much regard to whether the climate of the locality where the experiment was tried, was suitable to this particular kind of rice or not. Some success, however, appears to have been met with in its cultivation in the lower portions of Ceylon, where, after sundry failures, the proper season for sowing and the proper methods of its cultivation being ascertained, its growth has rapidly spread, so that now over 6,000 bushels are annually sown. The yield is stated to be one-third greater than that of the ordinary qualities. The kind experimented upon is the golden variety ; and though the acclimatized grain has lost its dark golden colour, it has not deteriorated in size or weight from the seed first introduced. It ripens in four months and fetches a higher price than other kinds. Carolina paddy, however, requires very careful cultivation, and the cultivation of indigenous varieties of the best kinds on the ridge-system (as is the custom with Carolina rice). is likely to be more successful than experiments with foreign varieties requiring particular conditions of climate. The experiment is to be carried on in Madras, and especially at the Saidapat Farm, and elaborate instructions have been issued by the Madras Government for reporting the results.

OUR Australian contemporary, *The Leader*, in its special report of the opening of the exhibition at Melbourne, gives an account of the Indian court, from which we extract the following as being of interest to our readers :—

The representation of the raw products of the empire is on an extensive scale, and are for the best part made up of samples of cotton, jute, fibres, silk, indigo, lac spices, drugs, dyes, tannery materials, tobacco, cigars, coffee, and tea ; of this last product there is an especially good show. Tea forms at the present time one of the chief exports of the empire, and is carried on almost exclusively by English planters. The samples are numerous and a gentleman (Mr. Sibthorpe), who is one of the Commissioners, has been specially delegated to this branch by the Tea Syndicate of India. To enable visitors to form a fair judgment of the value of Indian tea, it has been decided to hold tea parties in a *Thain* or chapel attached to a pagoda, which has been erected by the Indian commissioners alongside of the Ceylon court. The *Thain* itself is an attractive feature of the court, and is built of wood carved in the most extravagant fashion by Burmese workmen.

WE have received the Report of the Botanical Gardens, Saharanpur, for the year 1879-80. The work of both these and the Lucknow Horticultural Gardens are much the same, *viz.*, raising trees (ornamental and useful), flowers, and vegetables for distribution, and conducting experiments in acclimatizing staples which are likely to prove useful in Northern India. We extract the following remarks on the Report from the columns of an up-country contemporary :—

Amongst others the sweet chestnut and the olive appear to promise the greatest success. Mr. Gollan (the gardener) and Mr. Ridley (of the Lucknow Gardens) are not quite of one mind as to the merits of acclimatized vegetable seeds. As some kinds, however, such as artichokes, beans, peas, and cauliflowers, are admitted to succeed at Saharanpur as well as at Lucknow, there is not so very wide a difference of opinion as would appear at first sight. The carrot and *prosopis* trees are grown at Saharanpur to a considerable extent but do not promise to take the place of any existing fodder trees in India. The *euch'ena luxurianas* or *reana* is definitely ascertained to be only fit for garden cultivation. *Rhea*, too, on which much time and money has been wasted, is found to be quite unsuited for the N.-W.P. Of cottons the Bamiah gave the finest staple, but its cultivation is highly expensive, and the plant requires far greater care than the ordinary cultivator can be expected to bestow on it. The New Orleans and the Upper Georgian promise to be very successful. There is, however, always the danger lest imported cottons should degenerate sooner or later, as the Hinganghat undoubtedly does in the N.-W.P. and the American has in Dharwar. Thousands of mulberries were planted out for the extension of sericulture : and it was found that the *Morus multicaulis* was the earliest to give a good crop of leaves, the *M. chinensis* giving a later though a richer and more nutritive crop. The *Catalpa bignonioides* promises to be a most useful tree, the hardness of its wood makes it invaluable for railway sleepers. It is also light, and takes a brilliant polish. The Saharanpur gardens supply several drugs to the Medical Department from either Saharanpur, or one of the hill gardens at Mussoorie or Chajuri. Mr. Duthie, however, proposes to change the site of the Mussoorie gardens, which are badly situated as regards light and water, and the area of which is very limited. Excellent sites could be obtained amongst the hills of Jamisar Bawar, with a far superior climate to that of Mussoorie. The museum has been enriched with many valuable additions notably the magnificent collection of the Kurrum Valley *flora* presented by Dr. Aitchison.

The Institution seems to have done good work and has the advantage of superintendence by a scientific botanist, Mr. Duthie, assisted by a thoroughly trained gardener, Mr. Gollan. Under these conditions the report is of more than local interest ; for indeed the Saharanpur Gardens are in correspondence with all the principal Botanical institutions of the world.

IT is satisfactory to learn from the Review of the Maritime Trade of British India with other countries, for the official year 1879-80, recently published, that the import and export trade had very largely recovered from the depression of the previous year as regards merchandise. With reference to treasure, the re-appearance of the normal figures of small exports (as compared with the exports of the three previous years), and large net imports of gold, indicates a return to prosperity, and an increased demand by the people of India for the precious metal, to be hoarded and converted into ornaments. The trade with the *United Kingdom* is, as might be expected, by far the largest item of Indian Maritime commerce, and constituted, for the year under review, 53·8 per cent. of the entire trade. As compared with that of 1878-79, there was an increase of over 447 lakhs. With regard to the European continental countries, the imports into India are of very small dimensions when compared with the exports. From *Austria* the imports are chiefly paper, glassware, beads, and apparel, the total value being about 11½ lakhs; while the exports chiefly were cotton, indigo, and hides, amounting to 186 lakhs. From *France* the imports are, millinery, clocks and watches, brandy and wines, and silk stuffs, value about 43 lakhs; the exports to that country being coffee to the value of 4 1 lakhs, cotton 169 lakhs, indigo in small quantities, seeds valued at 101 lakhs, raw silk and shawls, the last item showing a marked decrease from former years. The total value of exports to France amounted to 484½ lakhs. Imports from *Germany*, of coals, spirits, and salt, amounted only to 6½ lakhs, and the exports about 27½ lakhs. With *Holland* the trade is nominal, India importing about one-and-a-half lakhs' worth of gin and curacao, and exporting cotton, rice, and linseed to the value of 21½ lakhs. To *Italy*, India sent 145 lakhs' worth of cotton, hides, seeds, raw silk, and tobacco, a trade in the latter article being now fostered—the total exports being valued at 220 lakhs, the imports, being chiefly coral about 4½ lakhs, and hops 1¼ lakh. These, however, are South German hops imported from Venice, and appear to be superseding English hops in Indian breweries. For the last four years no ship has brought anything to India from a *Russian* port, and our exports were confined to gum and cotton, to the value of Rs. 78,000. The trade with other European countries is not worth mention.

THE Administration Report of the Baroda State for 1878-79 shows that under the Minister, Rajah Sir T. Madava Rao, K.C.S.I., and under the Agent for the Governor-General, P. S. Melvill, Esq., C.S.I., the State is becoming, in all departments of the administration, a model one. As regards the progress made in agricultural affairs, we learn that—

Waste lands were brought under cultivation during the year at an assessment of Rs. 60,000. With reference to the unfavourableness of the seasons, the fall of rain was generally double, and in some places greatly more than double that of an average year. But the rain came all at one time, or in other words, it was badly distributed and the consequence was that all the *kharif* crops, except rice, suffered enormously. The staple food of the people is *bajri* and *jowari*, and to these the excessive wet was very injurious. Locusts and grubs did much injury. The *rabi*, a cold weather crop, was good. In Baroda however, the *rabi* is an insignificant harvest generally as compared with the *kharif*. Prices continued about twice as high as in an ordinary year. *Bajri* sold during the year at an average rate of 15¼ lbs. per Baroda rupee, and rice at 13lbs.

THE *Madras Times* recently asked whether anyone had attempted the cultivation of hops in India, and in reply we see that "Hops" writes :—

"Referring to your inquiry in your issue of the 15th instant as to whether any one has tried to grow hops in India, I may mention that an attempt at its cultivation was, [illegible] suggestion, I believe, of the Managing Proprietor of the Neilgherry Brewery Company, made at the Lawrence Asylum Farm at Lovedale, on the Neilgherries, and from the last annual report of that institution I notice that it proved a failure. Hops I read in the *Brewers' Guardian* "will thrive on any land where one can grow wheat or corn ; but it prefers a deep soil—the deeper the better ;" and also that "skill and care" are indispensable

in its culture. Perhaps the Farm Bailiff at the Lawrence Asylum might be able to afford us full information in regard to the cause or causes which resulted in a failure. The successful culture of hops on the Neilgherry hills would, in every way, prove very advantageous. The Neilgherry Brewery Company import all hops used in the manufacture of their ales—which are obtaining a wide reputation, and, when last at Ooty, I saw some excellent varieties of English, Bavarian, and American hops in their stores. We would hail with delight the day this company will be able to brew its ales from hops grown on the Blue hills. Hops, I hear, have been successfully grown in Northern India, and with a little care in regard to soil, locality, preparation of the ground, &c., its successful culture on the Neilgherries could be secured."

Hop cultivation has made considerable progress in parts of India within the last few years and there are those who think that the time is by no means distant when the industry will assume an important position in Inda's staple productions. Some interesting information and data on this subject will be found in another column.

A LETTER addressed to the *Ceylon Observer* by Mr. J. Holloway, a planter of that colony, furnishes some curious particulars as to the profit derivable from the cultivation of the croton-oil tree. The information is brief, but calculated to provoke futher inquiry where the subject finds in terest :—

Even taking the seed at 6*d*. per lb., 20lbs from each tree in one year (trees can be grown among coffee 15 feet apart without injuring the coffee) and say 190 trees to the acre would be Rs 950 per annum from one acre of croton trees after the fourth year, besides what income there may be from coffee or other produce.

The croton is evidently a quick growing tree, coming as it does to maturity in about four years and throwing out by that time a considerable amount of shade. This we should imagine a suitable tree for planting on land that has been too ruthlessly deprived of its clothing.

THE *Rangoon Gazette*, says there is " a great scarcity of food in Java, almost amounting to a famine, hence the steady demand for rice from this port for the Straits whence it is sent to Java." Large shipments have been made, including many thousand bags of Bengal rice brought over to Rangoon from Calcutta. Our contemporary adds :—" It is likely that the demand will continue, and, as there is still a fair quantity of paddy in stock, milling will go on till the new crop comes into the market." A later issue of the same paper informs us that crop prospects are said to be rather unfavorable in the Bassein and Henzadah districts, owing to the rains not being copious when they were wanted. The crops in other parts of the province are however likely to turn out well. The demand in Rangoon for grain for Java continues. In the fortnight ending 8th instant, about 40,000 cwt of rice were shipped to Penang and Singapore *en route* to Java. Our own correspondent at Rangoon tells us that although complaints come, more especially from Akyab and Thayetmyo, that the paddy crop will suffer from the scarcity of rain towards the end of the monsoon, yet taking the whole country it is thought the crop will be an average one. The outturn last season was exceptionally good.

A FIREPROOF composition seems at last to have been discovered. In the report published by the *Journal of Applied Sciences* of the Exhibition in Paris, last year, mention was made of some muslin curtains exhibited by M. A. J. Martin to which flame was applied, again and again, without consuming them. The composition M. Martin employs for rendering paper, wood, and textile fabric, impervious to fire, is the following :—

	Parts.
Pure sulphate of ammonia	80
Carbonate of ammonia	25
Boracic acid	30
Pure borax	17
Starch	20
Distilled water	1,000

The materials are dipped in this solution while hot, so as to be thoroughly impregnated ; when they are dry enough, they are to be ironed in the same way as ordinary starched fabrics.

IN a home paper we read that a gentleman in San Francisco having in his conservatory various hard-wooded and thick-leaved plants covered with insects, tried, with only temporary success, the tedious and expensive plan of washing with soft soap ; also syringing with various substances, including carbolic acid which injured the tender growths. He then hit upon what proved to be a very effectual remedy, of which he says :—

"I procured from a druggist an atomiser, and, filling the bottom with kerosine, sprayed over a camellia to be experimented upon. It was a very dirty plant, the branches and leaves of which were covered not only with scale but with black fungus ; a very small quantity sufficed to vaporise and cover the entire plant. After the fluid had evaporated and the plant was dry, the scales were found dead, shrivelled, and partly detached, and with the slightest touch fell off ; the black fungus, also which, everybody knows is so tenacious on the leaf, was dried up into a loose powder, which a shake sent to the ground.

"I did not confine myself to the single experiment, but have since used kerosine in the spray on several other plants pestered and diseased with these parasites, orange trees, &c; I have also tried atomised kerosine to destroy aphis on pelargoniums and on the soft and tender flower-buds of greenhouse roses. I destroyed the aphis, but the new and tender growth of my plants was destroyed also."

AN American paper states that under the name of "Ericine," a fine golden-yellow dye is now prepared from the young wood of various poplars, as well as from the woody portions of heather, the botanical name of the latter (*Erica vulgaris*) having apparently suggested that of the dye. Young branches and shoots of poplar are cut off, crushed and brayed, and are then boiled in alum-water, the proportions allowed being 10 pounds of wood and 1 pound of powdered alum to each 3 gallons of water. The liquor is boiled from about twenty minutes to half an hour, and then filtered. In cooling it thickens and clears, throwing down a greenish-yellow deposit of resinous matter. When sufficiently clear, the liquor is again filtered, and then left exposed to the air for three or four days or more, according to the weather and the state of the atmosphere. It quickly oxidises under the action of the light and air, and assumes a rich golden tint. In this state it can be used for dyeing fabrics of all descriptions. For yellow and orange-yellow shades, it is used alone; mixed with Prussian blue, it gives green; with oak bark, brown and tan; with cochineal, &c., orange and scarlet shades. Or the colouring matter can be precipitated, and then makes a fine and perfectly innocuous yellow body-colour for wall-hangings and such like purposes.

THE fruit of the " shrubby trefoil" (*Ptelea trifoliata*) is bitter, and in odour is almost exactly the same as the hop. In fact, the fruit is sometimes used in America as a substitute for the latter ; and for this reason the plant is also known as the " hop-tree." In consequence of the ravages of the *phylloxera*, the French are now looking about for new beverages, and, as observed in the *Revue Horticole*, if the destruction of the vine continues, there is no doubt that wine must be largely replaced by beer. M. Charles Baltet has discovered that the fruit of the " shrubby trefoil" makes as good beer as hops. At a recent agricultural exhibition at Chalons-sur-Marne a M. Ponsard exhibited a sample of beer in which the fruits of this plant were substituted for hops, and its quality and flavour are reported as being equal to those of the best Strasbourg beer. Surely this plant would grow on the Nilgiris and in other parts of India if carefully cultivated.

VARIOUS experts have given very different estimates of the recent wheat harvest in England, and as the truth is of some importance to India as a wheat-exporting country, it is disappointing to find one calculation appraise the crop as one considerably over the average, whilst another gives it as at the best 15 per cent below the average of the century. The fact is that even experts have been misled by the miserably poor crop of 1879, and that each authority has been impressed with the conditions of those countries with which he is most familiar. That the wheat crop of the west, south-west, and north-east of England is fully up to the average, there appears no question, but that average is greatly reduced by the lower outturn of the eastern and south-eastern districts, where, at the outside, 24 bushels to the acre will be threshed. When it is remembered that the average outturn per acre in the United Kingdom is 28 bushels, and that the extreme variation is from 24 to 32 bushels per acre, the effect of a poor crop over so large an area will be fully appreciated. Nor is all the new wheat of good quality; some has been sold at 36*s*. per quarter, a very poor price indeed. It is not, however, so much the outturn of the English harvest, nor even the price at which home-grown wheat sells, that influences the Indian exporter. It is the vast and as yet apparently inexhaustible supplies from Western America which must keep prices low in England, and prohibit exports from India, where Rs. 2 per maund is already becoming stereotyped as a cheap rate. The absence of competition in the American railway system keeps up the price of American wheat still. This is a subject, however, to which we hope to return ; meanwhile India's rival as a wheat exporter is the far west of America.

THE grain-producing capacity of the American States is something enormous. On one day the receipts of Indian corn at the New York Produce Exchange on the 28th ultimo were 808,000 bushels, the largest ever known. The yield for the year is anticipat-

ed to be 13 per cent below that of the previous year. The yield for this year is estimated at 1,345,000,000 bushels, against 1,545,000,000 in 1879. This is Indian corn alone: with other cereals, the produce must be tremendous. Indeed Americans have been known to boast that with a few months' notice they would take a contract to feed the globe. And the production of wheat in the United States, enormous though it has been for many years, is yearly becoming still more immense. Thus, in the course of a single year the outturn of the seven chief corn-growing States—Minessota, Michigan, Ohio, Indiana, Illinois, Lowa, and California—has increased by twenty-five millions of bushels, or from 200 millions in 1878 to 225 millions in 1879. If the harvests of the United States are competing seriously with Indian wheat, they are competing even more seriously with the wheat crops of Russia. It has been calculated that the facility of transport in America places the Russian cultivator at a disadvantage of nearly five shillings per quarter.

THE Samarang *Vaderland* contains the following description of a vegetable tallow found in Siak greatly resembling the well-known *minyak tangkawang*.

"Sometime ago the attention of the Government was directed to a certain fatty substance termed *minyak suntei*, which is prepared in very large quantities in the kingdom of Siak from the fruit of the *suntei* tree. On inquiry it turned out that the *suntei* tree is similar to the *tangkawang* tree, which in the Western division of Borneo yields the *minyak tangkawang*—a fatty substance which is often used there in dressing food instead of butter, and which is extensively exported to Singapore. Both these fatty subtances appear to be very suitable for greasing iron and other metals used in the machinery of manufactories and steam ships. With an eye to the low prices of these fatty substances, the Netherlands Government decided upon them for lubricating machinery on board H. N. M's vessels in Netherlands India, instead of the beef fat hitherto used for the purpose. This experiment showed convincingly that *suntei* or *tangkawang* tallow is at least equal to beef fat in quality, whilst the quantity required for ordinary use does not exceed that of the last mentioned fatty substance.

MISCELLANEOUS ITEMS.

THE Annual Exhibition of the Madras Agri-Horticultural Society will be held early in February 1881. A long list of the prizes to be given has been published.

THERE will be an Agricultural Exhibition at Deccan on the 1st January next, under the patronage of Nawab Ashanullah Khan.

WE have received the prospectus of the Maiji Exhibition and Horse Show which will open on the 21st of February 1881. A number of prizes of the aggregate value of Rs. 5,595 will be given for horses and mules and cattle of all kinds. There will also be some prizes for encouraging indigenous art and manufactures.

THE New York Agricultural Bureau's monthly report states that the average condition of the crop of ten Cotton States is more favourable.

THE following articles are exempted from the duties to which they are liable under the Indian Tariff Act, on the ground that they are for the most part re-exported—Gum Arabic, gum Benjamin, gum Olibanum or Frankincense, Mother o'-pearl, and Tortoise-shell.

THE only article of Indian production which now pays export duty, is rice, and the duty thereon realised for the year ending 31st March last, was fifty-nine lakhs.

IN a notification in a recent *Gazette*, it is declared that licenses for the importation of sulphur into British India, intended only for agricultural purposes might, with the sanction of the local Government, be granted without the payment of the fee of Rs. 10, prescribed under Rule 6 of the rules issued under the Arms' Act.

WE read in the *Poona Observer*:—It is reported that "Hoomnee worms" have made their appearance in the Sholapore Collectorate, and that they are destroying the roots of the standing crops. This worm has been described as about an inch and-a-half in length, by half an inch in circumference.

OPIUM is being cultivated with success in Mosambique. The yield is said to be much larger than in India, but nothing appears to be known definitely about the quality.

THE quantity of opium advertised for sale next year is 56,400 chests, in monthly quantities of 4,700 chests. From January to June the number of chests offered for sale will be 2,350 chests of Behar and Benares, respectively.

THE importation of jute to Dundee direct from Calcutta and Chittagong during the nine months ending September, shows a serious decrease when compared with the imports in the corresponding period of last year.

THE indigo season opened on the 9th ultimo with a small sale of about 350 chests, and three more sales have since been held, the total quantity offered by public auction (to 20th instant) amounting to about 1,900 chests; of this quantity, 1,450 chests were sold. The catalogues have, at time of writing, included only about 100 chests of Bengal and Tirhoot indigo, the remainder consisting chiefly of ordinary to middling native Oudes and a few lots only of good and desirable quality.

THE highest price paid as yet this season for indigo has been Rs. 265 per maund for a lot of 47 chests of the mark E. G. W. Banaghat, Chupra.

AMONG the Government "Notifications of Patents," we observe one of Mr. Eugene Charles Schrottky, Agricultural Chemist of Calcutta, for the improvement of indigo manufacture.

MANUFACTURE of gunny-bags is very largely carried on in Cooch Behar and Rajshahye by the people in their own homes and by European mills. In Serajgunge, the jute mills employ some 2,200 people, and are stated to have turned out gunny-cloth sufficient for four-and-a-half millions of bags during the year.

IN Rungpore and Julpigoree, a common home manufacture is that of *sudee* cloth, made from a species of silk derived from a worm which feeds on the castor-oil plant. Cotton carpets are manufactured in large numbers in Rungpore, and exported to other districts, but the manufacture of country cloths is dying out.

FROM a recent Assam Administration Report we see that an important question—of controlling the collection of India-rubber in the Government forests and the trade in foreign rubber imported into Assam—was forwarded to all Deputy Commissioners for report; but as their views regarding this, as well as the other proposals made by the Inspector-General of Forests, were not received before the close of the year, no final steps could be taken for their settlement.

FOOD grains are becoming decidedly cheaper in every district in the Madras Presidency. Last year second sort rice was selling in Ganjam at 13·8 seers of 80 tolahs for the rupee; this year the price is one rupee for 21 seers, or a fall of over fifty per cent.; *cholum* and *ragi* have also fallen greatly in price. In Trichinopoly only 13·5 seers of second sort rice are selling for the rupee; in Madras and South Canara it is selling at twelve measures.

THE *Madras Times* gives the percentage of agriculturists on the total population in the Madras Presidency as 23. The average number of persons dependent on each male agriculturist above 12 years of age as 4·2. The average number of acres cultivated by each male agriculturist above 12 years of age is 4·5. The average payment to Government (including all charges for water) per acre of the revenue-paying area is Rs. 1·4, the average incidence of local rates and cess is 2. The total amount of local rates and cesses paid in land throughout the presidency is Rs. 48,86,953.

A NUMBER of maps of various parts of the Madras Presidency are on sale at the Government Survey Office (Madras). For the benefit of our planter friends, we may mention that maps on the scale of 16 inches to the mile of all the estates in the Nilgiri district, and many of those in the Wynaad and Shevaroy Hills may be had on application. The price is one rupee per 100 acres. Maps of all Coffee Estates, Devarukadus and Wargas, on the scale of 16 inches to a mile, in the Province of Coorg, may be had on application to the Secretary to the Chief Commissioner of Coorg, Bangalore.

WE read in a Bangalore paper that an old soldier there has, after five or six years of patient investigation and persevering effort, invented a new kind of asphalte for which he claims that it will stand the greatest heat of the sun, does not yield or crack under the greatest weight, and will adhere to wood, brick, or stone, in either a horizontal or perpendicular position. The asphalte has been put to a severe trial by the State Railway Engineers at Bangalore, who pronounce very favourably on it. The inventor intends patenting the process, and after that will offer it for sale.

A RECENT examination of the Ceylon pearl banks by Captain Donnan, Master Attendant of Colombo, has resulted in shewing an enormous deposit of healthy mature oysters available for fishing next year. It is estimated that there are now on the banks sixty millions of oysters, which in 1881 should represent a value of Rs. 12,000,000; but it is doubtful if even a half of them can be lifted during the coming season, and the fate of the remainder if left on the banks until the following year, would not be very doubtful.

EXCELLENT cotton is grown in Upper Burmah, and, when high prices obtained, it was shipped to Europe under the name of Pegu. But now it pays better to send it to China and the Shan States, where large quantities are taken yearly by mules, bullocks, ponies, and donkeys.

THE scheme for starting a cotton mill at Shanghai has been revived. A Company has been formed by Chinese, with a capital of Tls. 400,000 in four thousand shares of Tls. 100 each. It is stated that half the shares have been taken up. The Viceroy there is said to approve of the project.

MR. J. J. COLES HARDINGE, the Secretary of the Agri-Horticultural Gardens, Rangoon, intends, we (*Rangoon Gazette*) understand, taking three months' privilege leave and proceeding to Bhamo accompanied by a taxidermist, in order to collect specimens of the *fauna* and *flora* of that part of the country, most of which will, no doubt, go to enrich the collection already to be found at the Phayre Museum and adjoining gardens.

ENDEAVOURS have been made in vain to identify an insect which is very destructive to the sugarcane in South Arcot; but presumably it

is the same as is found in Queensland and British Guiana. The insects multiply in the heaps of refuse and trash left in the plantation, and if these were burnt, as well as the infested canes, the pest would show a marked diminution.

THE oil extracted from cotton seed is said to be largely exported from America to Italy and other countries where olive oil is produced, and thence re-exported as genuine olive oil, which it fully equals for all purposes. A ton of seed is stated to yield 35 gallons of oil and 750lbs of excellent oil-cake. What becomes of the cotton seed accumulated in the process of cleaning Indian cotton?

A NEW wheat pest has been discovered in Ontario. From descriptions received of the insect from different quarters, it is believed that it is the "wheat-stem maggot," *Merszyma Americana* of Fitch. In the mature form this insect is a fly, shaped like the common house fly, but much smaller and rather more slender in proportion to breadth. The *larva* lives in the stem of wheat and destroys the plant by devouring the substance of the stalk. Of course, when the stalk is nearly dis-severed, the head of wheat dies off prematurely. The insect will attack oats, barley, or rye, but prefers wheat. The same insect is complained of in New York State.

THE *Melbourne Argus* informs its readers that "the mastication of the betel-leaf (*charica betel*) and nut (*areca catechu*) is a habit which is as common in an Indian community as smoking amongst the English. Both sexes indulge in it, and the great lords and princes who keep large harems have to pay no end of betel-nut money, after the same fashion as our pin-money.

OFFICIAL PAPERS.

PRELIMINARY REPORT ON THE INQUIRY INTO COFFEE LEAF DISEASE.

Dated Peradeniya, the 12th June 1880.

FROM H. Marshall Ward, Esq., B.A., Cantab, Cryptogamist, to the Hon'ble the Colonial Secretary, Colombo.

I HAVE the honour to report that, in accordance with the terms of my engagement, I have been occupied since arriving in Ceylon in February last with observations and experiments upon "coffee leaf disease."

It is proposed to confine this preliminary report to a statement of observed facts, especially as several of these are new; nevertheless, much has been accomplished on the States, in the way of comparing what is already known, and in acquiring further information as to the nature of leaf disease, its distribution and treatment. The true interests of the planters will be, however, best served by a future and more extended report on these matters.

Having made myself acquainted with the literature already published, and obtained as much information as possible on the subject, I at once proceeded to further practical acquaintance with "leaf disease," and commenced a microscopical analysis of the coffee plant in health and disease; this has been continued hitherto in various parts of the coffee districts. Specimens have been obtained from all elevations, and from the most various situations, soils, and climates that the districts afford.

I also placed myself in communication with representative planters, for the purpose of obtaining further information, and made some preliminary experiments with reference to suggestions obtained, in order to test the value of various observations as to the nature of "leaf disease."

On March 15th a tour through the chief districts in the southern and eastern parts of the Central Province was commenced. I made observations on various estates in Hantane, Nilambe, Hewnhetta, Pussellawe, Rambods, Maturata, Uda Pusselawa, Ambagamuwa, Dikoya, Dimbulla, Badulla, Madulsima, Hewa-eliya, and Haputale.

Two objects were kept in view during these journeys: (1) to gather as much information as possible concerning coffee, its cultivation, its appearance in health and disease, and the experience of planters as to remedial measures; (2) to investigate the pathology of "leaf-disease," and the life-history of *Hemileia vastatrix* under the various conditions afforded by differences of soil, altitude, climate, &c.

During the whole time were kept up as continuously as possible the researches commenced at Peradeniya, and no opportunity was lost in verifying or correcting observations. I carried microscopic and drawing apparatus everywhere, and, as always, carefully figured any objects of importance to the inquiry. A large series of drawings and notes was thus accumulated for future guidance as new lines of research are opened up.

On my return, experiments were at once commenced to determine certain points suggested by the experience gained. These are still proceeding and yielding results. Meanwhile it is my duty to bring some examples forward, as illustrating and warranting the conclusions so far arrived at.

(1.) Several beds of Jamaica coffee seedlings in the Peradeniya gardens appeared quite healthy on 10th February 1880; each seedling was about eight inches high and bore six or eight pairs of leaves. Specimens were selected and microscopically examined; nothing shewed that the internal structure was abnormal, or that they were functionally wanting in any way.

Twenty-four of these seedlings were potted off in baked earth and removed for future experiments. To windward of the beds, and separated from them by an ordinary gravel path, were several old coffee trees, eight to ten feet high and badly diseased. The open verandah, in which the selected plants had been placed, also lay to the leeward of a quantity of old and diseased trees, separated by many yards of garden.

During each day following, the leaves of specimens from both beds and pots were examined; on the lowermost leaves were found a few scattered and ill-defined spores and tubes evidently of fungoid nature, as well as delicate threads of spiders' web, particles of sand, &c. The uppermost leaves shewed no such growths.

On the 20th February, the first yellow patch was observed on the lower side of a lowermost leaf of one of the exposed plants: during successive days several more patches appeared, always on the older or lower leaves, and in a month all the beds contained badly diseased specimens. By this time also the selected specimens had become diseased, chiefly on the "seed-leaves" (cotyledons).

The most careful examination failed to shew the diseased spots on any other part of the seedling than these older leaves; and even in the leaf stalk no fungus or other abnormal structure was observable, and to all appearance the root and stem were in perfect health.

(2.) Specimens of disease patches in all stages were selected from the above plants. Some were very small, hardly yellow "pin-spots," only seen when held up to the light; others older, larger, and more oily-looking; still older ones were covered below with yellow or orange "rust;" while yet further advanced irregular patches presented brown or black blotches in the central part, the yellow powder being at the edges.

The microscope establishes the following facts, and I have confirmed the observations since by examination of specimens from all parts of the coffee districts at various elevations and seasons.

Thin slices of the "pin-spots" and pale yellow patches, taken in all directions and examined fresh, or treated with chemical reagents shew that this part of the leaf has the passages between its cells which lead to the exterior blocked up with a much-branched, tubular, coral-like mycelium · the short stumpy branches applying themselves here and there in their course to the outside walls of the cells. The contents of the tubes are very granular and oily, usually coloured by a pigment varying from yellow to deep orange-red.

The older patches present similar features exaggerated, but the branched tubes of the mycelium have sent peculiar groups of the processes outwards through the outlets (stomata) of the epidermis: on reaching the exterior, the ends of these branches form swellings which soon become filled with deep orange coloured pigment and granules, and the groups of bodies seen from above present the appearance of rosettes. Since these bodies are easily rubbed off, they form a powdery mass on the outside—the so-called "rust."

Similar examination of the brown or black central blotches shews that the leaf cells have lost most of their contents, turned brown, and collapsed: thus the upper and lower surfaces come closer together, and such parts are thinner than the rest of the leaf. Usually, a number of black dots are seen on the upper and lower surfaces.

There can be no doubt that the tubular branched mycelium has been feeding upon the contents of the leaf cells, turning the green colouring matter and other substances into the granular and oily masses found within it and finally passing forth into the bodies forming the "rust" powder; and when we reflect upon the immense quantities of matter thus derived and thrown off from the leaves, we may understand in some measure the terrible effect produced upon the coffee plant.

(3.) Some of the yellow "rust" was placed in water on a glass slide and examined under the microscope. Each "grain" of the powder is a hollow case somewhat kidney-shaped in longitudinal section, and triangular, with one angle downwards, in transverse section: it is narrower at the end attached to the mycelium. The upper curved side is studded with papillæ, or wart-like projections of its outer colourless coat: the two smooth sides converge below to a rounded longitudinal ridge. Such a figure exhibits various forms if projected in different positions. As said, this papillate body has granular orange-coloured contents.

Many of them soon swell in water, and become filled with globules of clear fluid (vacuoles) from the equal and rapid imbibition of water; the papillate body now appears as if filled with spherical clearer bodies embedded in the colured mass. These globules are not always equal in size, but generally are nearly so, and average $\frac{1}{10}$ to $\frac{1}{4}$ the diameter of the whole mass: not only by their appearance, refusal to absorb staining reagents, and general behaviour, but by the fact that they can be made to disappear and re-appear, am I convinced of their fluid nature.

Others of the papillate bodies, however, do not fill with globules; but swell and soon loose their reddish colour, and the contents become very granular and grey-looking. After a time, varying from a few hours to a much longer period, the granules, which are very minute and numerous, pass into a state of violent motion to and fro in the fluid contents of the papillate body. This motion is too active to be merely physical, and has been observed too often to be accidental. After remaining in this state for some hours, the granules pass out into the surrounding water, and become widely distributed, leaving the empty papillate case behind: their ultimate fate is not yet satisfactorily established.

A piece of leaf, with "rust" on it, was exposed to sunlight, and found to become paler. Examination shewed that the majority of the papillate bodies had lost their contents, and remained as empty, colourless cases: the further history of the contents has not been yet ascertained.

On 22nd February, during an observation on the moist papillate bodies, several of them were found to have emitted tubular processes from one to

four points of the circumference; these tubes are continuations of the inner coat, and the coloured contents pass into them. Further observations have shewn that one tube usually grows to a great length, its cavity is continuous, and no partitions form across it, it takes a curved and even coiled course, and sends out many short branches at frequent intervals: the diameter of the tube is about one-fifth the breadth of the papillate body. A streaming of the contents is often seen, and the coloured matter passes gradually into the ends of the branches. From the above facts it is inferred that the papillate bodies are *spores*, which in certain circumstances germinate and produce a tubular mycelium: further facts are mentioned hereafter.

The minute black dots on the dark parts of old patches are found to contain multitudes of very small hyaline spores, budded off from the ends of delicate filaments which are matted together into a hollow case beneath the epidermis: the cavity becomes filled with the spores. These facts are here mentioned because the black points are so universal; they are not yet known to have anything in common with the above phenomena beyond what has been now stated.

(4.) On 22nd March the peculiar appearance presented by certain patches of "rust" obtained from "Inverness" estate was shewn to be due to a different kind of body from the papillate spores. The "rust" spots appeared pink, rather than orange-coloured, and were of a pasty rather than powdery character. Among the clusters of papillate spores the microscope shewed certain bodies of little more than half the size, quite smooth, crowded with red granular matter, and of a shape somewhat like a turnip or peg-top: each was on a narrow stalk, and many had a central boss on the top. These are not to be confounded with immature papillate spores.

Associated with the same external features, I have since re-discovered these bodies at various places and times, *e. g.*, Maturata (March 25th,) Ambagamuwa (April 5th), Peradeniya (May and June), and extended observations have elicited the following information.

From the top, opposite the stalked end, a stiff tubular prolongation of the turnip-shaped body is sent up: the coloured contents pass in, and when it has reached a length equal to six or eight times that of the original body, four partitions have cut the tube into as may chambers. From each chamber a delicate lateral branch is sent forth, which at once buds off a small globule at its tip: this globule receives the coloured contents, falls off, and persists, while the rest dries Here, again, I think we are justified in concluding that the turnip-shaped body is a spore that on germination produces a short tubular septate mycelium, whence small spores of another kind (*conidia*) are budded off; such cases of different kinds of reproductive bodies are well known to all mycologists.

The small globular spores have been made to germinate, but died at an early stage in all cases from the attacks of introduced organisms (*Bacteria Torulae*), &c., which are so troublesome in these experiments.

(5). The question what becomes of the long and curled tubes emitted by the papillate spores has been followed up with more success lately. The following facts have been obtained by growing the spores on the under side of thin glass squares, so arranged as to form the roof of a small cell kept moist by wet blotting paper; various contrivances to avoid the introduction of foreign fungi need not here be detailed.

Having attained a considerable length, all the colouring matter, &c., passes along a branch, and a pear-shaped swelling is formed at its end; this receives all the contents, a septum forms for the first time, and we have a swollen reddish body separated off from the empty tube and spore, which shortly die off.

This coloured body has been seen to send out branches. A number of rather large hyaline motile bodies (zoospores) generally make their appearance, and two of these have been seen to fuse. The connection between these various facts demands further inquiry.

(6.) Besides numerous examinations in Peradeniya no opportunity was lost during my journeys to study the vegetable forms which appear on the exterior of coffee; in all I have drawings of about a dozen different kinds of spore or of filamentous growths common on the leaves. Of these several are obviously blown by the wind on to the leaves; some germinate freely, while others do not appear to do so, while one or two have been traced to common forms abundant everywhere.

It is not proposed to describe here the various spores met with. Obviously while it will be necessary to trace the origin and destination of each form until we are either sure it is foreign or is connected with "leaf disease," the kind of inquiry thus instituted presents no ordinary difficulties: until we are quite satisfied as to which of the filaments, if any, belongs to *Hemeleia*, we are in the dark respecting one phase of its life-history, and until we know the whole of its life history, remedial measures are premature.

(7.) Numerous attempts to directly infect coffee plants with "leaf disease" have as yet failed. I may select the following from a multitude of examples as to methods adopted:

1.—Papillate spores were sown on the under side of a young leaf, covered with a glass cell, and placed in various positions, temperatures, and dry or moist atmospheres.

2.—Similar sowings were made on thin slices of coffee leaf, kept moist in glass cells—some in water, other in various solutions.

3—Sections of disease-spots were treated as above to try and induce the mycelium to spread from the leaf passages either on to other slices or on to the coffee leaf.

4—Several of the spores found on the coffee-leaf have been sown as above. The chief cause of failure here has been the unavoidable introduction of other forms which increase so rapidly as to destroy the selected ones before their normal fate has become indicated.

In drawing any conclusions from these experiments, too much stress cannot be laid upon the fact that, however carefully we plan an experiment in the laboratory, we fall short of Nature's conditions: further it must be admitted that until the fate of the various forms found on coffee is ascertained, we may have missed a phase in the life history of *Hemileia*. I am therefore pursuing closely the different changes passed through by these spores and their products, and hope to place the results before you in a future report.

In conclusion, I feel justified in drawing these inferences from what has been seen so far. Derived from some source purely external, a fungoid organism finds its way into the passages between the cells of the leaf: here it has a term of existence shewn to the observer by the origin and spread of the yellow "disease spots", caused by the changes in consistence and colour of the leaf contents at those places.

The outbreak of the yellow "rust" from the leaf passages, through the stomata takes place when the leaf begins to fail in supplying sap. Such an explanation is in accordance with all the facts yet known to me, and with the present state of physiology. In seedlings, the cotyledons especially becomes yellow, and in older plants the lower leaves usually suffer first: on wind-blow ridges, quartz patches and dry soil generally, bad attacks of rust are conspicuous when more sheltered and moist portions of the estate do not appear to be suffering: in sudden dry weather "an attack" commonly comes over an estate, while during the last stages of crop "leaf disease" is often very bad.

Now, if the mycelium, ramifying among the loose cells of the leaf, is absorbing its food from those cells, as is well known to be the habit of such parasites, we can see how so much more work is thrown upon the plant. Whereas a leaf normally supplies a certain quantity of elaborated food for the tree in a given time, we have here the same leaf compelled to provide food for tree *and fungus*—its cells must work the harder and its life be the shorter.

Until we fail to account for the ravages of leaf disease according to known principles, we have no right to seek an explanation elsewhere. Many and in some cases elaborate experiments are being planned to establish the important point as to what actually occurs between the fall of the leaf, with its "rust" and mycelium, and the re-appearance of the yellow "pin-spots." I have already indicated the direction in which these are leading, and it only remains to patiently carry on research. When it is remembered that these germinating spores have to be kept under observation during the night as well as day, that all kinds of minute organisms have to be guarded against, and hence that out of many attempts few succeed, I hope that the importance of this plan will be admitted.

In conclusion, I must beg to be allowed to thank the planters and other gentlemen who have so kindly and efficiently aided me thus far in what has become to me a labour of love.

ANALYSES OF QUARTZ.

From R. Smith, Esq., Assistant Metallurgist, Royal School of Mines, to the Under-Secretary of State for India, India Office, London, S. W., dated Jermyn-street, London, 12th May 1880.

I have the honor to inform you that the 24 samples of quartz and pyrites, obtained by Mr. R. Brough Smyth from the reefs near Devala in the South-Eastern Wynaad, India, and marked as under, have been submitted to examination, with the following results:—

No. 1.—"Hamlin's Reef."—
Gold—0 oz. 2 dwts. 23 grs per ton of 2,240lbs.
Silver—0 oz. 4 ,, 6 ,, ,, of ,, ,,

No. 2.—"Cavern Reef"—
Gold—0 oz. 13 dwts. 2 grs. per ton.
Silver—0 oz. 1 ,, 23 ,, ,,

No. 3.—"Ettacul Reef"—
Gold—1 oz. 1 dwt. 13 grs. per ton.
Silver—0 oz. 5 ,, 21 ,, ,,

No. 4.—"Skull Reef"—
Gold—0 oz. 3 dwts. 22 grs. per ton.
Silver—0 oz. 9 ,, 4 ,, ,,

No. 5.—"Wrights' Level"—
Gold—0 oz. 8 dwts. 6 grs. per ton.
Silver—0 oz. 2 ,, 15 ,, ,,

No. 6.—"Monarch Reef"—
Gold—0 oz. 8 dwts. 22 grs. per ton.
Silver—0 oz. 3 ,, 22 ,, ,,

No. 7.—"Waterfall Reef"—
Gold—0 oz. 2 dwts. 7 grs. per ton.
Silver—0 oz. 1 ,, 15 ,, ,,

No. 8.—"Nadukani Reef"—
Gold—0 oz. 8 dwts. 22 grs. per ton.
Silver—0 oz. 2 ,, 15 ,, ,,

No. 9.—"Bolingbroke"—
Gold—0 oz. 4 dwts. 11 grs. per ton.
Silver—0 oz. 1 ,, 7 ,, ,,

No. 10.—"Iron Pyrites, Bolingbroke"—
Gold—0 oz. 5 dwts. 21 grs. per ton.
Silver—0 oz. 4 „ 14 „ „

No. 11.—"New Reef, Prince of Wales"—
Good—0 oz. 8 dwts. 14 grs. per ton.
Silver—0 oz. 4 „ 6 „ „

No. 12.—"Rosedale Estate"—
Gold—0 oz. 6 dwts. 15 grs. per ton.
Silver—0 oz. 1 „ 23 „ „

No. 13.—"Dawson's Reef, Elizabeth State"—
Gold—0 oz. 5 dwts. 5 grs. per ton.
Silver—0 oz. 6 „ 13 „ „

No. 14.—"Sample not received.

No. 15.—"Dawson's Adit"—
14 Gold—0 oz. 7 dwts. 20 grs. per ton.
Silver—0 oz. 2 „ 15 „ „

No. 16.—"Bear Reef"—
15 Gold—0 oz. 17 dwts. 0 grs. per ton.
Silver—1 oz. 4 „ 4 „ „
Copper—1·69 per cent.

No. 17.—"North-Western Face Hill"—
Elizabeth Estate.
Gold—0 oz. 4 dwts. 22 grs. per ton.
Silver—0 oz. 4 „ 6 „ „

No. 18.—"Sandhurst Reef"—
17 Gold—0 oz. 5 dwts. 5 grs. per ton.
Silver—0 oz. 5 „ 21 „ „

No. 19.—"Phœnix Estate, (Williams)"—
18 Gold—0 oz. 7 dwts. 5 grs. per ton.
Silver—0 oz. 1 „ 7 „ „

No. 20.—"Reef behind the upper Harewood Bungalow"—
19 Gold—0 oz. 0 dwts. 5 grs. per ton.
Silver—very small quantities.

No. 21.—"Reef behind Mr. Lonsdales' Bungalow from face of drive"—
Gold—0 oz. 8 dwts. 22 grs. per ton.
Silver—0 oz. 1 „ 7 „ „

No. 22.—"Karambant Reef"—
Gold—0 oz. 0 dwts. 5 grs. per ton.
Silver—very small quantity.

No. 23.—"Casing from Karambant Reef"—
22 Gold—0 oz. 0 dwts. 4 grs. per ton.
Silver—very small quantity.

No. 24.—"Tailings from catch pits, Alpha Works"—
23 Gold—0 oz. 5 dwts. 5 grs. per ton.
Silver—0 oz. 2 „ 15 „ „

No. 25.—"Tailings from Reverberatory Furnace, Alpha Works"—
Gold—0 oz. 7 dwts. 13 grs. per ton
Silver—0 oz. 8 „ 4 „ „

The whole of each parcel of ore was reduced to a very fine powder to obtain a fair average sample before submitting it to examination.

The above are the mean results obtained from two or more assays of each sample.

The numbers from 15 to 25 do not correspond with those in the printed list of Mr. R. Brough Smyth, forwarded with the parcels of ore; the numbers marked O are therefore inserted for convenience of reference.

The silver present is for the most part alloyed with gold as "native gold" and would be extracted with it. A portion of the silver and also of the gold is probably present in the pyrites or other associated minerals.

The copper is present in very small quantity in several of the samples, but in much less proportion than was formed in No. 16 (Bear Reef).

If any difficulty is experienced in the extraction of the "native gold" from No. 16 by the process of amalgamation, it might prove desirable to concentrate the "native gold" with the pyrites by a "dressing" or "smelting" operation according to local facilities, for subsequent treatment for the separation of the copper, silver, and gold. I did not notice any free "native gold" in any of the samples of ore.

SELECTIONS.

HOP CULTIVATION.

Hop cultivation in certain districts in India has made most satisfactory progress within the last few years, and some growers, perhaps it would be more correct to say, experimenters, are sanguine that the time is by no means distant when, eventually at any rate, this industry will form one of the many important staples of our Indian productions, and render the importation of hops, now by no means an unimportant factor in Indian imports, almost, if not wholly, needless. That is, with persevering care, close application, and prudent patience, India my reasonably hope to become, in this matter of hop culture, independent of the home trade, every day developing, necessarily, greater proportions. It may not be altogether without interest, to hop cultivators in India, to mark some few details in connection with the area, yield, value, &c., of the hop cultivations in Great Britain.

Some idea may be formed, even by the most unobservant, of the extent to which this industry is prosecuted in England from the area it occupies in different counties. Thus in Kent, the most extensive garden of all, there are 43,400 acres under cultivation: Sussex claims a hop-growing area of 9,974 acres: Worcester district, or county, 2,609, and Hereford counts 5,947 acres under hop cultivation. In the county of Surrey there are only 2,376 acres, but it is said to be equal to any hop land in the world: while in the adjoining county, Hampshire, the area is given as 3,004 acres. Altogether, England may be said to have, under hop cultivation, 67,409 acres, growing in favorable season an average of, say, eight cwt. per acre or rather more than half a million cwts. in all, at a money valuation approaching three millions sterling.

But hop cultivation, even in England, and under the most favorable conditions, does not appear to be an unmixed blessing to those immediately concerned in it. People who ought to know, aver that no branch of agriculture is nearly so costly. The original outlay in forming a garden may be estimated according to attendant circumstances, at from £70 to £100 per acre The plants demand incessant attention, the most watchful care. They must be thoroughly weeded and fully ploughed out between the drills; they must be tied up to the poles at intervals while shooting; and when the flowers will repay the picking, that is, we suppose, when in a sufficiently healthy state of forwardness, gangs of hands must be employed to gather them. And as no cultivation is more expensive, so no crop is, it is said, more exhausting, and the ground being never allowed a rest, the consumption of manure is something enormous. Then again the grower can never be absolutely easy in his mind till the hops have been picked and passed through his kilns, for no crop, anywhere, is believed to be more uncertain. Before 1863, when matters had gone fairly well, and the anxious grower, might reasonably congratulate himself on a satisfactory gathering, his anxieties were so far at an end. Prices might, of course, vary, but the steady home demand might be relied on to absorb or dispose of the year's crop. Even then, a generally good season was far from constituting an unalloyed benefit. When every man's neighbour happened to be as well off as himself, there was inevitably a serious fall in prices, while the outgoings were above the average, the pickers being paid by quantity. Now, what the home grower hoped and prayed for was, that the hops on his farm might happen to be luxuriant, while they were shrivelled everywhere else (according to the philosophy which credited human nature with some satisfaction in the misfortune of its friends) and then his prime samples of 'whitebines' or 'goldings' fetched almost fabulous prices. We are told that well authenticated traditions still linger in the hop counties of gardens in favoured localities that were mines of gold so to speak, to their owners. But all this was altered in 1863, the year referred to, when the duty on foreign hops was abolished (something akin to the more recent cotton duties abolition): ever since the hop grower has had to bear the losses of bad years, without the consolation of feeling that as before, they might be amply made up to him in some extraordinary season; or possibly without the comfort of knowing that some of his neighbours were worse off than himself.

Previous to the repeal of the duty, though the imports appear to have been, for the most part, insignificant, no doubt they were, occasionally considerable. For, though the hop is a native of English hedgerows, the English climate is rather too damp, perhaps too cold, for its nurture; and continental growers are almost independent of the weather that so frequently proves disastrous to the British farmer. For instance, we learn that in 1859 not much more than two thousand cwts. were imported; whereas in 1861, when the duty had been reduced prior to its final abolition, the quantity had increased to one hundred and forty-nine thousands cwts. And it also appears, that since 1863, the year of total abolition, though the imports have of course shown an enormous advance, there have still been corresponding fluctuations, regulated chiefly by the abundance of the home supply. They range in value from less than half a million sterling in 1865 to something like,—if not over, so far as we can see a million and-a-half in 1869; the figures for that year being £1,217,938. That, roughly gives the measure of the competition which our home growers have apparently to face; and they know that prices will now be kept down to a maximum level, by what are termed the foreign reserves that are always in readiness for shipping. It is likewise shown that several continental countries,—Austria, Bavaria, Belgium, Alsace, Wurtemberg, &c., &c., even the Southern States of America and our own Australian colonies, have always, it appears, a large surplus to spare, of a quality too that quite equals the superior samples of the home or English growers. Indian speculators generally in hop cultivation, and our Punjab growers perhaps more especially, might do worse than ponder over the foregoing data.—*C. and M. Gazette.*

AFRICAN OPIUM.

We are indebted to the Portuguese Consul in Bombay for a copy of a report upon the Mozambique Opium Company's Farm, by Mr. M. Macgregor, C.E. Mr. Macgregor visited the farm on the 1st July 1880:—

I arrived here at 2-30 P.M. and have been all the afternoon going over the grounds, and I now beg to submit to you the following report:—

1. That on this date the 1st of July 1880, there are about one hundred and seventy-five acres of the finest land cleared; far superior, I am convinced, to any land at Malwa or in the vicinity of Lucknow in India.

2. About one hundred acres are now at this date sown, and about forty-five of these are under flower, and to all appearances must yield a very substantial crop about the end of September.

3. The whole of the ground taken by the Company is available for irrigation direct from the engines, and not only that, but the ground is of such a nature that a gentle incline enables the water to be led to any of the poppy-beds, even at the utmost point of the company's claims; in fact, a better place and more suitable soil could not have been chosen if the whole of the East Coast of Africa or even India, was searched for the cultivation of the poppy plant.

4. The poppies now in flower show a result that is not gained in India in even the very best of seasons. The bulbs on small and newly developed plants are large, round, and full of stable even in their undeveloped state; from this, I think, a great success will attend the future of this company. Failure will be entirely due to the mismanagement of the overlookers, for no fault can be attributed to the nature of the soil or the quantity of water required for the poppies, as there is abundance of the very best available soil as well as an unlimited supply of water.

5. The company is, I see, trying tobacco, but I am rather doubtful as to this plant, not as to the growing of it, but to the curing of the leaf, for I am certain a better soil never existed in India or America for either the cultivation of cotton, tobacco, or the poppy plant.

6. When you look at the nice little steamer, *Lady Nyassa*, of Messrs. Moire, and look at the engine on his estate, what a comparison—one rotten through neglect, the other as good as the day it left the workshop in England. Surely there must be a mistake somewhere here, when the most expensive property is going to distruction for no reason whatever.

7. The Governor of your port came here this evening from the westward, and he as well as myself, or in fact any visitor, must at a glance see that this undertaking is one that should yield a very large return, and should the company display as much experience in curing the opium as they have displayed success in growing the poppies, a very great future, indeed, is before them.

GROUND-NUTS.

IN the natural order *Leguminosæ*, which contains such a large number of species, and plants of such varied characters, two genera are remarkable, says the *Gardeners' Chronicle*, for having individuals with a peculiar habit, namely, that of ripening their seed underground.

The first of these plants, commonly known as the ground-nut (*Arachis hypogæa*) is a trailing, straggling annual, growing about two feet high, with a thick angular, pale green, hairy stem, and spreading branches. It bears yellow papilionaceous flowers, the calyx of which has a very long and slender tube, expanding at the top into two deeply cut lips. In general appearance this calyx tube has a strong resemblance to a flower-stalk, and being of a green colour it is the more easily mistaken; it was, indeed, for a long time so mistaken. The yellow petals are inserted in the throat of the calyx. The stamens are ten in number; frequently, however, one is abortive. The filaments are united into a tube for nearly their entire length, the anthers alternately rounded and oval. The ovary at first is very small, and is seated at the bottom of the calyx tube. The style is very long and slender, projecting a short distance beyond the staminal tube. After the flower has withered or fallen off, the ovary remains very small for some time, at the end of the long stalk, which, as it grows, curves downwards, pushing the ovary into the ground, and when sufficiently deep it begins to enlarge, perfecting itself in this position beneath the surface of the soil. So necessary is this burying process that if anything occurs to prevent it, neither the ovary is increased nor are the seeds formed. When fully grown, the fruits are about 1 inch or 1½ inch long, of a dusky yellowish colour, and with a netted or reticulated surface; each pod contains usually two brownish-red seeds; sometimes, however, three are found, but very rarely.

So largely is this plant cultivated at the present time in most tropical countries for the sake of the oil contained in the seeds, that it is difficult to fix upon its native country. It is, however, considered by some authors to have probably originally come from Brazil, the other species of the genus being natives of that country. Though, as we have already said the plant is largely cultivated in nearly all tropical regions, it is in western tropical Africa that it is most extensively grown.

It is described by Mr. Monteiro, in his *Angola and the River Congo*, as perhaps the most important plant in native tropical African agriculture. Many thousand tons are grown on the west coast, large quantities being sent to Europe principally to France. The author of the interesting work above referred to considers that the Arachis is destined to become one of the most important oil seeds of the future. The plant, which is known as the Mpinda or Ginguba, is cultivated in the greatest abundance a few miles inland from the coast, where the soil and climate are both better than in the arid country near the sea. Requiring as it does a rich soil for its profitable cultivation, it is consequently chiefly grown in the bottoms of the valleys, or in marshes, or in the vicinity of rivers. The cultivation is very simple. After the ground is cleared the weeds and grass are left to dry and are then burnt off, after which the ground is dug only to the depth of a few inches by women with little hoes, which, indeed, are the only agricultural implements used. The seeds are then dropped into the ground and covered up. These operations are carried on in October and November, and the first crop of seeds which are gathered for eating in a green state is ready about April. It is, however, not till July or August that they become thoroughly ripe and fit for harvesting for commercial purposes. Several thousand tons of these seeds are annually produced in this part of Africa, the bulk of which is grown in the Mbamba country lying parallel with the coast, at a distance of from 30 to 80 miles inland. The population of this comparatively small district is said to be very large, as may be gathered from the fact that the large produce of ground-nuts are shelled by hand, and brought down to the coast on the heads of the natives.

It is found by the natives to be more profitable to sell the seeds than to express the oil themselves, therefore but little oil beyond that required for their own use is prepared by them. Formerly it was obtained in a very rude manner by first pounding the seeds into a uniform mass in a wooden mortar. A lump was then taken from the mortar, hot water poured upon it, and the whole squeezed in the hands, the oil and water running from it, which was afterwards separated. The oil is very largely used in Angola for culinary purposes. The seeds, simply reduced to a paste by being ground on a stone, are used to thicken stews and similar dishes. Mr. Monteiro describes a large plantation of ground-nuts as a very beautiful sight—" a rich expanse of the most luxuriant foliage of the brightest green, every leaf studded with diamond like drops glittering in the early sun. The ground-nut is an important part of the food of the natives, and more so in the country from Ambriz to the river Congo than south at Loanda and Benguella. It is seldom eaten raw, but roasted, and when young and green, and roasted in the husks, is really delicious eating. It is excessively oily when fully ripe, and the natives then generally eat it with, bananas, and either the raw Mandiocca root or some preparation of it, experience showing them the necessity of the admixture of a farinaceous, substance with an excessively oily food."

From India also large quantities of Arachis or ground-nut oil are exported. In some of the Southern States of America the plant is now largely grown. Marseilles is the principal centre of the trade in this soil, but enormous quantities are brought to London as well as to the chief towns of Holland and Germany. So largely is the oil developed in the seeds that it is easily obtained by simple expression either with or without heat, that produced by the cold process being of course the most valuable. The oil is of a very light colour, with a bland taste, so much resembling olive-oil that it is said to be largely used for adulterating that oil. For pharmaceutical purposes ground-nut oil is now almost exclusively used in India instead of olive-oil, and in this country its chief use is in soap-making as well as in the preparation of cold cream and other toilet adjuncts. The residue of the seeds is made into cake for feeding cattle, and has been strongly recommended on account of the oil contained in it, its sweet taste, digestibility, and its richness in flesh-formers. As food for man the seeds are used in different parts of the world, either cooked or raw. In England they are frequently seen in small shops, being eaten chiefly by children, who call them "monkey nuts." In America a sweetmeat is prepared from them by parching them and treating them with sugar; simply roasted they are said to form a good substitute for coffee, and when finely beaten up into a pulp and formed into cakes, are sold in America for use as chocolate. In Loanda the traffic in ground-nuts is very extensive, and a source of great wealth to the country. In Ambacca, one of the most populous districts of the interior, thousands of tons were until recently sold annually; at the present time this trade is said to have almost entirely ceased. In consequence of the decrease in the price of ground-nuts—from £20 to £14 per ton—there has been but little inducement for the natives to cultivate the plant except for their own consumption.

The second plant, of which we spoke at the commencement as having a similar habit to that of the Arachis of ripening the seeds beneath the earth is known as the Bambarra ground-nut (*Voandzeia subterranea*). Like Arachis it belongs to the section *papilionaceæ*. It is the only species of the genus, and is described as being a native of Africa over which continent it is widely distributed by cultivation; it also occurs abundantly under the same conditions in Brazil and other parts of South America. Besides the name of Bambarra ground-nut, by which the plant is known in Africa, it is called by the natives in Natal *Igiuhlubz*, and in Brazil *Mandubi d'Angola*. The plant is annual, creeping. The leaves are borne on long stalks, and are composed of three leaflets each, the central one itself being stalked. The flowers are yellow, papilionaceous or similar in form to those of the last described plant. The calyx is bell-shaped, and the ovary, which bears two ovules, is surmounted by a short style and a hooked stigma. The flowers are both unisexual and perfect. After the period of flowering the flower-stalks bend over and push the young fruits into the ground, where like the Arachis, they ripen their seeds. The pods, when fully grown, are about ¾ inch long, somewhat oval in shape, in colour resembling the pod of Arachis, and also marked with a net-work of ribs, but coarser and not so well defined as in the ground-nut. Each pod contains but one seed, which is shining black, marked by a small white hilum. These seeds are eaten in countries where the plant grows, either in an unripe state and boiled like peas, or in their raw state when fully ripe.

NOTES ON MANURES.

AT a recent meeting of the Posen Agricultural Society, Dr. Wildt read a paper upon the results of certain comparative experiments in manuring recently carried out upon a number of contiguous estates (Sedan, Klotnik, Baranowo, Wierzonka, and Kiekrz), upon a uniform plan. The object in view was to determine what is the fittest form and most con-

venient season in and at which to employ potash as manure. The experiments afforded the interesting proof that the prejudicial effect of potash salts upon the starch contents of potatoes, which has frequently been observed in earlier researches, is diminished in intensity in proportion to the interval that elapses between the manuring and the setting of the seed potatoes. At Wierzonka, where the potash manure was applied at the time of setting, the loss of starch in the crop, as compared with the average quantity in unmanured potatoes, was 4·82 per cent. Kiekrz where there was an interval of ten days between manuring and setting, it was 4·16 per cent; in Zlotnik, where the interval was fifteen days, the loss was 3·77 per cent. in Baranowo, with an interval of thirty days, it was 2·85 per cent. and in Sedan, with an interval of sixty-eight days, it was 0·93 per cent. only. The action of the diffetent salts of potash was also exhibited in an interesting manner. Where the potatoes were planted very soon after the ground was manured, the sulphate of potash acted most beneficially; next to this the chlorate, and next to the chlorate, kainit. The difference in action becomes more marked as the interval between manuring and sowing is more prolonged. Thus at Sedan, where it was of 68 days' duration, the proportions were absolutely reversed. Then there was an excess in the yield of starch per morgen of the crop over that in unmanured potatoes to the extent of 99 8lbs. in the case of the sulphate of potash, 104·8lbs. in that of the chlorate, and 125·3lbs. where kainit was employed. The practical teachings of the experiments are therefore briefly to the effect that it is advisable to apply the potash salts as long as possible before setting the potatoes, and that cheap impure preparations (such as the kainit of the Stassfurt factories) are no way inferior to the more expensive pure salts in their beneficial influence.

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One of the most important subjects discussed by the German scientists who lately met at Baden-Baden was the agricultural value of the re-absorbed phosphoric acid in phosphorites. The German phosphorites (including Brunswick coprolities) always contain, in addition to the phosphate of lime, small quantities of clay and oxide of iron. Treated with sulphuric acid, in order to render the phosphoric acid soluble in water, these phosphates, of German origin, exhibit the disagreeable property of taking up again the phosphoric acid. After being stored for a time, a portion of the free sulphuric acid recombines with the clay and oxide of iron, and is no longer soluble in water. But Professor Petermann, of Gembouz, Belgium, Professor Grandeau, of Nancy, and others have discovered that even the phosphoric acid in the soil soluble in water combines again with lime, clay, and iron, and so becomes insoluble. They also show that combined phosphoric acid is better for loose, open, sandy, or peaty soil than soluble. It appears to be the wish of the owners of coprolite deposits, &c., that the chemists should admit the recombined phosphoric acid in their valuations of the phosphorites, and the meeting was asked to support the request. After a long discussion, it was decided not to oppose the object sought, but it was not considered that the experiments hitherto conducted were sufficient to determine the relative values of recombined and precipitated phosphoric acid. It was also resolved that further experiments should be undertaken to elucidate the matter.

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As is well known, the excrement of bats is often used as manure in certain districts of Sardinia, France, and Hungary, where it accumulates sometimes to a depth of a foot or more in the caves and grottoes frequented by countless numbers of these animals. In reference to this subject Dr. Weigelt, Director of the Agricultural Experimental Station at Rufach, states that some years ago he collected several wheelbarrowfuls of this guano from the unused upper storey of the building, and every year since has obtained from the same place a quantity varying from 30 to 40lbs. This he has used in his kitchen garden with extremely satisfactory results. Last year he made an analysis of the excrement collected at the beginning of May. It occurs as a damp brownish-black powder, in which the undigested *débris* of the shell and wing cases of different kinds of beetles are clearly recognizable, often times even retaining their original characteristic colours. It smells pungently of ammonia, and is slightly suggestive of the odour of muck. The sample examined contained 16·95 per cent. of water, and the dry substances were distributed as follows:—

Phosphoric acid	3·00 per cent.
Potash	1·59 „
Other mineral matters	13·16 „
Nitrogen	10·40 „

Hence it appears that bat guano bears a close resemblance to Peruvian guano, especially if its phosphoric acid contents be increased by the addition of suitable phosphates. In the quantities ordinarily attainable bat guano would, of course, play a very insignificant part in farming proper, but it could be turned to good account by emptying it in flower or vegetable gardens of moderate size.

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A writer in the *Revue Industrielle* points out that the lime mixed with sawdust and sulphate of iron which is employed for the purification of gas can be turned to profitable account after it has served these purposes, as a manure of considerable fertilising power. Submitted to qualitative analysis, the presence of a certain proportion of cyanides is revealed, and quantitatively its average composition is found to be as follows:—

Carbonate of lime	54·84
Caustic lime	15·00
Organic matter and carbon	17·50
Sand and clay	12·00
Undetermined matters	1·16
	100·00

An estimate of the nitrogen gives its proportion as 0·909 per cent. From the quantity of nitrogen and assimilable lime salts which it contains, the material should, therefore, form a good manure, more especially for artificial pastures. Employed in large quantities it colours the vegetation blue in consequence of the action of the iron and hydrocyanic acid it contains, and under this influence the plants die. On the other hand, its employment in moderate proportions is attended with very good results, more especially upon clayey soils.

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The specification, says the *Planters' Gazette*, has just been published of a patent granted to Lieutenant-Colonel Francis John Bolton and Professor James Alfred Wanklyn for "improvements in the manufacture of artificial manures and ammoniacal products" In carrying out their invention, the patentees proceed as follows:—"We evaporate urine, and succeed in obtaining the solids in a fair state of dryness, and suitable for employment as rich artificial guano, or as sources of ammoniacal salts. We mix the urine as fresh as is practicable with about one-fifth of its weight of soot or of charcoal in a granular condition, and then apply heat of about 212 deg. Fahr., or a little over until the greater part of the water has evaporated off; we then add more urine to the dried mass and continue the evaporation. We repeat this process many times, and ultimately dry up and maintain a mass consisting of urine-solids mixed with more or less charcoal, and that product is the artificial manure or ammoniacal product which we propose to manufacture. The charcoal which we find that we can advantageously employ, we obtain by taking sawdust or comminuted woody or vegetable fibres, and treat them in a closed vessel with superheated steam."

MANURIAL EXPERIMENTS.

The following on the comparative results of different manures is extracted from an article in the *Civil and Military Gazette* reviewing the operations of the Cawnpore Experimental Farm for the past year. We have ourselves treated of the subject in a former issue, but the following brief extract is full of interest; and we therefore do not hesitate to reproduce it:—

The different manures experimented upon were bone superphosphate, dissolved guano, and a green crop of indigo ploughed in; and the following results were obtained. The outturn of wheat per acre in maunds was as follows:—

	Mds.	or Bushels.
Bone superphosphate 2 maunds	19·8	27·
Ditto 3½ ditto	23·9	31·5
Dissolved guano 1 maund 15 seers	17·3	23·7
Ditto 2 maunds	21·6	29·6
Green crop of indigo ploughed in	17·4	23·8
No manure	14·2	19·5

From this table it will be seen that bone superphosphate is by far the most valuable of the manures tried. The dissolved guano is effective, but so costly, that the increased value of the crop does not compensate for the extra expense incurred.

The bone phosphate used costs Rs. 8-7-3 per maund, and of this sum Rs. 8-4-6 goes to buy the 17¼lbs (21·3 per cent.) of sulphuric acid which gives so much of its value as manure to the bone phosphate. The bones can, of course, be purchased at an almost nominal figure, and the supply of them may be expected to be always kept up from the large number of animals that die annually. The process of manufacture was as follows. The bones were crushed in the lever mill (*dhenkli*), worked by three coolies who, in a day of 7 hours, are able to produce 180lbs. of the dust of required fineness. The crushed bones (as dust) are then thrown into a tub and moistened with hot water and sulphuric acid equal to one-third the weight of the bones added. After standing for three or four days, 15 per cent. of dry earth is mixed with it, and it is then ready for use. The high cost of the bone superphosphate will of course put it out of the reach of the ordinary Indian agriculturist, but bone dust alone, if applied in a larger quantity than the artificial manure just mentioned, is equally good in its results, although probably its effects will not be apparent until the second crop, as it is slower in application though its effects are lasting. It is an extraordinary fact that the Indian cultivator has never realised the vast utility of the bones of his dead beasts as a manure for his land, and it is to be hoped that the experiments now being conducted with the plain bone dust may shew him its efficacy. Bones there are and always will be in abundance, as the number of horned cattle in the more densely populated districts of the N.-W. Provinces is computed to be half, that of their population, the total number cannot be less than twenty-five millions, and taking the average length of life of a beast to be ten years, this would give us two-and-a-half millions of beastsdying annually; and as a skeleton of an ordinary bullock weighs from 40 to 50lbs., we may say that the supply of bone dust would be a million

and-a-half maunds per annum, or sufficient to manure the same number of acres once every 3 years—as often as would be required—and this at a mere nominal cost to the cultivator. The effects of dissolved guano are shortly calculated as follows, and shew that it can never be used in this country owing to its high cost :—

Difference in outturn per cent. due to guano.

	In grain.	*In straw.*	*In cash profits.*
Guano, one maund 15 seers per acre	+21	+32	−40
Guano, two maunds per arce	+57	+73	Nil.

The effects of ploughing in a crop of indigo green were found to be that the crop so treated was the tallest and, to all appearances, the heaviest on the farm, but on being cut, it was found that the indigo manure had a greater effect on the straw than on the grain. The effects as compared with a similar plot not manured, were as follows :—

Difference per cent. in grain, +22 ; in straw +80 ; in cash profits +7.

The effects of all the different manures experimented on are embodied in the following table, but only the most satisfactory results arrived at in each case have been taken :—

Manure and rate per acre.	Outturn.				Profits.	
	Per acre (in lbs.)		Increase per cent. on unmanured produce.		Per acre.	Increase per cent. on profits on unmanured plots.
	Grain.	Straw	Grain.	Straw.		
Bone earth; 3½ mds. applied just before sowing.	1893·75	2026·78	plus. 61	plus. 76	Rs. a. p. 26 12 6	plus. 73
Guano ; 2 mds. applied just before sowing.	1777·94	2880 62	51	73	15 7 1	Nil.
Green crop of indigo ploughed in three months before sowing.	1429·66	2994·82	22	80	15 8 0	plus. 7

Thin sowing, so much advocated, has been found to be not satisfactory in its results, for although the plants were incomparably finer, the crop was much lighter than that obtained by the ordinary method.

SEED-BEDS.

THE work progressing upon farms at this season of the year, naturally leads us to consider the seed-bed into which the seed is deposited and the influence which such a seed-bed is likely to exert on the coming harvest. The proper condition of the seed-bed may therefore be regarded as of the greatest importance. Although this is so self-evident that no one would think of disputing the fact, it must still be admitted that we are too much in the habit of neglecting many of the conditions which are calculated to promote the results we desire. We almost unconsciously drift into certain courses of procedure, without taking into consideration the objects in view. Custom and established usage, prescribe a certain depth as being necessary ; this quantity of earth is consequently turned over, and the natural conclusion is that we have thereby provided a satisfactory seed-bed. We forget the fact, that the roots of the plants we cultivate desire to strike more deeply into the land, and are by no means satisfied with the conventional four or five-inch seed-bed. As soon as the roots have struck well through the surface-soil, their roots endeavour to penetrate into deeper soil, but they soon find an impassable barrier, probably in the form of a plough-pan. This has been caused by the sole of the plough taking its accustomed track, and gradually pressing the soil into a hard and compact bed. These plough-pans, in course of time, become so tough, that the plough naturally glides above them, and simply renders them harder by each additional ploughing of the upper soil. In many cases, we find that from long-continued working, these plough-pans become almost as hard a rock, and constitute very formidable barriers against the progress of the roots. Thus the roots become confined within a small portion of the soil, and in their powers of searching for food are greatly limited : so also must the productive energies of the crops be limited. The cultivator consequently suffers, by reason of a decreased supply of plant-food yielding a smaller crop than he ought to have obtained.

In the preparation of the seed-beds for our crops our first consideration should be to secure for the roots as large an area of feeding-ground as possible. If, after a farmer had taken a large field, he permitted a barrier to accumulate, which prevented half of it being used common prudence would suggest the removal of the impediment. If, however, instead of doing so, the farmer, unconscious of the barrier, crowded the half of the land with the stock which would have done well upon the entire field, he would soon find that their growth and condition were unsatisfactory. To remove the barrier would be the common-sense remedy, and then he would profit by their enlarged feeding ground. The frequent existence of these plough-pans in our soils, is an equally unreasonable impediment to plant growth, and, consequently, to the more profitable cultivation of the soil. The impediment being out of sight does not lessen its power for checking the farmer's success, any more than if it were seen. Being out of sight, it is of course frequently out of the mind also, for no one would allow a similar decrease of feeding-ground above the surface. As it is, the roots of the growing crops are to a great extent kept within the four or five inches of upper soil, and they draw upon the food present so severely, that manure has to be largely supplied to enable a fair crop to be produced. To carry forward the simile already used, the stock being kept within half the field, need a supply of hay to keep them making even a moderate progress. The perpetuation of this loss is only permitted because the barrier is out of sight.

This is an impediment to agricultural prosperity for which we need no legal enactments ; it is a voluntary encumbrance which will be cast aside as soon as any farmer recognises the fact that it exists. Neither will he be content to adopt the expedient of making good the damage by a supply of manure. There are many and great advantages arising from the use of manure, but when its use induces a person to neglect that thorough cultivation of the soil which is desirable, then its assistance is sadly misapplied. The important services rendered by artificial supplies of fertility, have rather induced farmers to place the mechanical condition of the soil in a secondary position. This is very undesirable, for all manures should take the position of assistants to good cultivation, and never rank as substitutes. They are both parts of a good system; each has its right and proper share of duty to perform, and it is by their combined powers the most successful results are to be secured. Tillage of the soil may for a time render the use of manure unnecessary and the employment of manure may help to cover up the necessity for perfect cultivation, but in both cases we prevent that co-operation of those agencies by which the most successful results may be obtained. Let each be well and judiciously made use of, and we shall find them valuable helpers in a good cause; but they should never stand in the position of competitors for favour.

Another and very serious disadvantage arising from the plough pans, to which reference has been made, is the interference it causes with the passage of air through the soil. We know the importance of a supply of air for the support of animal life, and although in the case of plant-life the requirement is less urgent, it is none the less necessary, for the action of the air in the soil is of the greatest importance for promoting its fertility.—*L. S. Journal.*

CARROT CULTIVATION.

AN interesting memorandum on carrot cultivation, by Mr. E. C. Buck, has appeared in the *North-Western Provinces Gazette* of the 16th instant. The subject seems to have been taken up from a famine point of view. We have always known the extreme value of carrots as diet for horses and cattle ; but Mr. Buck advocates the extensive cultivation of this excellent root as human food, especially with a view to its being used when crops fail. Mr. Buck's head Superintendent, a Bengali, has written a note on the subject, of which Mr. Buck says :—" As my head Superintendent has taken much personal interest in the inquiry, I append the greater part of his note in original." This note is carefully penned, and is highly creditable to the Baboo. It appears that the Superintendent's attention was first directed to the subject, on the occasion of a visit on duty to the Punjab frontier of the Meerut Division, where he observed large quantities of carrots being cultivated. On inquiry, he found they were intended for human food. The large extent of land under this root roused his attention, as natives of India do not, as a rule, raise a crop purely and solely for cattle food. If there be any suitable refuse when the ordinary crop is garnered, the cattle get it ; but it does not enter into a ryot's head to make the raising of cattle food a primary object. He will raise a little gram, oats, or barley, but all of these he eats himself, and such a thing as a special crop of grass, for hay or a field of roots only suitable for cattle, is unknown in India. This point seems to us to be missed by Mr. Buck -the value of this crop as cattle food. True, it is incidentally mentioned that the green tops can be available for cattle thus carrying on the old idea of only giving the cattle the incidental results of the crop. The produce per acre is set down at 200 maunds, and this, we think, might be very materially improved upon. The English outturn is given at 20 to 30 tons, or say 543 to 814 maunds per acre,—an average of 678 maunds. We do not see, therefore, why 400 maunds should not be attainable. Experiment has proved that a quarter of a seer of grain and two seers of carrots will support a man as well as three-quarters of a seer of grain, while the cost need not be over one-half of that of the grain diet. Besides the value of the root crop, an acre, which was found to yield 360 maunds of roots, gave 90 maunds of green leaves which were greedily consumed by the cattle. The cost of cultivating an acre is estimated at Rs. 21, including price of seed, and as the average selling price of carrots has been ascertained to be 8 annas per maund, the profit must be considerable.

			Rs.
360 mds. roots at 8 annas		... ...	180
Cost of cultivation	21-0-0		
Rent and taxes, say	5-0-0		
			26
Net profit		... ...	154

which sum does not take into account the benefit derived by the cattle from the green tops. There seem to be other uses to which this root is applied, as we are told the Mussulmans prepare sweetmeats of it, which sweetmeat the Superintendent says "is a luxury." The carrots are sown in September and October, and are ready for food in two months. This is another advantage—they do not take up much of the farmer's time.

AGRICULTURAL PROGRESS IN THE CENTRAL PROVINCES.

THE past year has happily been one of fairly suitable seasons and good harvests generally. The records of all departments testify to an improved condition of the people, and, after a period of depression caused by two years of scanty harvests, the return of better times may well have animated all classes with hope and encouragement." Such is the opening sentence of the Administration Report of the Central Provinces for 1879-80, and it is the key-note of the whole report. So true is it that India is a purely agricultural land, that nothing so powerfully affects the entire people as favorable seasons and good harvests. Notwithstanding a comparatively light rainfall, the crop was a full one. "Taking the whole acreage, there can be no doubt that in all districts the outturn was favourable;" this is said of rice which is the principal wet-weather crop. "The spring harvest—chiefly wheat and oil seeds—was in all districts good, and in tracts excellent." The only crop which suffered seriously was cotton, and this we are told, is not largely cultivated in the Northern Division. Out of a total under crop of 15,223,066 acres, only 756,136 acres or 5 per cent. were under cotton. The entire acreage, as we have said, was 15,223,066 against 14,808,667 last year—an increase of 2·72 per cent. The total was distributed as follows :—

	Acre.	Percentage.
Rice	3,065,866 ...	20·
Wheat	2,994,321 ...	19·6
Other food-grains	6,022,075 ...	39·6
Oil seeds	1,278,255 ...	8 1
Cotton	756,136 ...	5·
Others	256,413 ...	1·7

The produce per acre is very light, otherwise an immense quantity of food-grains should be garnered from those 12,982,262 acres. The average production of rice is 440lbs., or say 7½ bushels of 60lbs. each, whereas the average outturn of the whole of India is 14 bushels, or just double. Cotton, again, only produces an average of 40lbs. per acre, whereas in the Punjab the average is 180lbs. Supposing an acre to be cropped twice in the year—once with rice and once with cotton—the result would be as follows, the prices being the average for the whole year :—

	Rs.	A.	P.
440lbs. rice at Rs. 3-1-2 per maund ...	16	7	10
40lbs. cotton at Rs. 16-10 per maund ...	8	1	9
Total ...	24	9	7

That is, a total gross income of Rs. 24-9-7 for the crops; surely better could be done than this. The Nagpore farm seems to have done sufficiently well to please the Chief Commissioner. We fail to see where the satisfaction finds an excuse, for we are told "no special success was obtained with any of the experimental crops." The only pleasing feature we note in the model farm report is the conclusion arrived at, that "the greater portion of the experimental farm will in future be devoted to experiments with the indigenous varieties." We have all along held that this was the legitimate work of a model farm. For experiments with exotics, a botanical garden is the place. Rent is very low, but that, while to a certain extent counter-balancing the low outturn, is no excuse for it. We can see one cause of the lower average outturn of crops in the fact that cattle are scarce in the Central Provinces ; and we consequently assume that the cultivation given to the fields is of the most superficial kind. Assuming that the half of the cattle are bullocks, we have 2,611,839 bullocks for 15,223,066 acres, or one bullock for every 5¾ acres, a number manifestly insufficient for proper cultivation. The sheep and goats only number 694,761,—a miserably small number of animals of the kinds so useful and so profitable to the farmer. It is evident from a study of the number of stock owned by the farmers that they are poor, and that, of course, precludes the possibility of any attempt at high class farming. The introduction of good communications, enabling the cultivators to convey their grain to market, or to the railway, is necessary in order to improve the material condition of these people. We observe that an effort is being made to improve the outturn of the Mohpani coal mines. During the year the out-put was 13,491 tons. The Empress Cotton Mill is getting along in a way calculated to lead to similar ventures ; the consumption of cotton was about three million pounds, and the production 1,804,513 lbs. of yarn, and 578,175lbs. of cloth, valued at Rs. 8,25,337 and Rs. 2,83,711. That there is room for an extension of the cotton manufacturing industry, is shown by the fact that there are in the Central Provinces 82,999 private looms at work, and that the value of their annual outturn is Rs. 81,21,567. The trade returns show a large falling-off, the total imports and exports having decreased from 767¼ lakhs of rupees in 1878-79 to 674 lakhs in 1879-80—a decrease of 12 per cent.—*I. D. News.*

A NEW WATER LIFT.

WE hear that an invention for lifting water is being patented in India by two officers, Mr. H. W. Steel, C.S., and Major E. H. Steel, Survey of India. It is likely to prove very useful to the many Europeans who are now engaged in indigo, tea-planting, &c., in this country. The invention in question is called the Lever Drum water lift. In a recent trial, the following results were obtained. Depth of well 33ft. running down to 36ft.; diameter of well 3ft. 6 inches ; amount of water in each lift 40 gallons ; number of lifts per hour 40 ; amount of water lifted per hour 16,000lbs. ; power employed 1 man and 1 buffalo ; duration of labour 8 hours in the 24. The cost of the first apparatus put up, and alterations made in existing plant, was Rs. 82. This cost is unnecessarily high, as the iron and wood used was found afterwards to be greatly in excess of real requirements. The cost is distributed under the following heads :—Iron 2 maunds and 6 seers, Rs 20-6 (including labour) ; wood for two uprights sheesum, Rs. 5, bamboos and oil, annas 6, wages to carpenters, Rs. 18-14, leather charsah and sewing, Rs. 9-6, ropes, Rs. 8 ; alterations to tank and conduit, Rs. 20—total Rs. 82. The inventors hope that, in time, the cultivator class will be induced to adopt the plan. It is exceedingly simple it contains no appliances with which the ordinary ryot is not well acquainted, and the ordinary village carpenter and blacksmith can make it. In thinking out the various details, the standard of intelligence which it was estimated would be required from those about to work it was put as low as possible ; in fact, the action of stooping to pick up a pice from the road was taken as the point beyond which the mind of the ordinary cultivator could not be taxed. Two wells in full working order may be seen at Ferozepore, each under the charge of an untrained villager. It is hoped that, in time, the cost of the apparatus, as detailed above, which it will be seen, includes alteration to existing plant, may be reduced to Rs. 50. We believe the royalty asked on each well will be very small. —*C. and M. Gazette.*

EUPHORBIACEÆ.

THE juice of the *Euphorbia* is said to be a protection for iron work, the following from Mr. McGibbon, Superintendent of the Cape Town Botanic Graden, has been received upon this subject :—

Since receipt of your letter of January last, I have been endeavouring to obtain more full information on the uses of *Euphorbia* juice than I possess, but I am sorry to say, without success.

Euphorbia sap is not used in any form at the Cape, nor is it an article of export. I have consulted the Customs Returns to that effect. In the neighbouring colony of Natal a patent was taken out, some years ago, for the use of *Euphorbia* sap made into a form of paint for use on ship bottoms, iron and wood, and marine structures generally. I have not learned that it is used in Natal for those purposes, nor do I find any of the sap is exported. I am told that the preparation of *Euphorbia* juice is worthless as a preventative against the attacks of *animal* life on wood or iron in water.

The species of succulent *Euphorbia* are very numerous at the Cape. The largest growing Cape sp. is *E. grandidens.* It reaches a height of 20 feet with numerous fleshy branches irregulary arranged round a straight stem. It is very abundant in the eastern districts of this colony. It bleeds freely and copiously.

Another sp. found more to the eastward and in Natal is *E. quinata* (a name of no authority I fear). This is the largest growing succulent *Euphorbia* I am acquainted with, exceeding in height *E. grandidens*, and larger in circumference than that sp. A good specimen of *E. quinata* ? is a handsome object, although of so singular aspect. The quantity of juice yielded by the tree is very plentiful. From this and the preceding sp., the sap was taken I believe for experiment. I would have much pleasure in sending you a few young plants or a lot of cuttings of both, or of other Cape species of succulent *Euphorbiaceæ*, if you desire to have them.

The *Euchlæna luxurians* succeeds fairly in certain situations, but it does not seed freely (as yet) with us. It is desirable to distribute seeds of the plant to our farmers.

FERTILIZERS.

IF we could have phosphatic fertilizers finely ground, says the *Journal of Chemistry ;* so that the product would be an impalpable dust, it would hardly be necessary to act upon burnt bones or mineral phosphates with acids. The only advantage of using acids, and changing tricalcic phosphates into bicalcic or monocalcic phosphates, is that thereby we render them more rapidly soluble, and consequently they are made ready for crops with less loss of time. The important factor in the acid treatment of bone is time ; for Nature acts slowly in fitting plant food for easy assimilation. There is, however, something more than the time gained as the chemical changes effected go beyond what naturally occurs in the soil. If we sow on our fields ground bone or mineral phosphate in their raw condition, these are acted upon by rain water which contains carbonic acid, and by this combined action we get one equivalent of lime removed, and the bicalcic phosphate is formed. This is slowly soluble in water, and is thus taken up into the circulation of plants in soluble form. Carbonic acid does not carry

the decomposition so far as the stronger acid (sulphuric) does, which changes bone powder at once over into monocalcic phosphate or superphosphate.

There is good reason to believe that monocalcic phosphate, or superphosphate, is too acid in its character to enter into the circulation of plants. If a fertilizer containing superphosphate be added to a soil containing lime, it is probable that the superphosphate, by uniting with the lime, "goes back," and becomes bicalcic phosphate, and thus it assumes the form that the bone powder does when left to spontaneous change in the soil. It will be better, then, in treating bones and mineral phophates, not to carry our work so far. By the use of one-half as much acid as is required to make superphosphate, we get as a result the bicalcic phosphate, and this we cannot doubt is the better way. In the manufacture of our home-made phosphates, we have used much less acid than is generally employed, and we like the product better. It is more lasting, it gradually nourishes crops, and is not lost by being washed out of the soil.

This whole matter of cooking plant food needs to be carefully considered, and if we are on the wrong track, let us get back into the right one as soon as possible. We can help Nature vastly, without doubt, but we must remember that Nature's laws are unerring, and whenever we do violence to her teachings or go beyond that measure of help which is permitted, we go wrong, and our interests suffer in consequence.

MINERALOGY.

LAND has a rising tendency in the Wynaad. A gentleman informed us (*Madras Mail*) to-day that he bought a piece of land in that district two years ago for eight hundred rupees, and has just accepted an offer for the same of one hundred thousand rupees, or a lakh. He will thus realise Rs. 125 for each rupee of his investment.

WE are not surprised that the gold discoveries in South India should direct attention to the same subject in Ceylon. For a long time geologists have known that there are indications in parts of the island of the presence of gold, and very recently Mr. A. C. Dixon discovered gold, in the Rambodde, Pusselawa, and Kurunegalle districts, and still more lately he found in the Matalle districts, specimens of "tellurium," which is said to be the invariable indication of the presence of gold. Still it by no means follows that the precious metal exists in paying quantities. We see it stated that sulphur has been found in the Matalle district in some quantity.

OF metals, India imported last year 386,150 cwt. of copper, worth Rs. 161,98,979. England sent us 328,956, cwt.; Hong-Kong 38,082 cwt., and Australia 14,444 cwt.

ALTHOUGH we have magnificent iron ore in various parts of the country, it has never yet been utilized to any great extent, We prefer apparently to pay foreigners Rs. 1,22,72,449 a year for the 2,099,127 cwt. of iron they send us, instead of using the ore that is to be found in millions of tons in this country. The same remark is applicable to lead, of which we imported 73,499 cwt., the cost of which was Rs. 10,62,958.

CHINA has sent us far more gold than any other country in the world during the last twenty-five years; then comes Australia, while England holds the third place. England, however, sent us the most silver, then comes China, and next the Straits Settlements. By far the larger portion of the imports were made at Bombay. The exports of gold were chiefly to England, to Ceylon, to Arabia, and Persia.

THE *China Mail* informs us that four mining engineers have arrived at Hong-Kong from England, having entered into a three years' engagement with Mr. Tong King-sing, the Director of the China Merchant S.S. Co., to proceed to Pekin to direct the working of a coal mine which is being opened within eighteen miles of the capital. Iron ore has been found in considerable quantities in the neighbourhood, and it is conjectured that the opening of the coal mine may lead to the establishment of iron works by the Government.

THE reason why large rubies are not more frequently met with than they are in the markets of Europe is, according to Mr. Streeter, owing to a law in force in Burmah which deprives the market of the most beautiful rubies. "Whoever finds a ruby of a certain weight (100 ticals) is bound under pain of death to deliver it up to the Financial Department of the Government." In order to avoid this penalty and loss of property, if a man be of a better position in society, he breaks it up into small pieces, thereby occasioning vast loss to Government.

GOLD, said Professor Egleton the other day, at the New York Academy of Science, has hitherto been considered by chemists as one of the most insoluble substances in Nature; but in reality it is quite soluble. Sonnestadt has shown that every ton of sea water contains 0·9 gramme of gold. This quantity is indeed extremely minute, but it must be remembered that Nature is able to compensate for this minuteness by continuing her operations through thousands and millions of years.

IT is surprising that the attention of capitalists in England and India has not been given to the manufacture of mineral oils in the East to a greater degree than at present. India and Burmah continue to import American oil, which although it has to travel thousands of miles by sea, can yet, after paying freight, insurance, and packing charges, be sold at a profit considerably under the cost price of oil manufactured in Burmah. Considering that Upper Burmah has, ever since we have known it, exported the unrefined earth oil, and that recent findings in Arrakan have shewn that we have in British territory large deposits of the same useful substance, it is not creditable to either European or native capitalists that the public should still have to buy their requirements in this line from America. The petroleum of Arrakan is said to be of superior quality and practically inexhaustible in quantity, and yet it costs so much to refine it with present appliances that the American oil is still the only sort generally used in this province as well as in India. If our capitalists have not yet been able to refine it and make it equally safe for public use at a cheap rate as the American oil, surely it would pay them handsomely to import skilled Americans to show them how it is to be done. Are we, with the raw material at our very doors, to go on importing our supplies of refined oil from New York for ever? Considering the plentiful supply both from Upper Burmah, and now from Arrakan, this would imply that our capitalists did not possess the energy and resources usually developed amongst capitalists in Europe.

WHILE the gold mines of India are creating excitement at home and some attention in India, the coal mines of this country, of much more consequence, in reality, to the country than those of gold, are gradually working their way into importance. A contemporary says :—

From Mr. Danvers' last railway report, we see that two-thirds of the coal consumed on the Indian railway during the last official year came from native mines: the figures were 362,762 tons of Indian coal against 150,096 of English. The largest consumer, the East Indian, uses only Indian coal, The B. B. & C. I., the Madras, and the South Indian use only English and Australian coal. The same is true of the Oude and Rohilkhund, and with the exception of a very small quantity of the Eastern Bengal Railway. The Sind, Punjab, and Delhi consumed last year 43,000 tons Indian coal against 4,600 tons English. Of the State railways all excepting the Dhond and Munmar use native coal only. Last year the G. I. P. Railway consumed 37,556 tons of Indian coal, but a contract has now been made by this company with Government for 50,000 tons yearly. In this respect the railways of Bengal and the Central India have great advantage over the line in Western and Southern India, on account of their proximity to the coal fields. The coal on those lines costs from 7*s.* 4*d.* on East Indian to 16*s.* 1*d.* on the Eastern Bengal, while on the Baroda line the cost was 34*s.* 8*d.* per ton, and on the Madras 36*s* 9*d.* per ton. The enormous advantage of the native mines to the railways near enough to avail of them is very clear, and the importance of the question to India, with a total consumption by her railways of 513,000 tons annually, can hardly be exaggerated. The coal mines of India will repay many times over indirectly if not directly the labour and capital which are bestowed upon them, and they well deserve the fostering care of Government.

DIAMONDS IN INDIA.

THE *Overland Mail* states that in a paper in the forthcoming number of the *Journal of the Scientific Proceedings of the Royal Dublin Society*, Mr. V. Ball of the Geological Survey of India gives an account of the mode of occurrence of diamonds in India and of their distribution, and adds references to the most important authorities on the subject :—

There are in India three extensive tracts widely separated from one another in which the diamond has been sought for. The most southern of those has long borne a familiar name which is however to a certain extent a misnomer. There are no diamond mines in Golconda. This name originally applied to a capital town now represented by a deserted fort in the neighbourhood of Hyderabad, seems to have been used for a whole kingdom, but the town itself was many miles distant from the nearest of the diamond mines, and it was only the mart where the precious stones were bought and sold. The second great tract occupies an immense area between the Mahanunda and the Godavery rivers, and the third great tract is situated in Bundelcund near the capital of which Punnah, some of the principal mines are to be found. The work of the Geological Survey has demonstrated that the diamonds occur in the Vindhyan rocks of Northern India. In the upper division of this formation there is a group of clay slate (Rewah) and in the lower a group of sandstone (Semri), in both of which diamond-bearing beds are met with. It is still very doubtful, however, if a diamond has yet been found in India in its original matrix. Mr. Ball gives an account of the chief mines, describing in detail from personal observation that of Sambalpur which has now for some time ceased to be productive. The Punnah mines are still productive, yielding a mean annual produce o

between £40,000 and £60,000 a year. Europeans have attempted diamond mining in each of these three traces, but in no one instance have their operations been attended with success, and yet there does not appear to be the least ground for supposing that there has been any real exhaustion of the localities where mining is feasible. In diamond mining there must necessarily be a considerable amount of individual handwork. There are immense facilities for peculation. It would almost seem that to work it profitably, a system of slavery must be adpoted. It is therefore to be distinctly understood that, except by a mere chance diamond mining will not prove a rapid road to fortune. Still writes Mr. King "for those content with a slowly paying occupation and a hard life involving close personal supervision of the workers it would pay, provided such persons possessed capital sufficient to last them a few years."

FORESTRY.

THE Mauritius Government having lately gone to the expense of importing a forest officer from India to report on the woods and forests of the island. That gentleman has just sent in his report in which it is recommended that two or more blocks of forest, of about 10,000 acres each, be formed in the lower parts of the island, to serve as reserves for the supply of fuel and small building wood for the inhabitants of Port Louis. The creation of a Government Department is also recommended, to have special charge of the State forests. The secondary and spontaneous growth where plantations have been abandoned, if protected from injury and allowed to grow, for twenty years, would, it is believed, "reforest the island, without a cent being spent for planting." "This growth, with the existing Crown lands, mountain, and river reserves and private forests would, if saved from further destruction aggregate upwards of 100,000 acres or nearly 25 por cent. of the total area of Mauritius, of which little more than 4 per cent. is said to be under cultivation."

THE attention of the Russian authorities like that of the Bombay Government has lately been turned to the prejudicial manner in which certain districts have been affected by the wholesale destruction of trees. From the earliest ages, the vegetation in the valley of Samarcand and generally of the districts of Saraf-jansk and Sagdiana has been so luxuriant, and the climate so mild and pleasant, that it has been compared by Persian poets to paradise, and so fertile is the whole oasis, one of the largest in Central Asia, that it produces not only sufficient corn for the subsistence of its 30,000 inhabitants and of the 9,000 troops quartered in it, but is also able to export large quantities of rice and wheat every year to Bokhara. During the last ten years, however, the climate has become sensibly worse, and this deterioration is believed to be mainly attributable to the reckless way in which the forests have been cut down and extensive tracts entirely denuded of trees, partly by the native inhabitants, who burn down whole woods in order to obtain charcoal easily, and partly by the Russians to procure the building material they required when they took possession of the territory. Energetic measures are, however, a correspondent of a German paper states, now being taken to arrest this wholesale destruction. The felling of trees for conversion into charcoal, or to float down the river to Bokhara, is strictly prohibited; and a decree has also been issued that a certain number of trees are to be planted on every acre of irrigated ground as well as on the banks of the streams and canals. In pursuance with this order no fewer than 11,750,000 young trees were, it is said, planted last spring in the district of Samarcand.

IN accordance with the suggestions of the Inspector-General of Forests, Assam, an experimental bamboo plantation was started at the Kulsi with a view to accertain accurately the yield of fresh shoots, such as are fit for paper manufacture, per acre per annum; whether this yield can be increased by manuring, irrigating, and other treatment, and also if the yield of fresh shoots is diminished by cutting out all such annually. It must not, of course be supposed that our rulers are going in for paper manufacture, although they have competed with private enterprise for many years past in almost every direction. Their object in this case was, we understand, to utilize not their opportunity but the knowledge they might acquire. The spot selected for this plantation, the report tells us, was rich alluvial flat on the right bank of the Kulsi river, and at the foot of the hill on which the plantation bungalow stands. The species used were the "Jati" and "Bijuli," bamboos, of which stocks with roots were first planted in June 1879, at distances of 12 feet by 12 feet, and by the end of that month, nearly all put out new shoots; but most of them subsequently died, owing, Mr. Mein thinks, to the fact, that they had not sufficient time to establish themselves in the ground and for making new roots by the time the heavy rains set in which flooded the plantation for a short time. Information as to the best time of year for planting was obtained from the villagers, rather unsafe guides, as it now turns out upon inquiry that, they plant bamboos in a rather haphazard way, frequently losing 50 per cent. of the stocks put down.

FROM the report of Dr. Thwaites on the Peradeniya Gardens (Ceylon) we extract the following on mahogany:—

A very considerable supply of seeds of this valuable tree has been received during the year from Jamaica. These seeds arrived in excellent condition for germinating, and a large number of young plants raised from them are growing here and are ready for distribution to those applying for them. To the Government agents of those provinces suitable for the cultivation of the tree have been sent supplies of seeds with instructions as to the best mode of raising them. Some seeds have also been forwarded to the conservators of forests, and others in India and elsewhere. The few old trees which are growing in this island produce seeds very sparingly indeed, so that supplies of seed from elsewhere are very acceptable from time to time. In this garden, unfortunately, the mahogany trees are liable to the attack, periodically of a lepidopterous borer which checks the growth of the young shoots, and consequently of the tree itself, materially.

"JHUMING."

THERE is a paragragh in the Chief Commissioner's Resolution on the "Forest Report of Assam for 1880," which strikingly illustrates one of the difficulties of our rule. Dr. Hunter has truly said that the Aryan populations of India have been well studied and carefully legislated for in accordance with their racial characteristics; while non-Aryans have been almost ignored. The custom of *jhuming*—to which the paragraph objects—is probably of all others the most widespread and radical characteristic of the non-Aryan races round and beyond our borders—a very necessity of their existence as they now live. The custom, as seen among the non-Aryans, is probably as old as and co-extensive with the races practising it. It is suggestive that the implement which superseded *jhuming*, the plough—was introduced by the Aryans, who, in all probability, on arrival, found the whole of India was systematically *jhumed* where possible. The custom prevails more or less among Butias, Akas, Daflas, Abors, Miris, Mishmis, Kamtis, Singphus, Nagas, Kukis, Lushais, Sheudus, Kyens, Mrus, and doubtless many others. The Garos, Kasias, and Angami Nagas constitute a group more or less to themselves, among whom for obvious reasons, it is modified. When new forest is cleared for a *jhum* it is usually devoted, the first year, to root crops, yams, cotton, &c., and in the second year, sown with hill rice and *koni*. These being on an equal footing with jungle seeds need weeding two or three times. In the third year, jungle seeds, notably those of the larger grains borne by the wind, and scattered in millions everywhere, together with the growth of *ulu* grass, render another crop too uncertain to be worth risk, and the land is abandoned. In the plains during the rainy season the ground is cleared of weeds by ploughing in water, a hot sun assisting to convert them into manure after which the rice, already half grown, is planted out and matures ere the jungle seeds can sprout and make head. This cannot be done in the hills except with favourable situations and soil, and with great labour for terracing, which brings us to the gist of the whole subject, *i.e.*, that barring fire as in *jhuming*, of water as terracing, there is but one other alternative, *viz.*, hoeing by which land can be made and kept clean for rice. To perform the latter operation so as to eradicate *ulu* grass, requires a depth of at least a foot, but this, on a steep hill side, subject to tropical rain, would carry away both crop and vegetable soil in a few weeks. It speaks volumes as to our mismanagement of these hill races, that, though in contact with them so long, we are so ignorant of the causes of their most conspicuous and chracteristic custom that an attempt is made by one of our best Commissioners to benefit them by abolishing their only mode of cultivation.—*Englishman.*

BENGAL FOREST ADMINISTRATION.

FROM the Bengal Forest Administration Report for 1879-80, we learn that the area of reserved forest in Bengal amounts to 2,945 square miles, of which 1,581 belong to the Sunderbuns, leaving only 1,364 square miles for the rest of the three provinces. It was intended to have added 1,800 square miles to the area in 1878-79, but this addition was found impossible to complete as the necessary arrangements could not be made in time. The addition will, however, be made during the current year, and will consist of tracts in Singbhoom, Chittagong, and other divisions. Mr. Gamble strongly urges on the Darjeeling tea-planters to extend the timber reserves, wherever practicable, by preparing nurseries of young plants, and by bestowing the necessary care on the seedlings to protect them until they are sufficiently grown for transplanting. He gives the names of a few suitable trees for elevations up to 7,000 feet, amongst which we remark the *toon*. This is a very hardy, fast-growing, and handsome tree.

its timber is, moreover, valuable in several ways. An area of 189 acres was added during the year to the Government plantations put out from time to time; these plantations now aggregate 958 acres. If a few hundred acres could be thus planted every where and there, over the whole country, wherever suitable localities could be found, the public would soon hear the last of famines arising from a deficient rainfall. The efforts that are now persistently made to protect forest land from fires, the result of accident, carelessness, or design have been very successful during the year. The only district where serious fires occurred, was Palamow. The firewood arrangements, in reference to the Sunderbuns, are working admirably, and the profit accruing to the department from this source is considerable. The receipts from the Sunderbuns Division for the year amounted to Rs. 1,87,324, and the expenditure to only Rs. 87,720, leaving a balance of Rs. 1,49,604.

The unreserved forests under departmental control—consist of a small tract in Julpigoree, which will eventually be brought into the reserves and of 5,100 square miles of open forest in Chittagong. Sir Ashley Eden regrets that the Government of India has so reduced the number of superior officers in the department in Bengal, "and the further weakening of the department by the transfer, elsewhere, of officers of local experience," that he does not see his way to give the officers so much leave as he would like. He is fully alive to the fact that, for long periods of the year, these officers are necessarily exposed "to malarious influences, which must render a fair amount of leave absolutely necessary for all." This is highly creditable to the Lieutenant-Governor, and will no doubt be appreciated by the forest officers serving in Bengal. The resolution closes with a well-merited compliment to Mr. Gamble.

THE IMPORTANCE OF FORESTS.

It is satisfactory to learn from the anniversary address of Mr. Ellery, President of the Royal Society of Victoria, Australia, that legislative measures have been taken to check the "reckless" destruction of timber in the forests of that colony, where rival owners of saw-mills chop down trees out of spite and then leave them to rot. The Department of Agriculture, supported by the new forest laws, has begun to reafforest the stripped mountain-sides with exotic as well as indigenous trees. The State nurseries at Mount Macedon are making "wonderful progress," and a valuable growth now covers a large part of the summit. From these nurseries thousands of plants are distributed to other parts of the colony; and it is remarkable that many of the European and American timber trees thrive better than the native and grow more rapidly than in their original habitation "It is intended also," says Mr. Ellery, "to sow many of our wrecked forest areas broadcast with the seeds of indigenous trees, notably the ironbark, and the same process will be tried on some of the treeless plains to the north." With a view to proper protection of the young plantatons, a beginning has been made in the establishment of a college, where young men will be trained in woodcraft and forestry, and in agricultural chemistry. By these praiseworthy means it is hoped that the climate of the colony will be ameliorated, and the ever-increasing tendency towards drought—which is the invariable accompaniment of a treeless district—arrested. The *Bombay Gazette* has for years past uniformly urged upon Government the necessity of increased attention to the very important question of forests. The area under forest must be very greatly increased, and the hills and mountains of the country unfit for cultivation must be now brought under forest protection in the general interests, especially in relation to the natural irrigation and water-supply. We give below a table showing the area under woods and forests in several European countries during the years mentioned. The areas have since been increased, generally speaking :—

Country.		Year.	Acres under woods & forests.	Percentage of total area.
Great Britain	...	1877	2,187,000	Nearly 4 per cent.
Ireland	...	1877	328,000	" 17 "
Russia	...	1872	527,426,000	" 43 "
Sweden	...	1875	40,636,000	" 41 "
Norway	...	1870	17,200.000	" 23 "
Prussia	...	1876	20,047,000	" 24 "
Baden	...	1876	1,500,000	" 36 "
Wurtemberg	...	1876	1,500,000	" 32 "
Austria Proper	...	1875	28,300,000	" 32 "
Hungary	...	1875	19,490,000	" 29 "
Switzerland	...	1877	1,900,000	" 19 "
France	...	1872	20,600,000	" 16 "

Owing to the nature of the climate of the British Islands with its abundance of atmospheric moisture and freedom from such extremes of heat and cold as are prevalent in continental Europe and tropical Asia, the forest question has received but little attention. In continental Europe the question has received and is receiving much. At the annual meeting of the Geographical Society of Vienna, it was stated by Councillor Wex that the river Volga, is decreasing in volume owing to the destruction of woods, so as to affect materially the level of the Caspian Sea and the sea of Aral. Remedial measures are being adopted. The Austrain Government are wisely desirous to conserve and utilise their now valuable forest properties, and there is a State Forest Department with a staff of 1,170 persons, 22 of whom are skilled officers of high position. The evils of denudation are however, perhaps, nowhere more signally exemplified than in Spain, and Rentzoch even goes so far as to ascribe the political decadence of Spain wholly to the destruction of the forests (March, p. 306). Although her physical conditions render a large extent of forests almost indispensable to industrial progress, Spain may be said to be the only European country, excepting Great Britain, in which there has been no legal provision for the protection of woods. It is beyond doubt that vast wooded tracts affect most powerfully the economy of the globe. Rainfall in relation to forest is not the only question; other powerful factors must be considered. Among others the following :—

1. Screening the soil from the heat of the sun's rays.
2. The immense leaf surface offered to the cooling process of radiations.
3. The copious evaporation of moisture from leaves.
4. The maintenance of equable temperature and humidity.
5. The control of the regular flow of rivers.
6. The supply of perennial streams and springs, which fertilize, benefit, and beautify a country.
7. The protection of the soil on the slopes of hills and mountains.
8. The protection from silting of wells, canals, lakes, and rivers.

The relation of woods to the natural drainage of the surface and subsoil, and especially to the permanence of the configuration of the terrestrial surface, also deserves great consideration. In a recent article we pointed out that an attempt was being made to set aside the forest policy of Sir Richard Temple, but we now learn that Sir James Fergusson—it was by his advice, when Under-Secretary of State for India, that the Forest Department was established—has entirely frustrated this attempt. And we are glad to believe this, for it is manifestly of the greatest importance that in the progressive development of this tropical country enlightened principles should influence Government in matters relating to this all-important question for the behoof of present and future generations.—*Bombay Gazette*.

GARDEN.

We learn that the proposal of a complete botanical survey of India has excited considerable interest among scientific circles at home where, we believe, the idea first arose. For the last dozen year the botanical survey has been the hobby of Dr. Forbes Watson and one or two other gentlemen in the India Office. The officer to whom by general consent the management of the survey was long assigned by anticipation, namely Dr. King of Calcutta, is singularly well-fitted to undertake the task. It is expected that the survey will extend over ten years; but long before the expiry of that period the surveyors would be able to supply Government with a great deal of information which would prove of the greatest practical value to the country.

No South Carolina industry has thrived more since the war than market-gardening about Charleston; and this year the shipments of strawberries have reached over 1,000,000 quarts, and those of early potatoes about 42,000 barrels.

The peach orchard of John H. Parnell in Troup country Ga. W. S. A. is the largest in the world, it covers 230 acres of land, and will probably yield $70,000 this year. Its owner is a near relative of the celebrated Charles Stewart Parnell, M.P.

The autumnal show of fruits and produce of Yezo (Japan) was held at Sappore on the 1st of October, and continued open to public inspection for six days. The *Japan Mail* says :—

The exhibits were carefully and neatly arranged in a temporary wooden building in the centre of the town. They consisted of the usual productions of the farm and garden :—potatoes of various kinds, apples, pears, plums, greengages melons, pumpkins, beetroot, grapes; the cabbages, onions, squashes, and some other vegetables exhibited being of enormous size. The rich soil of Yezo is evidently capable of producing food of the best quality and in abundance. All that appears to be wanting is a greater supply of labour and a spirit of enterprise.

Regarding the perspiration of plants, the *Gentleman's Magazine* writes :—

All who have revelled in the luxury of cultivating their own cabbages, must have noticed the big drops of water that roll about on their leaves during even the driest weather. Being most abundant in the morning, they are generally regarded as dew-drops, but this is a mistake. They are accumulations of vegetable perspiration, but nevertheless are as pure as dew-drops. Dr. J. W. Moll has investigated this subject and published in Amsterdam the result of his reseaches. In eight out of forty-two cases of different species of plants, the exudation was effected by special water-pores, in four of these by the stomata, or breathing pores; in eight other cases by stomata, and in three cases it took place at portions of the leaf containing neither stomata nor special water-pores. His general conclusion is that most plants have the power of excretion water in drops from their leaves, and that the effect of this excreting

is to relieve the plant from excessive injection by root pressure, which injection or over-supply of water would otherwise probably interfere with the respiration of the plant by choking the air passages.

THE BOTANY OF THE KURRUM VALLEY.

THE *Times* contains a brief summary of the botany of the Kurrum Valley, being an account of the work recently done there by Surgeon Major Aitchison, who, on the recommendation of Sir F. Roberts, was attached to the force as botanist in April 1879. The chief collections were made along the left back of the Kurrum river from Thull to Peiwar Kotal, and thence upon the higher plateau. The entire collection consisting of over 15,000 specimens, has been taken to Kew, and there arranged by Surgeon Major Aitchison, with the assistance of some of the staff. A botanical memoir of the Kurrum Valley, with an outline of the geography of the country traversed, has been published in the Linnæan Society's Journal. The Kurrum plains, formed of immense deposits of mountain *débris*, are in summer totally devoid of water, and in winter are covered with snow, and their aspect, therefore, is not, for a botanist, promising. But numerous extremely fertile valleys debouch upon the plain along the base of the Safed Koh. Here the botany is very interesting, and the field cultivation resembles that of the best parts of Cashmere. The limit of forest on the mountain slopes is usually reached at 11,000 feet, but occasionally extends even higher. A dense *deodar* forest occupies the ridges of the Peiwar Kotal, with *Abies smithiana* and *Pinus excelsa*. At 11,000 feet this suddenly and completely disappears, and is replaced with masses of the common juniper. This, in turn, disappears at 12,000 feet, leaving the summits of the peak perfectly bare. The forests are extensive and fine, containing splendid timber. A very handsome new *clematis*, with large flowers of a pale lemon colour, has been called after General Roberts, and a new yellow rose is among the many new specimens found and described.

INDIAN MANGOES IN JAMAICA.

SOME paper lately received from Jamaica contain a description of the first East Indian mangoes which have come to maturity in the island. So at least they are designated by the Kingston paper, which has apparently forgotten that all the Jamaica mangoes are lineal descendants of the Indian variety. In two years more a century will have elapsed since the *Mangifera Indica* was introduced into Jamaica. A French ship, bound to St. Domingo from Bourbon, or more probably, one that had called at Bourbon on its way from some Indian port, was captured by Lord Rodney, and was found to contain a collection of Indian plants, among the rest being some mangoes, which were taken to Jamaica, and grown in gardens established by the House of Assembly under Dr. Dancer. There can be no very cogent reason, therefore, why an experiment which conferred on Jamaica one of its finest and most prolific fruits should not now be repeated with equal success. The mangoes of which our contemporary speaks were originally imported from Bombay, and are doubtless specimens of the Mazagon variety, the most perfect of all the different species. It is this fact which invests the experiment just tried in Jamaica with special interest, and accounts for the difficulty which has been experienced in bringing the fruit to maturity; for it is a noted fact that the Mazagon mango, when transplanted to any other part of India, grows with difficulty and loses its distinctive flavour. The trees in question were planted in the Castleton Gardens, but would not fructify, and five years ago two plants were taken by inarching to the Hope Plantation, near Kingston, where their success is at last assured. At both places, they were under the care of the Director of Public Gardens; so it would seem that they have found in the Hope Plantation soil some of the essential qualities of their native Mazagon. The fruit is described as "in bulk and shape very similar to the yam mango, and as having a pleasant flavour of its own." The islanders, however, could not be expected to admit the superiority of the new mangoes to those which they believe to be indigenous. While admitting that they are "superior to many varieties of Jamaica mango," the writer says that "they do not in any way approach our Number Eleven, the mango *par excellence*." "They have a rosy, comely exterior, the rind is exceedingly thick, and the edible part is firm, but not stringy." The Jamaica people must be hard to please if these qualities do not represent to them a perfect mango; and we shall not be surprised if careful cultivation should prove the superiority of the Mazagon even to the incomparable "Number Eleven." Jamaica at any rate, has solved a problem which has puzzled Anglo-Indians; for we find that it is successfully exporting mangoes to various American ports, where they are already in great demand. The local paper thinks that the new variety will keep longer than others, and will easily survive the six or seven days' trip to New York; and we may soon hear of Bombay mangoes grown in Jamaica forming the *pièce de résistance* of Yankee desserts.

THE CULTURE OF THE GLADIOLUS.

DURING the summer and autumn, there are few more showy and beautiful ornaments of the flower garden than the *gladioli* or corn flags They have a stately style of growth and flowering, and their flowers embrace nearly every shade of colour in richest and most brilliant tints. When well cultivated, and when the roots are planted with some view to maintaining a succession of flower, they may be had in flower for some months, and the last spikes may be cut if not finished when frost is apprehended, and put in water, and opened in the greenhouse or in a room. They are, in fact among the most tractable of flowers.

They delight in rich liberal cultivation, indeed, they are comparatively poor without it. Deep digging or trenching is a point of the first importance in their management. The soil should, if possible, be largely composed of fresh maiden loam, but if that cannot be obtained, the best compost that can be made up for them should be made use of. Trenching should be effected as early in the winter as possible, so that the soil may be thoroughly well pulverized by frost In trenching, let the compost of manure, whichever it is determined to apply to them, be put in with the top spit so that it may be mixed with the soil about mid depth of the trench.

The best manure to use is cowdung that has been in the heap for six or nine months, during which time it should be turned frequently. If the manure or compost must of necessity be used economically, the best way to do so is to leave the application of it over till planting time, when it can be put directly about the roots. But by a little forethought, there are very few who have a garden that may not be amply supplied with compost, if not with manure, for this or any other choice flower which requires high culture.

Planting time may range from December to May in favourable districts, and where the land is light, warm, and well drained; but in less favourable conditions planting so early as December is attended with some risk to the roots, which are apt to rot when soaked with moisture during the coldest period of the winter.

Generally speaking, in Scotland it is safer to defer the first planting till the most favourable weather which can be found in February or March; that is, dry, sunny weather, when the soil may be worked without clogging the tools. When this occurs, the first plantation should be made, and successive batches may be put in at intervals of a fortnight or three weeks, according as the weather may permit, up till the second week in May, after which there is some risk that they may be too late to flower well. But much depends on the character of the season; if bright and warm, and the plants are well attended to with water, or are favoured with genial showers, they will flower freely enough even if planted in June. It is not, however, desirable to depend too much upon results that are to be brought about by an exceptionally fine season, and we would therefore advise that the last planting should be done not later than the second week in May. By planting a selection of late and early varieties at that time, a very late display of bloom may be depended upon, the early sorts will be certain to flower in any except the most adverse season, while in favourable ones the late bloomers will be sure to yield their beautiful spikes.

The roots may be planted in various ways; either in clumps or lines in the borders or beds, or they may be massed in contrast in beds edged or margined with any suitable contrasting or neutral tinted plant either in flower or in foliage. They have a beautiful effect, too, when planted in the bays of masses of dwarf shrubs, over which the taller growing varieties may rear their glowing spikes of flowers relieved and chastened by the foliage underneath and around them. Indeed, for the mere purposes of display of garden decoration, they may be grown in a great variety of ways. But when grown for the purpose of exhibition solely, they require a select position and special conditions.

The position best suited for the growth of *gladioli* for exhibition purposes, is one that is moderately sheltered, the medium of shelter being placed at some distance from the plants, so as not to shade or draw them by want of air and light. The time of planting these should be regulated by the time of the exhibition at which they are to be put in competition. If it is in July, they should be planted in February; or if that is prevented by adverse weather, let them be potted at that time, and placed in cold frames to start with the view of planting them out when the weather is sufficiently favourable. But when once they are potted, they should remain in the pots till they are well filled with roots, so that they may not be subjected to any check by having their roots disturbed, or it may be broken in the process of planting. A specially excellent compost should be made up for those which are designed for exhibition, high culture must be the rule in this case, not only that splendid spikes, but splendid flowers both as to size and substance, may be produced. For shows to be held in August or September, the planting may be done correspondingly later, but in order to have plenty of spikes for any one show, it should be kept in view that many more should be planted than will be required to make up the requisite number of spikes when the time comes to select them. Much may be done as the time approaches to regulate the condition of the spikes; shading will require to be adopted to keep the most forward back while fullest exposure to the sun in backward cases will have to be given, so as to bring as many out on the day of the show as can be managed. We have had to resort to the expedient of cutting forward spikes and putting them in a cool dark room or cellar in bottles of water, to keep them back; and also the cutting of very late spikes, and placing them also in water in the greenhouse or store, in order to bring them out in time.

The depth the roots should be planted is a matter of some importance. In exposed situations and in very light soils, we would recommend from four to five inches; and in deep heavy soils not over well drained, we should ay three inches were better than any greater depth. In spring and early summer, the roots will be rendered more cool and moist by having a good mulching of manure applied to the surface of the ground before drought sets in. Staking the plants as the growth may seem to want it, is of the utmost importance, and should receive due attention.—*N. B. Agriculturist.*

TEA.

THE *Indian Tea Gazette* writes very hopefully of the attempts at tea-planting which are being tried at the Andamans.

THE total exports of tea in October 1880, were 5,842,119lbs against 4,176,789lbs. in October 1879. Total exports from commencement of season (1st May) to end of October 1880, were 26,006,897lbs ; same time last year, 19,448,297lbs.

THE following have been the tea exports from 1st November to 31st October for the past four years :—

	Great Britain.	Other Ports.	Total.
	lbs	lbs	lbs
1876-77	29,105,283	266,436	29,371,719
1877-78	32,868,362	486 325	33,354,687
1878-79	34.263,252	206 092	34,469,344
1879-80	43,804,595	719,927	44,524,522

WE gladly give publicity to the following confession, which appears in a circular of a large London tea-house :—

" The increasing popularity and use of Indian teas cause us to give greater prominence to them. We are bound to admit that teas grown on the virgin soil of India do possess a fragrance and strength unattainable in any China teas."

INDIAN tea has met with a very favorable reception at Melbourne : the prices fetched were in every case above those ruling in the London market at the time of their shipment to Australia.

THE Kumaon correspondent of the *Delhi Gazette* wrote a fortnight ago :—" The tea season is all but over—unless in some exceptional cases. The crop this year, as far as I can hear, is below the average, and the yield ranges from about 4½ to under 1½ maunds per acre."

THE tea manufacturing season in the Darjeeling hills is now over and although we have no figures as to the outturn before us, we are certain that the crop will be less than was estimated at the opening of the season.

SEVERAL large grants of excellent land have been taken up in the Dumsong district (Darjeeling) for tea cultivation. Pruning has been begun within the last fortnight on a few hill gardens, and most planters have now followed suit.

EXTENSIONS in tea cultivation continue in Darjeeling and Julpigoree. In each district eight new gardens were opened during the past official year, and the total number of gardens is at present 37 in Julpigoree and 152 in Darjeeling. The area under cultivation was 11,079 acres in the former district, and 37,327 acres in the latter, and the estimated yield of the season, 411,580lbs and 5,126,460lbs respectively, or a total of 5,538,040lbs, as compared with 7,535,980lbs in 1878-79.

AT the Botanical Garden in Aichi *ken* an Indian tea-plant has been planted as an experiment. The leaves have lately been plucked and treated the same as the Uji tea, and it has been found that the product of dried tea was greater in proportion to the quantity of raw leaves used than with the Japanese plants, and that both its taste and appearance are very good. Such being the case, the outturn has been sent to the superior authorities of the *ken* for examination, with a statement that the growers are devoting their attention to the new plant.

ANENT Indian teas in Australia, a Calcutta contemporary remarks :—To those who may entertain the idea of sending their produce to the Australian market, it would be as well to point out that the colonials know nothing about the liquor of tea, and are only guided to their values by appearances. ' Small well-made Pekoes, Pekoe Souchongs, and leafy broken Pekoe Souchongs with tips, are most run after, and the smaller the boxes, the better.

IT is satisfactory to learn that the Indian contributors to the Melbourne Exhibition have been successful in attracting the attention of our colonial cousins to the products of this country, and have stimulated inquiry among the commercial classes of Australia in more than one direction. Tea, which the co-operation of the Chamber of Commerce in Calcutta with the Government of India, has, by the formation of a tea syndicate, been made prominent among the exhibits and become the subject of some excitement ; and the first sales which took place just before the departure of the last mail, aroused considerable interest. The prices obtained were most satisfactory, and more than realised the expectations of the most sanguine. Considerable interest has been roused not only in Melbourne itself, but also in the inland towns, and applications have been received from all quarters for consignments of Indian teas.

A GENTLEMAN who has had great experience of tea cultivation from the time when Indian teas first became an element in the Indian export trade, writes :—

I look with great suspicion on the future of tea in India. In fact, in my opinion all tea gardens that do not produce five or six maunds an acre, must ultimately be closed—and many gardens produce under *three* maunds. When one-half the gardens in Assam and Cachar are closed, and their produce, which is now sold at a loss, ceases to be sent into the market, the price of Indian teas will rise, and the proprietors of the good gardens,—the five and six maund gardens,—will drive a good trade. It must be a case of the survival of the fittest. I have just heard of two old gardens, for one of which three proprietors have to remit £1,600 each from home to keep it barely going, for the other the single proprietor has had to send out a much larger sum. Query, would not the first loss in these cases have been the least, and will they not regret before long that they did not retire altogether ? The labour difficulty has always been great, but it has got to be encountered in a far more acute form than has yet been experienced. A Government Commissioner is not an infallible means of cure, certainly, but the depression of the tea industry in this country is becoming so serious as to invite some attention on the part of the Government here and at home. The British Government now derive £1,000,000 sterling (40,000,000lbs. at 6*d*. duty) from this one item of Indian teas and yet Mr. Grant Allen asks—" Is India Worth Keeping ?"

THE tea industry in Dehra Doon has increased with surprising rapidity during the last ten years. Ever since the date of our interference with Afghanistan and the occupation of Quettah, the Doon planters, as also those of Kumaon and the Kangra Valley have suffered by the closing of the Central Asian Market to their produce. Orders had previously come from Bokhara, and buyers came to the doors of the planters, gave them good prices and took the tea away in bags. Under the new *régime*, however, with Lord Ripon in India, the Central Asian tea trade has revived, which would seem to indicate a confidence in communications being kept open. A correspondent writes to the *Daily News* :—

It would be hardly fair to expect high prices all at once ; but news from Umritsur raises the hopes of the planters. Indeed the Umritsur tea merchants have of late been buying liberally. The good done by tea cultivation in the Doon can scarcely be estimated. . . . . . In 1848 nearly 51,000 acres of cultivable land were lying in waste. A few grants had been made ten years before to favored individuals, many of them Government officials, but failure resulted from numerous causes, such as unwieldy grants, deaths of cultivators from malaria ignorance of the grantees, and hopes of great things from Government. But subsequently Government officials were prohibited holding land by the Home Government, and there was a panic, many civilians selling their interests for almost anything offered. Immediately after that, however, the rules were relaxed, and even civilians have cultivated the Doon resources to a profit. The grants, too, under Lord Canning's rules helped European enterprise by allowing the purchase of estates in fee simple.

THE Japanese Government is acting judiciously, writes the *Japan Mail* in preventing as far as practicable any adulteration of the tea grown in the country. The attempt at sophistication reported from Kobe some time since, was, we believe, promptly suppressed and a recurrence guarded against. It is in this way that the reputation of Japan teas for purity, and the consequent demand for them, will be maintained. In China, however, notwithstanding many serious warnings, a different course is apparently adopted by the natives and a recent *Shanghai Courier* says :—" we fancy there would be fewer tea drinkers at home if people knew what some of their tea was made of. The sale and exportation of the stuff which, for the want of a better description, is called ' Maloo mixture' has been prohibited over and over again by the Mixed Court, where large quantities of it have been confiscated. Yet there seems to be still a brisk trade going on in it. The police, however, are acting with praiseworthy vigilance in the matter and are frequently making heavy seizures. Within the week, the Hongkew division, under the able direction of Mr. Stripling, have seized a couple of tons of such rubbish consisting of dried tea leaves mixed with willow leaves, and have buried it, as usual, in the waste land opposite the station. It cannot be a particularly pleasant thing for people at home to know that, before they get some of their ' tea,' Chinese coolies have stewed it down two or three times and quite finished with it themselves."

MESSRS. J. SILLAR & CO. lately called public attention at home to the fact that a large quantity of a vile mixture, fraudulently called "tea," utterly unfit for human consumption, and which had been condemned by the analyst attached to the Board of Customs, had nevertheless been allowed to be re-exported ; and many writers

have been commenting on the circumstances as if it was a new thing. But, as a matter of fact, this importation of impure tea is a constant trade, and the instances of its being hindered by the authorities are sufficiently few to make the risk a comparatively small one. To all interested in the sale of Indian teas, this is a subject of peculiar moment, since the impure tea is commonly employed as a "blend." In the instance mentioned by Messrs. Sillar (which is not the latest however), the owner of this "tea" succeeded, on appeal to the Lords of the Treasury, in getting a different interpretation put upon Clause 30 of the Food and Drugs Act than that of the solicitor to the Board of Customs. A writer in the *Times* explains that "it appears that the disposal of defective or adulterated tea is vested absolutely in the Board of Customs, and they may allow it to be exported, stored, or given out for consumption, as they see fit; but if it is pronounced unfit for food by the analyst the Act says—'the same shall be forfeited and destroyed or otherwise disposed of as the Commissioners of Customs may direct.' The Customs Board read this portion of the section as placing the tea which is unfit for food out of the pale of fitness for consumption at home or abroad, and, therefore, making the forfeiture absolute, and the mode of riddance an after question. This certainly seems the common-sense view of the question; but we understand the solicitor to the Treasury thinks otherwise, and upon his opinion and reading of the Act several thousands of chests of tea which are described by epithets which cannot be repeated here have been delivered to the owner to be shipped back to China, to re-appear probably in this market."

INDIAN TEA IN AUSTRALIA.

The Melbourne *Age* of October the 6th, thus reviews the subject of Indian tea :—

Among the more important results that are likely to accrue from our International Exhibition is a better knowledge of the various products of other States, and especially of those which are suitable to our own requirements. A cursory examination only of the courts representing the British Eastern Empire unmistakably proves that there is a strong desire growing up throughout these dependencies to extend their trade relations with Australia. Already, as a whole, the consumption of this continent is beginning to assume the position of an important factor in the markets of supply; and should our progress during the next quarter of a century equal the strides we have made during the past period, the importance of being early in the field to meet these new wants cannot be gainsayed. Indeed, the exhibits we refer to as a whole indicate very clearly that our Indian neighbours fully appreciate the possibility of finding an extensive outlet for their products in Australia and thus expect to utilize the new demand so as to keep upon a more even footing the demand with the ever-increasing supply. India to a certain extent like other countries, has been suffering of late from over-production in special products—a result due to the fact that only a single market, that of Great Britain, has been looked to for their disposal. The natural result of this over-supply in one direction has been to induce both producers and merchants to look outside their old circumscribed lines of interchange for other communities to do business with; and the opportunity of an International Exhibition in Melbourne has wisely been selected to bring under the special notice of Australians the products of British India, in the hope that a large and mutually profitable trade may spring up between the two countries.

Early in the present year we directed attention to the spirited and business-like manner in which Calcutta merchants and tea-growers had taken up this subject, and of the steps the syndicate which had the matter in hand were taking to introduce Indian teas into Australia. As the matter is one of special interest to the thousands that make up the tea-drinking portion of our community, some facts regarding these teas, at present only very partially known in Australia, will hardly be out of place. Assam, in which is included the important districts of Cachar and Sylhet, is the tea-growing district of India; the climate is very moist and extremely unhealthy. The rainfall averages from 100 to 150 inches during the year, and generally commences in April lasting until October. The plantations, or gardens as they are generally termed, on which the tea plant is cultivated, yield, as a rule, from 700 to 800 lbs. per acre. The plant begins to yield when it is three years old, but is only picked lightly. At six years the plant is assumed to have matured, and will continue to yield as long as cultivation is kept up, which is done simply by hoeing round the plants. Manuring on some estates has been successfully tried of late, but the expense involved in the process prevents the plan being generally adopted. In the hill districts, which are drier and colder than the plains, the tea plant does not thrive so well, nor does it give so large a yield, the average being only 250 to 300 lbs. per acre. Indian teas are classed under two heads. In Assam, Cachar, Sylhet, Chittagong, the Dooars and the Terai, the strong pungent brisk with a rich full-flavored liquor, teas are manufactured, whilst from the indigenous plant of the hill district of Darjeeling and the Kangra Valley come the fine soft flavoury teas which command the highest prices in both the local and English markets. The estimated crop for the whole of India this year—we are informed by Mr. D. A Sibthorpe—the representative of the Calcutta Syndicate, and one of the Indian Commissioners to the Exhibition—is 40,000,000lbs, of tea against 36,000,000lbs. for 1879 and 34,000,000lbs. in 1878. The local consumption of tea in India, owing to the fact that the natives do not use it, is small, estimated at only about 2,000,000lbs., the balance of the crop is sent to the London market, where, up to the present time, it has always found a ready sale. It will be seen, however, that the continuous large increase in the production of Indian tea necessitates further outlets. Most of the Indian tea-makers confine themselves to manufacturing four or five sorts, which are known as pekoe, broken pekoe, pekoe souchong, souchongs and broken souchongs. Pekoe and broken pekoe are the finest teas in flavour and appearance, being made from the tips of the young shoots, and hence is full of life and rich with sap: the pekoe souchong is the next leaf on the shoot, the souchong and the broken souchong following in due order. Prior to the present movement to introduce Indian teas into general use in the Australian markets, the shipments made have generally consisted of high-class flavoury teas for mixing purposes, but there is really no valid reason why these colonies should not take, as Great Britain does, a fair proportion of the common sorts for ordinary consumption. Importers as well as tea-drinkers know that the China teas which have been coming of late years to the Australian markets have, as a rule, only one feature to recommend them—that of cheapness. Although the consumer doubtless fully appreciates this, there is just the suspicion now that quality has been sacrificed to a greater extent than it should be without the drinker getting the advantage. Ninepence to a shilling per pound in bond would appear—if our sale reports are correct—to be the price ordinary distributors are buying at, yet the housewife still pays her half-crown or three shillings, so that there would seem to be a screw loose somewhere. The introduction of a competing element into the market like Indian teas will, without doubt be a boon to the consumer; for with competition we are more likely to get the quality than in its absence, while the opening up of a new branch of trade with British India will furnish us with an outlet for our own products which China has never invited.

The Melbourne *Daily Telegraph* speaking of an auction held on 14th October, says :—

Considerable interest was manifested as to the result of the first auction sale of Indian teas put on the market by Messrs. James Henty & Co., the agents for the Calcutta Tea Syndicate. The catalogue comprised 783 half-chests and cases of Darjeeling, Assam, and Cachar makes, and it is extremely satisfactory to be able to state that every lot was competed for and taken up. Hitherto from 150 to 200 packages of Indian teas at one sale have exhausted the buying powers of our market, but the well organized effort now being made, and the direction of public attention to the teas through the medium of the morning journals is having the anticipated effect. The prices realized were irregular, the best proportional rates being obtained for the low and medium grades submitted, the biddings for the finer Darjeeling not coming up to expectations. In one respect, Mr. Sibthorpe, the Syndicate's representative, has cause for satisfaction, the distribution of the teas being general throughout the trade. The sales were made in bond, the prices obtained being as follow :—Darjeeling pekoes, 2*s*. 6½*d*, to 2*s*. 7½*d*.; Assam pekoes, 2*s*. 9½*d*.; pekoes, 1*s*. 1½d. to 2*s*. 0½d.; souchongs and Assam, 1*s*. 2½d., 1*s*. 3*d*., 1*s*. 4*d*., and 1*s*. 4½ d. ! pekoe souchongs, 1*s*. 5*d* to 1*s*. 7*d*. The result of the sale will warrant the continuance of the Syndicate's operations, and henceforth regular supplies will be put on the market, and an Indian trade thereby established.

COFFEE.

A COLOMBO paper states that at no period within recent years have Ceylon coffee estates been in such undoubtedly fine and healthy condition as they are at the present time.

There has been very heavy rain at the Shevaroy, and planters are looking forward with a hope that there will be very little light coffee this season.

In the Province of Isabella (Phillipines), says the *Straits Times*, the coffee and cacao trees under cultivation have been almost totally destroyed by the recent earthquakes.

The planters in Fiji are evidently determined to take all possible precaution to keep leaf disease at arms' length. In the *Fiji Times* a planter gives out in large print, that no one is to come near him or his estate, as, so far, he has successfully kept coffee leaf disease from his property!

The value of the coffee exported from India in 1854-55, was £82,804. The value of that exported last year was £1,626,746, or nearly twenty times as much as was exported just a quarter of a century ago.

There has been a considerable increase this year in the dimensions of the coffee trade of the Madras Presidency. The quantities shipped in the six months ending the 30th September, were 189,880 cwt. in 1878, 114,874 cwt. in 1879, and 203,169 cwt. in 1880, and the value rose from 60½ lakhs in 1878 to 89 lakhs in 1880.

We (*South of India Observer*) are receiving most favourable accounts of the prospects of coffee from South-East Wynaad, more particularly the estates in the neighbourhood of the

Ouchterlony Valley; the prospects, however, are not of *immediate* bumper crops but for 1881. The yield this year, we understand, will only be a moderate one; but this is satisfactorily accounted for by the splendid crops of last season.

A CORRESPONDENT from Mercara intimates that the yield of the coffee and cardamom plantations in the Coorg country is not likely to be good, about half what it was last year. The coffee berries are unusually late in coming to maturity, while the cardamom pods are small and short of seed.

SAYS the Bangalore Examiner:—

We are sorry to learn that in Travancore, this season, the coffee crop is a small one—about 2 cwt. to the acre—which would not pay anywhere but in Travancore, where labour is cheap, and Superintendents know their work. Estates are said to be looking much better than usual for crop time. Leaf disease has gone, an unusual occurrence so early, and though "keep down expenditure" is still the local motto, the planters have reasonable hopes, from the absence of leaf disease, of a good crop next season.

THE outturn of the season's coffee crop is, writes a Ceylon paper, better than was expected, and though the effects of the leaf disease are not wholly snuffed out, with judicious and economical management, the coffee enterprize need be in no fear. The new industries in the shape of cinchona and Liberian coffee seem to have well taken root, and large plantations of the latter are being got up principally in the low-lying districts, where the soil and the damp humid climate, and the hot steaming sun, force up the growth of the plant with marvellous rapidity. In a few years hence the extent of land under cultivation and the quantity of the produce exported will, we hope, usher in a new era in the history of our island.

THE fungus which has appeared in the coffee grub in some parts of Dimbula (Ceylon) is said to be spreading much to the discomfiture of the said grub and to the delight of the planters. On Lippakelle and Henfold plantations, the grub is said to be manifestly distressed, and success has attended efforts made to propagate the fungus. We trust specimens will be sent to Dr. Trimen and Mr. Ward. The fungus and the circumstances of its appearance ought to be peculiarly interesting to scientific men as well as to practical agriculturists.

REGARDING coffee leaf disease, a medical correspondent writes to the *Ceylon Observer*:—

"Will you call the attention of the planters to kerosine oil as a cure for leaf disease. Rs. 5 of kerosine will suffice for two or three acres and perhaps more: the stems, branches, and leaves are to be painted with a brush dipped in the oil. I should like some planter to try the experiment on a very badly affected piece of coffee, say a quarter of an acre in extent, and to give me the result through your paper."

The idea is not new. Among our "Editorial Notes" will be found a short account of some experiments with kerosine conducted by a gentleman in San Francisco, though his mode of procedure was somewhat different to that suggested by the *Observer's* correspondent.

THE coffee market is again a disappointment to planters. We believe the large Brazil crop,—says a Ceylon paper—is the principal, if not the sole cause of the present fall in prices. From a Rio Commercial Report in the *British Trade Journal* the following extract is of interest:—

The coffee season upon which we have just entered, has opened with an exceptionally large crop, which is reported to be in excellent condition. The weather has been remarkably fine and free from rain thus far, and the planters have been able to secure their crops under the most favourable auspices. The market, however, has been considerably embarrassed by the mismanagement of the Dom Pedro II. railway, which has failed to transport the crop promptly, and even when arrived, has failed to deliver it as fast as required because of new weighing regulations. The stock in hand, therefore, has been poorly assorted, and insufficient to meet current demands. Owing to the general complaints aroused by this weighing regulation, steps have been taken by the Government to increase the delivering facilities of the railway and the embarrassment has in large part disappeared.

Since then arrivals at and exports from Rio have largely increased. Another possible cause of the want of firmness is the belief held in some quarters that Ceylon and Java are to give fair average crops during 1880-81! We find in a Mincing-lane Report for the above journal the statement:—

The crop in Hayti is expected to be about 15,000 tons; in Java 50,000 tons; in Ceylon, 40,000 tons.

Now Java is not likely to give more than 40,000 tons according to the latest report, and certainly Ceylon will not exceed 35,000, if it does exceed 30,000 tons which latter is the more general estimate. But these differences are after all slight compared with the effect of the big Brazil crop. We do not think political complications or the Eastern Question have much to do with the fall in coffee: coffee is largely bought for armies in the field.

THE COFFEE PRODUCTION OF INDIA.

THE VALUE OF OFFICIAL STATISTICS.

WE should have thought that the Government would not have experienced much difficulty in giving to the public exact statistics regarding coffee-cultivation, but as a matter of fact it has either met with insurmountable difficulties in its endeavours to do so, or the returns published by the Madras Government and those issued by the Government of India have been carelessly passed through the Press. We are aware that it is almost as useless to expect exactness from a Government, as it if to expect it to help to develop the resources of the country without being called upon by its subjects to do so. There are certain discrepancies observable at a glance between the figures relating to coffee cultivation issued by the Madras Government, and those issued by the Government of India. In the Madras Administration Report, we find it stated that the total area under coffee in this presidency is as follows:—Mature plants, acres 574,951; immature plants, acres 14[illegible],251; taken up for planting, but not yet planted, acres 43,821. In the returns issued by the Government of India, we have altogether a different set of figures, as regards the acreage of land planted, the number and acreage of mature and immature plants, and the approximate yield in pounds. It is certainly not a matter of vital importance, but it is just as well that statistics by the Government and bearing its imprimatur should be tolerably accurate. We are inclined to place more reliance in the statements issued by our own Government than in those issued by the Government of India. But we have thought it our duty to point out that the two do not agree, and the disagreement can only have arisen from carelessness on the part of those who had to draw up the statements.

Whether coffee cultivation will continue to increase as it has done during the past twenty years, is somewhat doubtful A very great portion of the best land adapted for coffee growing has been already taken up, though much of it is not as yet planted. Those who are unacquainted with coffee, must not run away with the idea when they hear a planter saying he has an estate of three or four hundred acres, that the whole of his land is under coffee. As a rule, he selects only the very best portions of it on which to plant, as in nearly every case it is impossible to utilize all the land for which he pays kist. He must necessarily keep some under grass for his cattle to feed upon, while probably many acres are to be found not worth cultivating, owing to the presence of rock, or a want of a sufficient depth of soil. Be that as it may, it is very certain that, if the figures published by Government be correct, very many planters must be losing instead of making money by their industry. We are not responsible for them, but we draw attention to them as curiosities worth studying. We have given above the figures relating to the acreage, and this is what we find stated regarding the yield. "Total approximate yield is 18,606,195lbs. or about 110lbs. per acre." Now, we should like very much to know what planter would be able to carry on his estate for two or three years if he only got an average crop of 110lbs. per acre. If the gentleman who took the trouble to write the account of coffee cultivation in the Madras Administration Report had examined his figures, he would have discovered at once, had he but checked those figures, that a mistake had been made somewhere Even supposing the 54,591 acres of mature plants bore only 100lbs. the acre, it is evident that the aggregate yield must have been more than four times as great as that set down in the report before us, viz., 12,806,195slb. On turning to page 289 of the book issued by the Board of Revenue, we see it there stated that the exports of coffee amounted to 36,165,920lbs. in 1876-77, and that during the previous year they were 42,691,712lbs., figures which are very much nearer the actuals than those paraded at page 213. On turning to the figures published by the Government of India, we find still another account of the yield of coffee estates. We are there told that the approximate yield for 1877-78, including the Cochin and Travancore States, was 29,463,718lbs. Now can any of our planter readers tell us which set of those figures is the correct one. They are all *official* —save the mark!—and are all set out in the best of leaded type. As if these discrepancies were not sufficient in number, there is still another that remains to be noticed. The Government of India, ignoring, apparently, what the Government of Madras says on the subject, puts down the average yield per acre at 243lbs, a figure very much nearer the truth than the one given above. But neither the statistics of our own Government nor those of the Government of India agree with those of the actual exports.

Now we do not see how we can place any reliance on the other figures given us, unless some satisfactory information be forthcoming as regards those we have just quoted. We are told, for instance, that the average yield is 200lbs. per acre in the Wynaad, and the cost of cultivation Rs. 250. If these figures be true, what are we to infer from them? Let us suppose, for a moment, that coffee fetches in this country Rs. 55 the hundredweight. If 200lbs. be the outturn per acre, as stated by Government, it would not be worth more than Rs. 110 at the high price we have fixed, so that, according to Government, the planters are such extremely patriotic individuals that, in order to benefit this country, they actually spend Rs. 250 to produce what will return them but Rs. 110. The figures given by the Government of India do not, except in the one single instance of Wynaad, approach Rs. 250 as the cost of cultivation per acre. It is set down at Rs. 248 for that district, so that to grow a pound of coffee which

sel's for less than two shillings, more than two shillings are expended in cultivation. But it seems strange to us that Rs. 248 should be spent per acre in Wynaad, whereas in Tinnevelly only Rs. 80 are spent, in Coimbatore Rs. 60, and on the Shevaroys Rs. 100. We have not much doubt that the gross acreage of land taken up by planters is correctly stated by the Madras Government, but, after a very careful examination of the other figures given us, we are of opinion that they are altogether incorrect and misleading. Are the Custom-house returns to be believed, or are the figures given by the Board of Revenue to be accepted? They do not correspond, neither can they be made to do so, although there ought not to be so great a difference between them as there is. Even supposing the figures given by the Madras Government are not so recent as those given by the Government of India, and making due allowance for the variations of time, it will be nevertheless evident that one set or the other are unreliable. Perhaps the members of the Planters Association may deem it worth their while to look into these figures before the next crop is ready for plucking. They can, if they wish it, exercise a very efficient check on the returns relating to their own industry, without incurring very much expense.—*Madras Times.*

POTATO (AND ? COFFEE LEAF) FUNGUS.

THE Report of the Select Committee appointed to inquire into the best means of diminishing the frequency and extent of failures in the potato crop has just been published, and affords much valuable information on a subject of widespread interest. Although in Ireland the people are less dependant now than formerly upon this precarious root, the distress of the present year was mainly due, as the famines of 1741 and 1845-46 were due to the failure of the potato crop, whilst in other parts of the world its cultivation is steadily on the increase. The same land which, when laid down to corn, will maintain a given number of persons, will support three times that number when used for raising potatoes, and it will be long, we fear, before Irishmen cease to rely over much on this single and uncertain vegetable. The inquiries of the Committee were principally, it may be said almost entirely, confined to obtaining information upon what is known as the potato disease, and in the course of their sittings they examined the leading living authorities on the subject. The scientific witnesses were agreed on the nature of the disease, which according to them consists in the growth of a fungus on or in the plant. The disease spreads during the summer by means of spores or seeds, which first attack the leaves of the plant, the disease then descending to the tubers. A single fungus will produce "thousands of millions" of such spores, and each of them is capable in a space of time not exceeding forty-eight hours of becoming a developed fungus, and of producing fresh spores. This almost inconceivable fecundity is sufficient to account for the rapid spread of the disease during the summer. Experts, however, are at variance as to whether the spores are wafted by the wind or atmosphere to any considerable distance; but that they can be and are largely conveyed from place to place by birds, ground game, insects, and unconscious human agency is more generally admitted. Whilst again all agree that the spores, which during the summer extend the disease from plant to plant with such fearful rapidity, are incapable of living over the winter, there is difference of opinion as to how the disease hybernates. Some hold that it is mainly carried over by the filaments which constitute the body of the fungus, and which remain sometimes attached to the outside, sometimes within the skin of the potato, in which case it would be planted with the seed, although it might, to a lesser degree, remain on the old stalks and be spread with manure; while others attach great importance to resting spores. These are sexually vitalised, and possess an infinitely greater vitality than the ordinary spores, being capable of living undeveloped and exposed to the vicissitudes of climate for as long as three years. If this theory is to be accepted, the disease must be largely carried over the winter, not only in the seed potato, but in the stalks, the manure heap, and the ground itself.

The chief essential conditions for the full development and rapid spread of the disease are said to be the coincidence of moist weather with a particular stage of the growth of the plant and development of the fungus. All the witnesses strongly objected to sowing a second crop of potatoes within a certain period in the same land; yet in Ireland, among the small farmers, it is the general practice to sow every second year on the same ground. No precautions are taken against propagating the disease from year to year through the stalks; nor, although every variety of potato deteriorates as time goes on in its disease-resisting powers does the Irish cultivator think it needful to change his seed. Neither in Ireland nor in Great Britain have the most ordinary precautions been taken to produce a certain and healthy crop. Professor Baldwin is alone in his belief in the possibility of completely stamping out the disease, but other witnesses concur in thinking that we might find or develop varieties of potatoes which would be more capable of resisting it than those hitherto produced. The Committee, however, point out that although the production of new varieties or possibly the improvement of existing varieties, by a careful selection of tubers would be a work of national importance, it does not offer to the individual who devotes himself to it much hope of remuneration. They urge therefore that whether under direct Government control or through existing Agricultural Societies subsidised by Government experimental undertakings for the creation and establishment of new varieties of the potato should be encouraged in England, Scotland, and Ireland. In the latter country the farms of the Agricultural Department of the National Board might be extended and the attention of the Superintendent specifically directed to researches on the potato disease and to the creation, selection, and establishment of new varieties of the potato; whilst in England and Scotland should the Societies decline the task Superintendents with similar duties might be appointed. A further suggestion of the Committee, that in Ireland provision should be made by authority of the Government for supplying good seed potatoes to small growers for cash payments is less likely to be generally supported.—*Echo.*

WEST AFRICAN COFFEE.

THE following extract from Mr. Jamieson's last report on the Government Botanical Gardens, Ootacamund, will be read with interest by our planter friends :—

Last year I furnished a detailed report regarding the successful introduction and cultivation of West African or Liberian coffee at Barliyar. After another year's experience I can only reiterate the opinion then expressed, that I consider the progress made and the present condition of the plants eminently satisfactory, and it is now beyond doubt that this variety of coffee when grown under conditions analagous to those at Barliyar is vastly superior to the ordinary coffee *Arabica*. Another interesting fact with regard to this coffee has been determined during the past year. Having had opportunities of examining the flowers and fruit of the plants introduced and planted at Barliyar in 1877 as true "Liberian coffee," I am now quite satisfied that it is a distinct variety from the plants received in 1874-75 as "West African coffee." There is no distinguishable difference between the leaves and habit of growth of the two varieties. The flowers of the West African are not so large, and the berries are borne in larger whorls, and are more spherical in shape than that of the true Liberian variety; but the most important difference in a commercial point of view is that the West African is a much freer and more abundant cropper than the other; it is also hardier and ripens its fruit about two months earlier than the latter, and it has never produced any abortive berries, which is frequently the case with the Liberian variety. Several hundred seeds were sold and 5,925 plants raised from last year's crop of West African Coffee, and orders have been received for 500 plants. With a view to encourage plants to take up the cultivation of this valuable coffee in suitable localities, I intend advertising plants for sale at greatly reduced prices. Our trees have not been topped or pruned, but allowed to grow in their natural form, and promise to yield a good crop this year; but no doubt the yield of fruit will be greatly increased as more care and knowledge are brought to bear on their cultivation.

COFFEE IN BRAZIL.

REGARDING coffee in Brazil, a correspondent of the *Times* writes :—

The only produce which gives fair returns, on which the country depends for half its income, is coffee, the average yearly exportation of which, between 1865 and 1870, is said to have been 164,114 tons, of the value of £10,190,000. Coffee is king in Brazil, and threatens to absorb all the productive powers of the empire, to the great dismay of those prudent economists who declaim against the folly of "carrying all their eggs in one basket." There are, it is said, 530,000,000 coffee plants in the empire, covering 1,500,000 acres, to which large additions are made year by year; the annual crop is 260 000 tons, of which 50,000 are for home consumption. And yet, though "Brazilian coffee makes up about one-half of the quantity of coffee produced in the whole world," though its excellence has been recognised at the Vienna and Philadelphia exhibitions, and rewarded with gold medals and *mention honorable*, it seems to be held of so little account in the markets that, to ensure a sale, it has to be labelled as Java, Porto Rico, Ceylon, or Mocha produce. There is room for improvement in this branch of production in Brazil, and it also admits of further extension; but, although coffee can be planted almost throughout the territory of the empire, I was assured at the well-known *fazenda*, or estate, of Baron Fara, of Rio Bonito, near Barra do Piraby, a model establishment, yielding with two adjoining estates, 2,300,000lbs. of coffee, an annual income of £60,000, that the coffee crops above the latitude of Rio Janeiro are liable to be withered by droughts, while below the latitude of San Paulo they are often nipped by frost, the most favourable soil and climate being found in the northern districts of San Paulo, where the income to be made by coffee is higher by one-third than what the Baron himself can raise out of his own model farm.

THE WORLD'S COFFEE PRODUCTION.

THE four great coffee countries of the world are Brazil, Java, Sumatra, and Ceylon. The data and figures for 1879 show that Brazil itself has produced an extraordinary quantity of beans. Hitherto, 250,000 tons have been considered as a good yearly figure for Brazil; last year, the export alone amounted to 273,000 tons. But the consumption of coffee in the country itself now amounts to 60,000 tons, raising the total yearly products of Brazil to 333,600 tons. Fortunately for the planters in other parts of the world, coffee has grown into a necessity in the United States, and, thanks to this, its price has risen. Although the soil

of Brazil especially for coffee culture, is very extensive, yet the difficulty of obtaining labor daily becomes greater, and this renders it doubtful whether the above figure can be much exceeded. The crop in Java and Sumatra was estimated at 94,000 tons for export; the consumption of the inhabitants, although the population is double that of Brazil, is not half that of the latter country. The production in Ceylon, though greater than that of 1878 shows a falling off when compared with former years; there were in all 41,200 tons exported from the island, the native consumption being very small. Coffee is, besides, grown in Central America, in several of the South American Republics, in the British and other colonies of the West Indies, in Hayti Cuba, Porto Rico, Arabia, Mauritius, Reunion, and along the North-east coast of Africa in Liberia and the African West Coast, in Manilla, Celebes and several of the islands of the Pacific and, lastly, in British India. But the total production of all these regions does not reach half of the export of the four chief countries named above.—*New York Mercantile Review.*

CINCHONA.

We have much pleasure in recording that Mr. J. Fergusson, Deputy Conservator in charge of the Nullumboor Teak Plantations, has for the second time, been awarded the gold medal of the Scottish Arboricultural Society for the best essay of the year. In 1879 he received the gold medal for his essay on the Teak Forests of Southern India. This year his subject was Cinchona Cultivation, and his object is to show that, in the long run, it would be better to treat cinchona as a forest tree. The plantation to be thinned over by degrees, and the best trees allowed to grow to maturity, rather than on the principle of orcharding as at present pursued.

We learn that Mr. Cross, the Central American Cinchona Explorer, is in Ootacamund, nursing the plants brought to India by him last month. The consignment consisted of three *Calisayas* of the Santa Fé variety, six plants of the hard and soft Columbian and one Cocoa plant. These came from some three hundred miles within the Central American continent, and have cost several thousands of rupees to bring to this country. Mr. Cross will see them properly established in Ootacamund before he leaves. The Santa Fé is shown by analysis to yield ten per cent. of pure sulphate of quinine. Perhaps Mr. Cross' services might be utilized to report upon the Government Cinchona Plantations. So eminent an authority might have something to say upon the subject worth knowing.

A report by Mr. David Howard has recently been forwarded to the local Government by the Secretary of State for India, on the recent importations of East Indian cinchona bark to England. Mr. Howard says that "the *Officinalis* bark from the Government plantations at Dodabetta gives us some valuable information as to the effect of age on the value of the bark. The date of the plantation from which each parcel was obtained was given, and thus a series of barks have been obtained classed as natural, mossed, and renewed from trees planted in each year from 1863 to 1867." The result of the classing was highly satisfactory, showing that as yet the bark from the oldest plantations, so far from deteriorating, continues to improve. Both the genuine and the total crystallizable alkaloid steadily increased from the bark of the 1867 plantation to that of 1861, that of 1863 plantation yielding the same quinine as that of 1864 and slightly more cinchonidine and quinidine. The particulars given by Mr. Howard are considered highly satisfactory and will be freely circulated for public information.

MR. DAVID HOWARD ON INDIAN CINCHONA BARK.

Mr. David Howard, the nephew of the chief authority on the subject, reports that recent importations of East Indian cinchona bark have thrown light on several points worthy of the notice of those interested in the subject. The *officinalis* bark from the Government Plantation at Dodabetta gives us some valuable information as to the effect of age on the value of the bark. The date of the plantations from which each parcel was obtained was given, and we thus have a series of barks, classed as natural, mossed, and renewed, from trees planted each year from 1863 to 1867. As "natural" bark from the lower stems is only obtained from trees not yet treated for "renewing," it is evident that in the older plantations the natural bark will be chiefly from the upper stem or from saplings and inferior trees, and thus, as Dr. De Vrij has shown, will be of inferior quality. The result shows this to be the case, the best parcel of natural bark being from the plantation of 1867, that from the other plantations being of uneven quality, shewing no regular variation. The mossed bark, on the other hand may fairly be taken to represent the oldest bark from the main stems in each plantation, and therefore is the best guide as to the influence age on the quality of the bark. The result is highly satisfactory, showing that as yet the bark from the oldest plantations, so far from deteriorating, continues to improve. Both the quinine and the total crystallisable alkaloid steadily increase from the bark of the 18[illegible] plantation to that of 1864, that of the 1863 plantation yielding the same quinine as that of 1864, and slightly more cinchonidine and quinidine.

It is certainly more likely that such regular progression is the result of greater maturity than that the difference should be caused by any variety in the *C. officinalis* cultivated. This is a most important point, for recent importations of the bark of *C. succirubra* confirm the opinion so often expressed by my uncle, J. E. Howard, F.R.S., and by Mr. Broughton, the late Quinologist to the Indian Government ("Quinology of the East Indian Plantations," p. 71) that in this species the bark deteriorates beyond a certain age. It is difficult to say exactly what that age may be, and it probable varies according to the growth of the tree, but some of the very finest of the red bark now coming from India, so far as appearance goes, certainly seems to have passed its maximum of richness in quinine. As to the "renewed" *officinalis* bark, the time during which the different parcels have been forming is not given, nor is it stated whether it is from the first, second, or later crops, and therefore the comparison may not be accurate; but it is interesting to see that here also the older plantations show no deterioration, the best being from the 1863 plantation.

From a private plantation I have received a sample of root bark of *C. officinalis* from trees which were coppiced three years ago. It gives quinine 2·2 per cent., cinchonidine 2 per cent., quinidine 1·5 per cent., and cinchonine 3·3 per cent. The stem bark from this plantation, at the time when the trees were cut down, gave quinine 2·6 per cent., cinchonidine 1·6 per cent., cinchonine 1 per cent., and but a trace of quinidine. We find, therefore, that in this sample the ordinary tendency of root bark to produce the dextrogyrate alkaloids is developed to a most unusual degree, the percentage of quinidine is a most extraordinary one for bark from *C. officinalis*. I have also received from Darjeeling a very interesting sample of the bark of *C. succirubra* accidentally renewed. It is entirely the produce of accidental injuries to the trees (not deep enough to injure the cambium and prevent the bark forming over the whole surface), no protection whatever having been given where the bark was removed. The result is as successful as could have been expected from renewing under the most favourable conditions, the contained alkaloids being quinine 2·8 per cent., cinchonidine 1·5 per cent., cinchonine 1·2 per cent., quinidine ·1 per cent. Two parcels of the stem bark sent over at the same time from this plantation gave, first, quinine ·8 per cent., cinchonidine 1·2 per cent., cinchonine 1·2 per cent., and secondly, quinine ·9 per cent., cinchonidine 1·1 per cent., cinchonine 2·0 per cent. The improvement in value in renewed bark is therefore not owing to the covering, but is found equally in this accidentally renewed bark, and it would seem that the mossing is valuable chiefly as enabling the tree to produce the renewed bark with as little injury to its health as possible. It will probably be found that a less perfect shelter than moss may, in some circumstances, be sufficient to preserve the health of the tree under this process.

It has been proposed by M. Moens to shave off the outer layers of bark without cutting quite through the bark. No doubt the cellular portion of the bark is richer in alkaloids than the inner fibrous layer (*vide* 'Quinology of the East Indian Plantations,' by J. E. Howard, F.R.S., pp 23, 24, and 38), although the corky excrescences thrown out by the variety of *C. officinalis*, the "knotty bark of Jussieu," contain but little alkaloid (*Pharmaceutical Journal*, third series, No. 454, p. 769; 'Quinology of the East Indian Plantations' p. 70). The inner and outer portions of a sample of the bark of *C. succirubra* gave the following results:—

	Quinine.	Cinchonidine.	Cinchonine.
Inner.	·6 per cent.	1·2 per cent.	1·4 per cent.
Outer.	1·2 „	1·4 „	1·7 „

It will be noted that not only is the total alkaloid more in the outer bark, but the quinine is in greater proportion, and therefore the outer bark would be of much greater value per pound to a manufacturer than the whole bark.

The practical value of the process chiefly depends on the effect on the tree. If when thus treated, the tree throws out fresh bark of a similar quality to that produced in the old method of renewing without greater injury to its health, the process may be successful; but of course it is essential not to cut so deeply as to injure the cambium, and thus destroy the recuperative power of the bark.

SERICULTURE.

Successful sericulture in Dehra Doon is now under discussion, but we hear the planters do not believe in it, nor encourage it with any warmth.

A Madras paper says:—It is much to be regretted that the silk industry has not been placed on a really sound footing in this presidency. Bengal has managed to make it profitable. [Some years ago, the late Mr. Cammiade laid out several lakhs of rupees in gardens for the cultivation of silkworms, and in putting up expensive machinery for reeling silk. The experiment, however,

did not pay; for what reason we do not know. Probably it was owing to his want of a thorough knowledge of what was required. Worms are bred in Mysore, but the production of silk is not large.

SERICULTURE IN INDIA.

WE take the following on sericulture in India from a recent issue of the *North China Herald* :—

The Government of India has been making many good efforts in late years to foster old industries and to encourage the establishment of new ones ; and among others they have been stimulating sericulture. This has been in rather a languid condition from the time when the factories of the East India Company passed into private hands, and since then the export of silk from India can scarcely be said to have increased. The cost of feeding the worms on mulberry leaves was too great ; the worms which were reared from eggs imported from China degenerated very much ; and the extension of the China Japan silk trade affected that of India unfavourably. But the attention of the Government and of private capitalists has recently been directed to the introduction of sericulture into Western India, and the reports and statements on the subject, which have been published, speak very favourably of its prospects. The cocoons of the Tusser moth are found in almost every district in Western India, and it is proposed to pay the natives a small fixed price for collecting and bringing them to agents. One pie, or less than half a farthing, for one, or as some propose for two cocoons, does not appear to be any very great encouragement to the natives, but as there will be very little trouble in collecting them from the branches of trees, it may be sufficient to procure supplies. Tusser silk has long been an article of export from India to London, but never on a very large scale. It now appears, however that experiments have proved that it can be used in the manufacture of many fabrics for which mulberry silk has hitherto solely been employed. French manufacturers of ribbon have sent out special agents to India to purchase the silks and cocoons, and are anxious that the production should be increased as much as possible. The hybridisation of the Tussar and Japanese worms has also been successful, and will no doubt improve the quality of the silk.

Grants of money to conduct further experiments in rearing the worms and treating the cocoons have been made by the Government of India, and the subject has excited considerable interest in the Bombay Presidency. If silk culture can be introduced on a large scale into Western India, it will be very advantageous to the natives and to the Government. Additional employment will be provided for the former and large tracts of land which are now covered with jungle will be cleared, so that the trees which grow on them may be made available as food for the silkworms. These trees are of several species, and are found in almost every district. It will take some years before this new trade in silk from the Bombay country can assume large proportions even if the efforts now being made to introduce it are fully successful, but it is a menace on the part of India to our most important article of export. There is no reason which we know of why silk culture should not succeed in India just as well as tea-planting. The quality of the silk may not be so fine as China's for the first few years, but with the efforts which will continually be made to improve it by the introduction of silk-worm eggs from other countries, by the application of science in crossing and rearing worms, and above all by the care which will be given to reeling the silk, all difficulties in the way of introducing it to a high position in European markets will at last be overcome. When that has been effected, the Chinese may see that it would have been better for them not to have prevented foreigners from establishing filatures in the country, as they were entitled to do under the treaty made by Lord Elgin. But by that time the world may be able to do without China silks,—at all events to a very large extent.

THE PHILADELPHIA SILK SCHOOL.

THE ladies of the Silk Culture Association have reason to be encouraged in their work so far. They have opened their school with an accomplished teacher, have demonstrated that it can be supplied with fresh mulberry leaves daily from the neighbourhood of Philadelphia throughout the season, and have put themselves in correspondence with the people who want to raise silk. What is needed now is for the silk manufacturers of the country to follow the example set them by Philadelphia merchants, and contribute to the support of this school. Tall oaks from little acorns—and why not the threads of a great home industry from the cocoons of this Philadelphia School ? The Women's Silk Culture Association, established during past winter, started out with the well-settled knowledge that silk could be grown in this country, as well as in any other, provided the attention of the proper growers could be called to it. Raising silkworms on a large scale in one locality may or may not be done as cheaply here as abroad, when the day's wages of the Italian or Chinese labourer is to be put against the day's wages that would have to be paid in this country. But the proper growers are the wives and daughters of the farmers throughtout the country, who can give such attention as is needed, in the midst of their other occupations, precisely as they raise their chickens and eggs. But it does not pay to raise chickens and eggs at a long distance from market, while the less perishable cocoons, silkworms' eggs, or the reeled silk, can be forwarded any distance. The object of the ladies who have instituted the silk school is to teach as many learners as they can accommodate—about 125 at present—and afterwards send these out as teachers to other schools that may be established, as well as to spread the idea of cocoon culture in their own neighbourhoods at home.

The silkworm season lasts about twelve weeks for the two crops of worms; therefore the practical instruction in rearing these little workers is given from May to September. In the winter reeling is taught—that being the part of the business that demands delicate manipulation. Patterns are shown of an inexpensive reel which might be put up in any farmhouse, and where the filature can go on at odd leisure times such as women in the country have abundance of in the winter. The rearing of silkworms' eggs for exportation, and of the cocoons also, is carried on in some parts of the United States at present—in Kansas, North Carolina, and California. But the skill that accompanies silk raising in Italy, Southern France, and elsewhere, of reeling the silk, has been lost art here or rather an art that has been found wanting. The Philadelphia Silk School will teach this, as by means of the filature all the processes of silk cultivation can be carried on in this country.

The objection to raising American silk dates back to the unfortunate old multicaulis fever that ruined some speculators in trees and gave the widespread impression of a business that had been tried and found wanting. The speculation of that day, however, was confined mostly to planting tracts of mulberry trees, the prices of which ran up to fabulous sums—and all the farmers were to make their fortunes out of the sale of trees. The present experiment seems to stand on a better basis, namely, to spread the knowledge of rearing cocoons and reeling silk as an occupation for women in the country who have great difficulty in getting paying work and who are not occupied exclusively with household cares. Correspondence has brought out numerous inquiries from this class of American women, in the South as well as the North, showing that as a skilled industry there are numerous intelligent workers ready, as never before to take up such occupation This is the right handle—if old Epictetus may be believed—of the jug, just as the inflated and unbalanced speculation in mulberry trees was decidedly the wrong one, that has lasted in prejudice to this day. Mulberry plants, however, are obtained in large numbers from Kansas, and it is said this tree will grow wherever the apple grows.

The ingenuity of our silk manufacturers has found a profitable employment for the pierced cocoons, those from which the moth has escaped, and which, pierced for rearing purposes, were supposed to be spoiled as silk. The short lengths of silk from these are now used in making up soft silk handkerchiefs, ribbons, &c., and are said to enter into the fabric of the exquisite Chuddah shawls that are such favourites at present,—*Philadelphia Ledger.*

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IT is said that the number of cigars smoked in Germany in 1878 was 6,504 millions. Besides these, the Germans used, during the same period, above 60,000 tons of tobacco, 8,000 tons of which had been prepared for snuff, and 700 tons for chewing.

ALTHOUGH American tobacco competes with the Indian product in Italy in a very vigorous way, nevertheless the trade seems, we are told, to maintain itself, nearly 1¾ million pounds having been shipped last year, valued at Rs. 98,000. This trade is capable of large increase if the good markets which exist in most of the countries of continental Europe are properly cultivated.

A CORRESPONDENT at Kootiar, Trincomalie, writes to the *Ceylon Times* :—"Per this post I send you a few tobacco leaves, not a picked sample, but taken at random from a heap of about one cwt. by a coolie. I am gathering a sample prepared by Mr.——— (from Sumatra), to send home. I will send you a leaf or two of it, meanwhile you will see from this that we can grow a very fine leaf. These leaves were grown under many disadvantages and were, I think, cut rather green ; (1) they were grown at the height of the drought, and were not regularly watered ; (2) they received no cultivation of any kind, but were simply allowed to grow at will ; and since they were cut, they were allowed to get wet, while the quantity was too small to admit of proper fermentation. But an important point is gained in the leaf being so fine."

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A MONTHLY

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THERE are many cogent reasons why such a paper, as we propose to establish, should receive the support of our countrymen at home. When the Government of India was transferred from the Court of Directors to the Crown, it was inevitable that, sooner or later, the initiative in policy and legislation should also be changed from Calcutta to London. The effects of this transfer are, that the authorities in India are relieved from responsibility to even such feeble public opinion as there exists, while from the ignorance and indifference at Home, the Indian Government in London becomes more despotic than ever. A Government which rules India from Calcutta cannot entirely close its eyes and ears to the effect of its measures upon the people; but an irresponsible Bureaucracy attempting to govern India from Downing-street, legislates in the dark. It can know nothing of the wants of the people, except what is to be gathered from official reports, prepared so as to suit its wishes. The only way to correct this evil, is to raise up in England an enlightened interest in India, by making known, from free and unbiassed sources of information, the veritable state of the country and the character of the administration. In order to do this effectually, it is essential that the London journal should have its roots, so to speak in India. For Western ideas are a solvent of tremendous power; and under their influence, India is changing with a rapidity which must be watched to be understood. It results from this, that an English journal desiring to disseminate the truth regarding India, must obtain its information fresh and fresh, from writers in immediate contact with the facts, convictions, wishes, and aspirations which they delineate. By the establishment of London *Statesman*, in direct connection with a *Statesman* in Calcutta, this object would be accomplished.

Again, all history bears testimony to the fact, that a Government not exposed to the bracing atmosphere of free criticism, becomes corrupt and inefficient. Among Englishmen at least, this may be assumed as a political axiom. We should all of us feel, that if personal rule were set up in England, the national greatness and prosperity would swiftly wither and be lost. And yet, by a curious inconsistency, it is by means of personal irresponsible rule, that we have thought to secure the prosperity of India, and the happiness of its people. This political miracle has not come to pass. Englishmen entrusted with despotic power have too often succumbed to its corrupting influences. They have learned to believe that in *their* case might was right, that because they were entrusted with a mission to elevate and improve the people of India, they might, in their dealings with that people, dispense with those moral laws without which no elevation of character is possible. Everything was to be done *for* the people; nothing was to be done *by* the people. And the consequence has been, that the people of India have been treated by us as a *corpus vile*, on which administrative theorists and crotchet-mongers had full power to experiment as they pleased. There has been neither continuity of principle, nor consistent purpose in our administration, but a series of vast experiments, precipitate in their inception, and disastrous in their consequences. Thus it is that at the close of a century of British rule, carried on to a ceaseless chorus of self-congratulation, we find these singular effects.—A profound gulf existing between rulers and ruled; a peasantry sunk in poverty and indebtedness, and swept away in millions by periodical famines; an army, the most costly in the world, and yet so deficient in organisation that we cannot, in three months, collect 30,000 men on our own frontier; a heavy public debt, an increasing expenditure, and the Empire on the very verge of bankruptcy. We do not say that this comprises the whole of the picture, or that there are not brighter scenes to be found in it. But this we do say, that the above facts are strictly true, and they demand that we should cease from contemplating Narcissus-like, our own perfections, and try to ascertain how and why we have so grievously failed. But this again is impossible, unless a clearer and more accurate knowledge of India is generated in England than at present prevails there.

Lastly, each succeeding year exhibits more clearly that the entire Foreign policy of Great Britain revolves round our Indian Empire Peace or war in the mother country depends upon the opinions formed by the Government of the day, as to the degree of peril which menaces India from this or that Power. At this very time we are engaged in a war, the injustice and cowardice of which are patent, because Lord Beaconsfield and his colleagues think that something must be done to check the progress of Russia in Central Asia. Urged onward by this vague desire to do something, they estrange the Amir Shere Ali by persistently menacing his independence; and then make that estrangement the justification for carrying their menaces into execution. Even assuming that Englishmen were willing to overlook the profligacy of such a policy, they cannot afford to treat it with indifference. For is certain that the costs of an occupation of Afghanistan will have to be defrayed by them. The "scientific frontier" is a meaningless absurdity. If we annex any portion of Afghanistan, we shall be compelled, at no distant date, to annex the whole. It is absolutely certain that India will not be able to furnish the funds for such an acquisition; and the burden must therefore fall upon Great Britain. Are the British tax-payers willing to pay ten millions a year for the doubtful advantage of a "scientific frontier?" Eighteen months ago the Calcutta *Statesman* detected the designs of Lord Beaconsfield's Government, and warned its readers of what was coming. But in Indian official circles its warnings were unheeded, and in England unheard. Had there been in London such an organ of information regarding India, it is well-nigh certain that the present war would have been averted. For at every step the misrepresentations of Government would have been brushed aside, and their veritable policy laid bare; a healthy and enlightened public opinion would have had time to form; and Lord Beaconsfield's policy of "surprising" the country into a war would have been rendered impossible.

But though India will be our speciality, the paper we establish will not be exclusively Indian, but will deal with the whole range of English Politics, domestic as well as foreign, insular as well as Imperial. Social questions and current literature will also receive their due share of regard therein. What we aim at is a high class Liberal paper, interested in all matters in which the nation at large is interested, discussing them in the light of advanced Liberal principles, and accepting of the expression of our policy, the old Liberal sentiment—"The cause of Civil and Religious Liberty all over the world."

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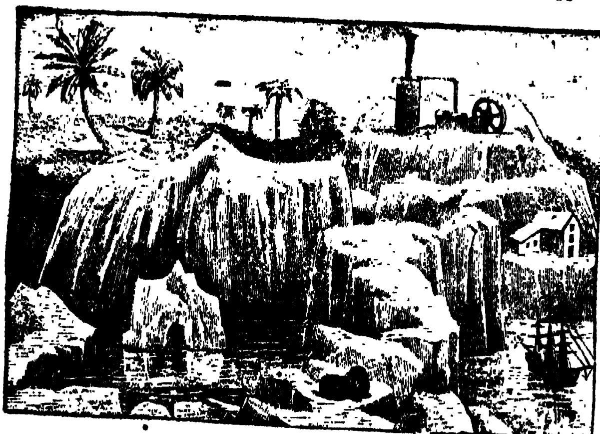
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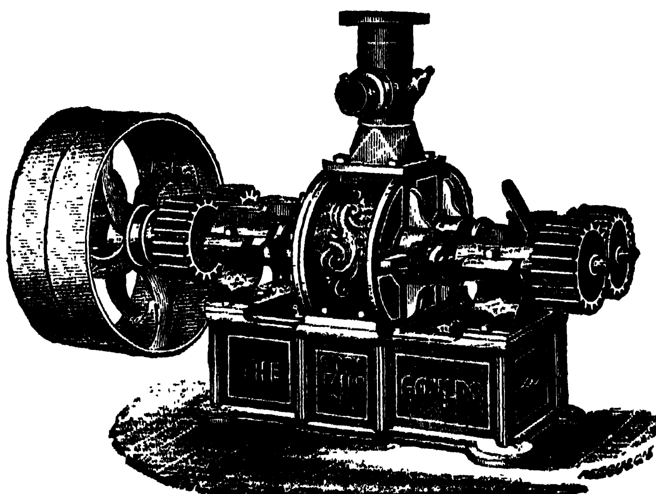
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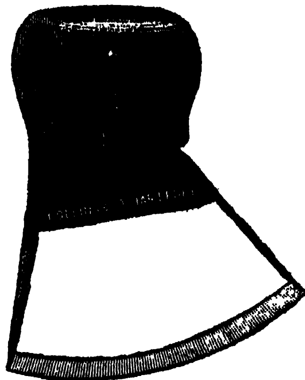
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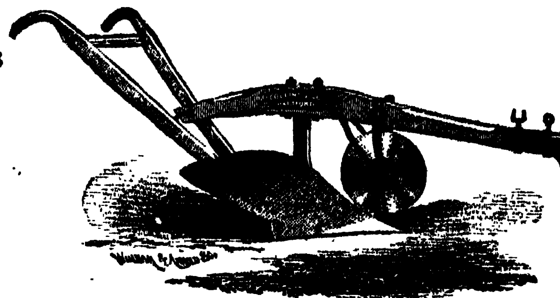


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The specimens were subjected to a temperature of over 3,000 degs. Fahr., the smelting point of Cast-iron being 2,786 degs. Fahr.

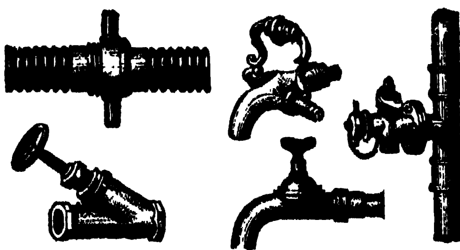
Apply for the above and for Raneegunge Salt Glazed Stoneware and imperishable Drainage Pipes to

BURN & CO.,

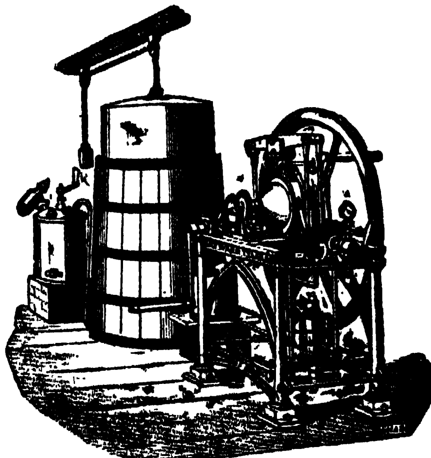
7, Hastings-street, Calcutta, or Raneegunge Pottery Works, Raneegunge, E. I. R., Bengal.

HAYWARD TYLER AND COMPANY, LONDON.

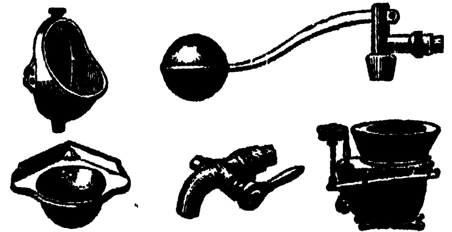
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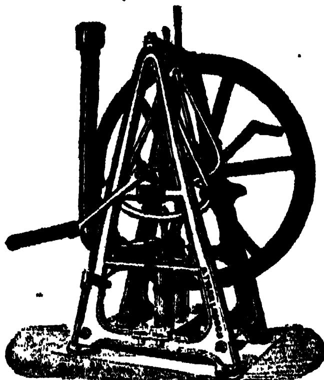


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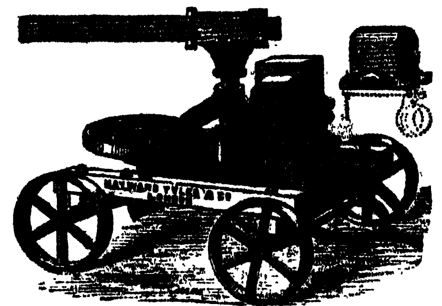
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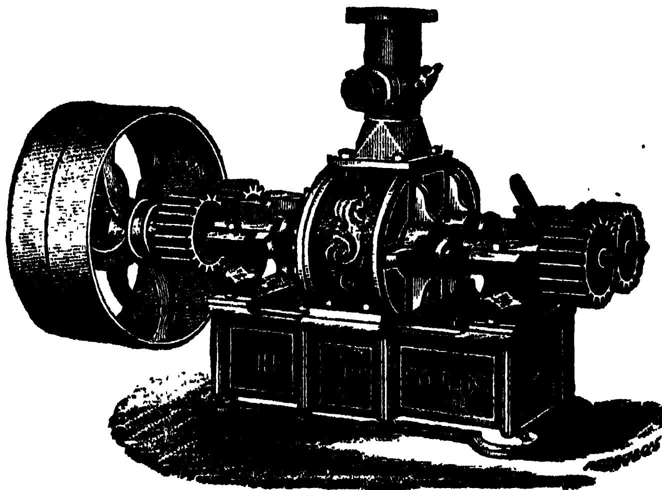
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No. 3 Pump, has a 3 inch suction pipe, throws a 2½-inch stream, and with 175 revolutions discharges 175 gallons per minute.

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This plough, of which we have been appointed sole manufacturers by the Patentee, is comparatively light and cheap, and stirs up the soil to three times the depth of a native Plough, and for a breadth of at least seven inches, leaving the good mould on the top. Particulars and prices on application.

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☞ *Catalogues on Application.*

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Registered No. 182.

THE

INDIAN AGRICULTURIST.

A MONTHLY

JOURNAL OF INDIAN AGRICULTURE, MINERALOGY, AND STATISTICS.

VOL. V.] CALCUTTA : THURSDAY, 1st JANUARY 1880. [No. 1.

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THE total Income from Premiums in 1878 amounted to £246,514, and Interest on Investments to £90,248. The Claims by Death and Matured Policies were £153,841. After payments of all claims and expenses, £143,104 has been added to the Life Funds, which now amount to £2,389,907.

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Balance, Profit and Loss		69,707	11	0
Life Fund	... ...	2,389,907	3	11
Total Funds in hand	...	£4,049,159	14	11

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N.B.—Persons assured in this Company are not liable as Shareholders of the Company.

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MANCHESTER FIRE ASSURANCE COMPANY.

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Cures Blood and Skin Diseases.
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Clears the Blood from all impure Matter, from whatever cause arising.

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This Style is furnished with two complete sets of reeds of five Octaves. Each set is divided and has a separate stop, for the upper and lower half. The upper half of the first set of reeds is named Flute, and the lower half Principal. In the second set the upper half is named Dulciana, and the lower Diapason. The first set is an Octave higher in pitch than the second, so that the instrument has practically a compass of six Octaves. By having the sets divided, it will be seen that more effect can be produced. The remaining stops are Tremelo, Diapason Forte, and Principal Forte. [*Net Cash, Rs.* 400.

Style No. 16, *Ten Stops.*

This instrument has two-and-a-half sets of reeds, and an Octave of Sub-bass. It has ten stops, *viz.*, Diapason, Dulciana, Flute, Principal Kulophon, Sub-bass, Tremelo, Principal Forte, Diapason Forte, and Octave Coupler. The last stop doubles the power of the Organ, and with the aid of the Sub-bass renders it a powerful and effective instrument for Churches and Halls ; at the same time its power is not obtained at any sacrifice of delicacy, and it will be found a most desirable instrument for home use. [*Net Cash, Rs.* 550.

Style No. 20, *Nine Stops.*

This instrument has three complete sets of reeds. Two of the sets are like those in the preceding Styles, having the Principal and Forte Diapason and Dulciana stops. The third set is new and distinct in quality, the upper half is named "Aulodia" and the lower half "Fagotte." The tones of this set are unrivalled in clearness, smoothness, and tender beauty, and their effects in connection with the swell are surprising.

This Organ *is* one that will be approved by all persons of refined taste. [*Net Cash, Rs. 750.*

***N.B.*—The above prices are exclusive of packing charges.**

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THE STATESMAN.

A new weekly paper devoted to the discussion of political questions, and especially to a consideration of the economic and administrative reforms called for by the present condition of India, and our relations with that Empire. The Journal is a high class periodical, published in London, in close correspondence with the* STATESMAN AND FRIEND OF INDIA *in Calcutta.

THERE are many cogent reasons why such a paper, as we propose to establish, should receive the support of our countrymen at home. When the Government of India was transferred from the Court of Directors to the Crown, it was inevitable that, sooner or later, the initiative in policy and legislation should also be changed from Calcutta to London. The effects of this transfer are, that the authorities in India are relieved from responsibility to even such feeble public opinion as there exists, while from the ignorance and indifference at Home, the Indian Government in London becomes more despotic than ever. A Government which rules India from Calcutta cannot entirely close its eyes and ears to the effect of its measures upon the people; but an irresponsible Bureaucracy attempting to govern India from Downing-street, legislates in the dark. It can know nothing of the wants of the people, except what is to be gathered from official reports, prepared so as to suit its wishes. The only way to correct this evil, is to raise up in England an enlightened interest in India, by making known, from free and unbiassed sources of information, the veritable state of the country and the character of the administration. In order to do this effectually, it is essential that the London journal should have its roots, so to speak in India. For Western ideas are a solvent of tremendous power; and under their influence, India is changing with a rapidity which must be watched to be understood. It results from this, that an English journal desiring to disseminate the truth regarding India, must obtain its information fresh and fresh, from writers in immediate contact with the facts, convictions, wishes, and aspirations which they delineate. By the establishment of London *Statesman*, in direct connection with a *Statesman* in Calcutta, this object would be accomplished.

Again, all history bears testimony to the fact, that a Government not exposed to the bracing atmosphere of free criticism, becomes corrupt and inefficient. Among Englishmen at least, this may be assumed as a political axiom. We should all of us feel, that if personal rule were set up in England, the national greatness and prosperity would swiftly wither and be lost. And yet, by a curious inconsistency, it is by means of personal irresponsible rule, that we have thought to secure the prosperity of India, and the happiness of its people. This political miracle has not come to pass. Englishmen entrusted with despotic power have too often succumbed to its corrupting influences. They have learned to believe that in *their* case might was right, that because they were entrusted with a mission to elevate and improve the people of India, they might, in their dealings with that people, dispense with those moral laws without which no elevation of character is possible. Everything was to be done *for* the people; nothing was to be done *by* the people. And the consequence has been, that the people of India have been treated by us as a *corpus vile*, on which administrative theorists and crotchet-mongers had full power to experiment as they pleased. There has been neither continuity of principle, nor consistent purpose in our administration, but a series of vast experiments, precipitate in their inception, and disastrous in their consequences. Thus it is that at the close of a century of British rule, carried on to a ceaseless chorus of self-congratulation, we find these singular effects:—A profound gulf existing between rulers and ruled; a peasantry sunk in poverty and indebtedness, and swept away in millions by periodical famines; an army, the most costly in the world, and yet so deficient in organisation that we cannot, in three months, collect 30,000 men on our own frontier; a heavy public debt, an increasing expenditure, and the Empire on the very verge of bankruptcy. We do not say that this comprises the whole of the picture, or that there are not brighter scenes to be found in it. But this we do say, that the above facts are strictly true, and the demand that we should cease from contemplating Narcissus-like, our own perfections, and try to ascertain how and why we have so grievously failed. But this again is impossible, unless a clearer and more accurate knowledge of India is generated in England than at present prevails there.

Lastly, each succeeding year exhibits more clearly that the entire Foreign policy of Great Britain revolves round our Indian Empire. Peace or war in the mother country depends upon the opinions formed by the Government of the day, as to the degree of peril which menaces India from this or that Power. At this very time we are engaged in a war, the injustice and cowardice of which are patent, because Lord Beaconsfield and his colleagues think that something must be done to check the progress of Russia in Central Asia. Urged onward by this vague desire to do something, they estrange the Amir Shere Ali by persistently menacing his independence; and then make that estrangement the justification for carrying their menaces into execution. Even assuming that Englishmen were willing to overlook the profligacy of such a policy, they cannot afford to treat it with indifference. For it is certain that the costs of an occupation of Afghanistan will have to be defrayed by them. The "scientific frontier" is a meaningless absurdity. If we annex any portion of Afghanistan, we shall be compelled, at no distant date, to annex the whole. It is absolutely certain that India will not be able to furnish the funds for such an acquisition; and the burden must therefore fall upon Great Britain. Are the British tax-payers willing to pay ten millions a year for the doubtful advantage of a "scientific frontier?" Eighteen months ago the Calcutta *Statesman* detected the designs of Lord Beaconsfield's Government, and warned its readers of what was coming. But in Indian official circles its warnings were unheeded, and in England unheard. Had there been in London such an organ of information regarding India, it is well-nigh certain that the present war would have been averted. For at every step the misrepresentations of Government would have been brushed aside, and their veritable policy laid bare; a healthy and enlightened public opinion would have had time to form; and Lord Beaconsfield's policy of "surprising" the country into a war would have been rendered impossible.

But though India will be our speciality, the paper we establish will not be exclusively Indian, but will deal with the whole range of English Politics, domestic as well as foreign, insular as well as Imperial. Social questions and current literature will also receive their due share of regard therein. What we aim at is a high class Liberal paper, interested in all matters in which the nation at large is interested, discussing them in the light of advanced Liberal principles, and accepting of the expression of our policy, the old Liberal sentiment—"The cause of Civil and Religious Liberty all over the world."

The idea is to establish a weekly organ of advanced Liberalism conducted by earnest Christian gentlemen whose interest in Indian affairs is paramount by the circumstance of their connection with the country, and exact knowledge of its affairs and administration. It will contain a weekly summary of the latest news from all the Indian papers, brought down to date by the latest telegraphic advices, and reviewed in their light. There is no such paper now, and the conception is believed to be a sound one. Our hope is to awaken by means of the paper, a deeper interest in India, and a higher sense of our responsibilities as its rulers, than unhappily at present exists; and to do this by floating Indian affairs into public notice, on the strength of the Imperial and domestic interests which they so vitally affect.

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT.
Proprietor.

Calcutta, 1st Feb. 1876.

CONTENTS :

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

CORRESPONDENCE.

THE CROTON-OIL TREE.

TO THE EDITOR.

SIR,—With reference to the notice of the Croton-oil tree in your issue of the 1st ultimo, I beg to ask if you could tell me the *Hindustani* name of the tree, and whether you think it would suit the climate of the North-West? We have plenty of bare spaces in the Doon that would be all the better for tree shade; and the quicker growing the tree, the better.

F.

Dehra Doon, 20th December 1880.

P.S.—Is the name *Jumal Gotec*; and where can the seed be procured?

NOTE.—Yes, the Hindustani name is Jumal Gotee, and it grows wild in great profusion along the foot of the hills near Jumalpore, which station, it is supposed, derives its name from the presence of the plant.—ED. *I. A.*

TEA.

TO THE EDITOR.

SIR,—It is a matter of no small importance, to those concerned, to find their fine classes of tea selling at only one anna or perhaps two above the inferior kinds. If those interested do not demand an explanation, it is their own fault, and I believe any one of experience will agree that when such a state of affairs exists, there is something *radically* wrong in the system of manufacture. Making all allowance for the market, it is ridiculous to hear the prices some gardens' Pekoes and Broken Pekoes sell at in the open market, as compared with common broken Souchong. Let us hope the idea, started some months ago, is not gaining ground—that good and inferior qualities fetch about the same price. There is little doubt that planters have expressed this opinion. Can it be that they have relaxed their tea-house supervision on this account? This is a matter for those interested to inquire into.

OUTSIDER.

CORUNDUM.

TO THE EDITOR.

SIR,—I am anxious to find out a few facts about the mineral Corundum, which is now being mined over a large portion of some of the talugs in the district :

First, what is its chief use?

Secondly, what is the price it fetches in the market at home?

Thirdly, where is it chiefly mined now?

The mineral is dug up by the landholders here and sold by the seer measure to native merchants who take it away to Madras and Bombay.

I suspect that the ryots at present sell it much under the price which it would fetch were they able to take advantage of the demand.

RAILWAY SLEEPERS.

TO THE EDITOR.

SIR,—In your issue for the 1st November last, No. 11, page 296, there was a very interesting suggestion for seasoning the *deodar* timber. Within the past few days there has occurred good opportunity of verifying—in part—the usefulness of that idea. To wit :—

At the Government Timber Depôt at Wazirbhullar—adjacent to the Beas station S P D.R—there are nearly twenty thousand sleepers brought down from the Himalayan forests bordering the upper portion of the river Beas, and now being taken over for the P.N.(S.)R.

The trees, whence these sleepers were cut, were felled, cleared of branches, and logged, in the usual way. But instead of the sleepers having been at once thrown into the river to be despatched to the plains *they were allowed to remain in their Himalayan homes for two years, for the purpose of seasoning.* The result is satisfactory, and would have been much more so had the trees been girdled, or

felled, and allowed to remain intact for two years before they were converted into sleepers.

The chief defect in the sleepers, now at the Wazirbhullar depôt, is owing to the longitudinal split in those cut from the centre of the tree, due to the too hasty conversion of the tree into sleepers; this split would not have happened had the trees been girdled for a couple of years, before being felled. The wood is knotty, but, in seasoned timber, this is not of much importance, as the knot does not easily separate from the wood, which only happens in unseasoned timber where, under the rays of the tropical sun, the two are torn asunder, and so the timber is rendered useless. At the Wazirbhullar depôt the greater portion of the sleepers are stacked under thatched coverings, thus preserving them still more; this is very apparent by an examination of the ends of the sleepers stacked outside and those under cover, the former showing splits, from the heat of the sun, from nine inches to a foot in length, thus detracting from the value and usefulness of the sleeper.

There is no doubt that the Punjab Forest Department could supply a lakh of first class broad gauge sleepers every year to the railway companies; and if only the same care be taken on the other rivers, as on the Beas, in sawing, launching, rafting, and storing sleepers (great credit is due to all concerned in these operations) the rejections need never exceed five per cent, even if so much, and even these could be disposed of, for door and window frames &c, &c. In this way the Government would save paying away three-and-a-half lakhs of rupees annually to *bapariès* for an inferior article which may only last, at the outside, eight to ten years, whereas these Beas sleepers will last twelve to fifteen years; and sleepers which have been cut from trees, girdled for two years before being converted into sleepers, would last fifteen to twenty. At all events with this example of the Beas sleepers before Government it behoves it to try the experiment with five hundred trees on each of the Himalayan rivers. In 1865, or thereabouts an experiment in connection with sawing up sleepers, was tried on the Ravi river, and a large number were rejected chiefly on account of splits, occasioned by the cutting up of unseasoned wood into sleepers: these rejections gave the experiment a bad name, and the Government appear to have sat down quietly for years, under the supposition that the supplying of sleepers to the railways would not pay: the cause never appears to have been inquired into, nor any remedy proposed.

Some of the best and most seasoned timber ever brought down from the Himalayan forests belonged to the old English firm, Messrs. Brassy Wythes, and Henfrey: a large portion was felled in 1866-68. and not launched until 1868-71; the consequence was the timber was perfect, and there was no such thing as a longitudinal split in the centre of the logs. After this, need more be said about the advisability of allowing the tree to season before being converted into sleepers, or into log? The trees were cut in the summer months.

ANOTHER FORESTER.

"WHEAT RICE."

TO THE EDITOR.

SIR,—In your issue for December, (received yesterday), your Mysore correspondent, "O.G.S," asks you to put him in the way of obtaining some seed of the *Sorghum Saccharatum*, or Chinese Sugar-cane, which he has been led to believe is identical with the new cereal called "Wheat rice," which has not as yet reached India. If your correspondent will send me his name and address in full, I will with pleasure give him half-a-pound of *S. saccharatum* seed, with instructions as to its culture.

I hope to receive a supply of the new cereal (Wheat rice) and may be able to spare some of it for your correspondent to try.

FRED. POGSON.

Millward Cottage, Kotegurh, 7th Dec. 1880.

ABOUT PAPER FIBRES.

TO THE EDITOR.

SIR,—I have just received the October number of your journal, and note the editorial reference therein to the report of the Royal Botanical Garden, Calcutta, 1879-80, which I dare say I shall shortly obtain and be able to study *in extenso*; meanwhile I beg to make a few comments on your article in continuation of my last letter referring to Mr. Liotard's memorandum.

Fully agreeing with you Sir, "*that the demand for paper is steadily increasing in a much faster ratio than is the supply of paper stock,*" endorsed by the late considerable rise in the price of *Esparto* grass, our present chief paper-making material, I must take exception to your remarks that "astonishing improvements in *machinery* have equalled the increase in the price of rags and grasses used for paper-making;" the fact being that the use of grasses, and I am only aware of one grass, and that *Esparto*, being hitherto used, at least in this country, has involved no improvement *in machinery*, the same machinery being employed for it as heretofore for rags, the only difference in the treatment between rags and grasses (generally so called) being the *chemical* treatment.

Now this chemical treatment consists in boiling the grass, or grasses, in alkaline leys to dissolve and discharge the glutinous, gummo-resinous, and coloring matters other than the fibrous residue, which latter has then to be purified by washing, to fit it for the subsequent bleaching process, and I am afraid that very few of the Indian grasses, (this somewhat costly process incurred, considering their yield of pure fibre, and adding thereto the cost of collection, inland transport, and freight to Europe,) can successfully compete with *Esparto* grass, either in respect to the quality of the stock producible therefrom, or the price at which the same can be laid down in this market *to pay a profit*.

Experimenting on the yield (to say nothing of the quality) of fibres, especially grasses, and their adaptability for paper-making requires considerable technical knowledge, failing which the results recorded are likely to prove fallacious, for instance in your notice of the Botanical Garden Report, it is stated that "out of twenty-five *experiments* with *Esparto*, it was found that the highest yield was 47·2, and the lowest 39·5 per cent." *Esparto* grass varies considerably in quality, and it is not stated what description of *Esparto* was tested; whether Spanish or African Alfa, nor whether the yield was for green, or unbleached fibre, neither is any reference made to the quality of such fibre. Now for the last 25 years I have been using *Esparto* on a practical working scale, manufacturing therefrom *some thousands of tons yearly* during that period, into paper-stock, half stuff, and paper, and *never yet* found my yield of sound white paper less than 46 *per cent* with all the accruing loss of yield during the mechanical treatment of that operation added. I do not know what the botanical names of the grasses, *Ranikaria* and *Kia nsia* may be, but it is just possible that if they were experimented upon in the same way as my poor old friend *Esparto* they may have suffered in the same manner. This question of the difference *in yield*, that is the product of "stock" or fibre from the plant treated, and the cost of such treatment, is a very important factor; but that *of the quality* of the resulting fibre is still more important. For, a fibrous "stock" of superior quality being a great *desideratum*, will command a sale, whereas a "stock" barely equal to *Esparto* will with difficulty find a market.

In his Annual Report (1877-78) Dr. King refers to my report on four Indian grasses I received from the India Office for experiment; from this I quote :—

"1 *Eriophorum comosum*, "bhabar-ghas," largely used for ropes in Upper India,

"2 *Saccharum spontaneum*, known as "kash."

"3 *Imperata cylindrica*, "Ooloo" grass.

"4 *Typha elephantina*, Hogla of Bengalies.

"*Eriophorum* is the best and most easily worked of the four; the "ultimate fibre very fine and delicate, rather more so than *Esparto*, "and of about the same strength, the yield 42 per cent., somewhat less.

"*Saccharum spontaneum* ranks next, but is more tender, and "certainly not equal to *Esparto*; it yields 44 per cent. *Imperata* "*cylindrica* I do not think suitable for paper, it is full of small "joints and knots which result in harsh woody sheaves; it gives a "yield of 41 per cent. *Typha latifolia* gives a strong fibre when purged "of its glutinous compounds, but the yield is very small, only 28 per "cent.

"I do not consider that it would pay commercially to attempt to treat "any one of these fibrous materials for conversion into "stock" for "European use, although very possibly, if procurable in abundance and "at cheap rates, they might be employed for paper-making locally "with advantage."

Since the above report was written, I have tested the *Munja* or "Sur grass," *Saccharum munja*, and found it superior to any of the foregoing. The small sample which came into my hands was very bright and clean, and had evidently been very carefully selected. The yield of this in the grey, *i.e.*, unbleached, was over 50 per cent and the resulting fibre quite equal to *Esparto* in quality, if not superior; but this could only be determined by working it into paper on a practical scale.

In Mr. Liotard's Memorandum, *vide* Cap. VI. as also in Dr. Royle's book "The Fibrous Plants of India," it is stated that the four varieties of *Saccharum, viz., S. munja, S. sara, S. procerum*, and *S. spontaneum*, so nearly resemble each other in general appearance, as to be mistaken one for the other—(such is also the case with *Esparto, Macrochloa tenacissima*, and Alfa, *Stipa tenacissima*). My experiments lead me to infer that *S. munja* approaches more nearly in quality and yield of fibre to *Esparto* than any other grasses I have

yet seen, and—assuming it procurable cheaply and abundantly, if judiciously cropped, that is, selected and cut at a proper stage of growth, and carefully converted into "stock" so as to economise freight and transport—it is very probable that it would favorably compete with *Esparto* and meet with a ready sale in the English market.

I have made strong white paper from maize leaves, also from rice straw, but neither of these plants afford a yield of pure fibre exceeding 36 per cent, consequently to convert them into "stock" in India for our market would not pay.

The grass, however, of all grasses, is the gigantic grass bamboo, which I believe to be as abundant, and procurable as cheap as any of the foregoing. Its treatment is simple, and it affords a yield of pure fibre of from 60 to 65 per cent unbleached as stock. That fibre is very far superior to *Esparto*, assimilating in its characteristics to flax and hemp, thus producing the great desideratum a firm strong paper, whereas very few of the grasses I have met with as yet, (and I have tested many more than those enumerated) are equal to *Esparto*, many of them not so good.

I will resume my remarks on other Indian fibres in my next, meanwhile being desirous of assisting in the further development of the supply of paper materials, I shall be happy to test and report upon any fibres transmitted to me for that purpose, and I may add that for preliminary experiment one or two pounds per "sample post" will suffice accompanied by details as to growth, locality, &c., &c.

THOS. ROUTLEDGE.

Claxheugh, Sunderland, 8th Nov. 1880.

CROTON OIL AND SEED.

(To the Editor of the Ceylon Observer.)

DEAR SIR,—I thank your correspondent signed "Caution" in your issue of 20th instant. I have since written to Mr. A. Whyte of Kandy, and now send you copy of my letter and his reply ; he also informs me that he has written to you an explanation.

It is not because I have a large quantity of seed on hand for sale, but because I thought Croton is profitable, and a good shade tree. Even, taking the seed at 6*d*. per lb., 20lbs. from each tree in one-year trees can be grown among coffee 15 feet apart without injuring the coffee, and say 190 trees to the acre would be Rs. 950 per annum from one acre of Croton trees after the 4th year, besides what income there may be from coffee or other produce.—Yours faithfully,

J. HOLLOWAY.

OUR FORESTERS.

(To the Editor of the Ceylon Times.)

SIR,—During my recent casual reading I came upon the following suggestive passage, which occurs in the Report of the Government Agent, Southern Province, for last year :—

"A careful examination of the few remaining forests in the province shews that almost all the timber of the valuable kinds is exhausted or only remains in quantities too small and too scattered to make it worth while to cut timber for the market. There is consequently a great want of good timber for bridges and buildings, and serious injury has been done by the general use for several years past of the inferior kinds of timber. The best remedy would probably be to draw for the present on the magnificent reserves of satin wood and palu in the North Central Province, and forms depôts for sale at convenient centres in this province ; and to provide for the future by forming plantations of teak and other useful timber."

"*Teak plantations.*—If timber plantations are to be of any future benefit, they must be formed with care and method, and not in the haphazard way hitherto adopted. The plantations in the Galle district are worthless : happily they are small and have not cost much. In Matara they are very much better, but until the last few months the trees have been put in too "far apart," and there is but little chance of their yielding fine large timber."

It appears from what I have seen during my travels in various parts of the island, that what is here said of the Southern Province is actually taking place in other districts. Government are milking their cow dry. They are evidently thinking only of current revenue and do not care for the future which will be left to take care of itself. What the Government Agent of the Southern Province says of teak may be equally said of all other building and useful timbers : the forests are being gradually and incessantly denuded, but no steps are being taken to replace what is destroyed or carried away. Instead of our speaking of a Forestry department, we should properly call it the Timber department.

X, Y, Z.

November 20.

TOBACCO.

(To the Editor of the Ceylon Times.)

SIR,—You will remember some four months since I sent you a few what I may call "practical hints about tobacco growing in Virginia," since which you have had a good deal to say on this product. I am glad to find that you consider the sample of leaf received from the Eastern Province, so encouraging. You are mistaken in saying that irrigation is indispensable, the Jaffna method with the native tobacco is to irrigate ; and with a tiny plot of land under cultivation, no doubt it pays wonderfully, but on any large scale and particularly with Maryland tobacco, it is quite unnecessary, a moderate rainfall, and dry weather during curing time is all that need be asked. I shall be happy to send you estimates of tobacco cultivation by the Jaffna and Dutch systems. You will find that while the latter is the bigger outlay, it shews the larger profits, but my opinion is, it can only be tried on a small scale. I may say, roughly speaking, that it will cost Rs. 350 an acre for that Dutch method. It should of course, be borne in mind that Virginia tobacco only attained its present pre-eminence after many trials and failures and the greatest care and thought. In America, all caution is used in gathering of the plants only when the leaves are what is considered full ripe; and then only those which are so, are individually selected. The largest plants are split down the centre, so that the air may be freely admitted to every part of the leaf during the process of drying. And the greatest care is used in packing for the market.

Soil is no test of tobacco. Experiment and price can alone decide whether or not it is suitable. The quality of Havannah tobacco is said to depend mainly on the state and quantity of the iron in the soil. As with us, the soil both of Havannah and Manilla, are red sorts, and the red and reddish brown soils contain, most of them, iron—the reddish brown oxide of iron,—while the light grey soils contain it only in the state of protoxide, or the black oxide of iron. Again, the soil for tobacco in North America, and also in European latitudes, requires to be of the richest nature, but this is not necessary to the same extent in our warmer climate, and more moist atmosphere. In Virginia, the light red, or chocolate coloured mountain lands, the light black soil in the caves of the mountains, and the richest low grounds are particularly sought after.

It is thus evident that in Ceylon it is as yet a matter of experiment. We know of course that in the North, the Tamils make enormous profits by a *local* sale, but their tobacco, would not be looked at in the European markets. In certain parts of India, on the Ganges for instance, as well as in the Northern Circars, a most beautiful and aromatic leaf is grown ; yet the soil, from what one hears, is not to be compared to the rich and fertile valleys of Doombora or Badulla. The thing to work for, is a speciality. Once get a tobacco of fine and distinctive flavor, and your fortune is made. But the trial must always be attended with risk.

NIL DESPERANDUM.

AGRICULTURAL EXPERIMENTS NEAR POONA.

(To the Editor of the Times of India.)

SIR,—I have read with considerable interest, in your issue of the 26th instant, the account regarding Major Coussmaker's agricultural experiment's near Poona with the Teosinte (*Reana Euchlæna luxurians*) and johari seeds ; and as it is by universal assent conceded that the man who can grow two blades of grass where only one grew before is a benefactor of the human race, I think Major Coussmaker deserves thanks for putting himself to the expense and trouble of making experiments, and publishing the result for the information of the public and of men, like myself, who take a very deep interest in such matters. I have explained to the ryots, according to the best of my ability, Major Coussmaker's laudable object in making the important experiments he alludes to in his letter of November 20, and the following inquiry was made : "Ah, sahib, it was a garden experiment made by a sahib in comfortable circumstances, and with plenty of money at his command. You know perfectly well that we poor ryots, who are living from hand to mouth, and are deeply involved in debt, cannot afford to lose time in making fruitless experiments. The johari springs up vigorously in our cultivated fields, and if we are fortunate enough to get seasonable showers of rain, the plants grow in well-manured fields, to our satisfaction, and we have nothing to complain about, for we have no lack of provender for our cattle, and grain for ourselves ; but will you, sahib (piteously), explain to us what safe course we should adopt to preserve a johari crop when the rain falls at intervals ruinous to vegetation, no wells or manure being at our command, and while creditors' chains are hanging around our necks like mill-stones ?" I stood before the men dumbfounded, and retreated hastily, but promised to write to Major Coussmaker, through your columns of course for a solution of the ryot's difficulty, and

await with anxiety the receipt of a favorable reply. In conclusion, I may as well let you know that I am the occupant of some fields belonging to Government, and am obliged out of pity to suffering humanity to remit the assessment when, for want of rain, there is a miserable failure.

SYMPATHIZER.

Camp Ahmedabad, Nov. 20.

The Indian Agriculturist.

CALCUTTA, JANUARY 1, 1881.

DUAL CULTIVATION.

IN estimating the products of various crops in this country, as compared with the outturn at home, we are apt to forget that with the exception of land devoted to market-garden crops, the English soil is asked to yield only one harvest in the year. In India the rule is two, and we have known three crops raised within twelve months. It is not, however, of this double cropping that we would now speak; we desire to consider the subject of growing two crops simultaneously. It is sometimes done at home, as with hay and clover. In India, on the other hand, the custom is all but universal with certain crops. The reason for following this mode, as given by the cultivator himself is, that in the event of the principal crop failing, he falls back on the secondary crop; and there is doubtless a good deal of reason in this, as, the climate and rainfall of India being occasionally so fatal to certain crops, it may happen that a season, unfavourable to one crop, may bring on another. This, however, is only the ostensible reason, the real one being the inferior quality of the seed frequently used; for when a double crop is sown, it does not follow that only half the ordinary quantity of seed of each grain is sown. By no means. Each crop is sown as if it were the only one to be put down, and it would be a bad sign of the seed, if something like a crop should not result. Another reason and a good one is, that frequently the farmer wishes to cut his crop green for cattle food, and as the two crops sown together do not ripen synchronously, the farmer has a longer spell of green fodder. Whatever the reasons may be, of this we may be sure—that the practice is not a good one. The farmer foolishly imagines that he gets two crops out of the ground, but mother earth is not to be taken advantage of in this crooked way. Every crop grown withdraws certain ingredients—certain elements of plant food—from the soil. No two crops withdraw exactly the same class of plant food, or to the same extent; consequently, it is possible to get a heavier weight of grain or straw from two crops grown in this way, if they are selected with a view to prevent clashing in their feeding, if we may so put it. At the same time it must be borne in mind that this is only achieved at the cost of more rapidly impoverishing the soil, and disturbing the natural proportions of those elements which should be held in all good soils. Nature in this as in all other excesses is inexorable. If we make too many demands on her, she may reply for a time, but only for a time, as a period speedily arrives when the yield stops, or only appears in very diminished quantity. Let us be sure of this: if we over-work ourselves, we shall feel a reaction afterwards, and if we make Nature do too much in the way of production, she will have her revenge in some form or other. It is a fatal mistake to suppose that two crops can be obtained in this way at the cost, so far as plant food is concerned, of only one. If the crop is a good one, the soil is proportionately weakened, that is, presuming that manure is only given in the perfunctory manner peculiar to India. Where high cultivation is followed, the result will of course be very different. One more great objection and we have done. Dr. Forbes Watson in his interesting report on Indian wheat, tells us that in a vast proportion of the samples sent to England to be reported on, foreign matter and other grains were present. The former was caused doubtless by the primitive mode in vogue for threshing out the grain, which makes it hardly possibly to avoid incorporating particles of clay and pebbles with the newly threshed grain: the latter was in most cases due to this dual cultivation, and the difficulty that exists in harvesting the two crops separately. They are cut one at a time of course, but ears of one will get mixed up with those of the other, in spite of the greatest care. If the Indian cultivator would meet the American farmer in the struggle now going on in connection with the wheat supply for the United Kingdom, he will have to conform more to modern customs, and present his produce in that clean and pure state which alone will find for it a chance of a market.

ON GUTTA PERCHA.

ITS HISTORY, PREPARATION, AND CULTIVATION.

[*By James Collins, F. B. S. Edin: Honorary Member of the Society of Pharmacy of Paris, etc. Government Economic Botanist, Singapore. Author of "Report Caoutchouc of Commerce" to H. M's. Secretary of State for India.*]

THE early history of gutta percha is involved in some obscurity. The first notice I have come across of its appearance in England, is contained in John Tradescant's Catalogue of the "Rarities preserved at South Lambeth, near London" (1666). No trace of this "plyable mazer wood" as it is there described, can be found at the Ashmolean Museum at Oxford, of which museum the collection of Tradescant was the nucleus. This connection between gutta percha and the old historic "mazer cups" is a highly interesting one, and it is by no means impossible that the "mazer cups" described by Spencer and others, were at times made of gutta percha as a substitute for maple. Curiously enough Dr. Balfour gives "mazer wood tree" as one of the vernacular names of the *Isonandra gutta* (now *Dichopsis gutta*).

To Dr. Wm. Montgomerie, a Surgeon in the East India Company's Service, belongs the honor of first introducing gutta percha to the commercial world, as an article likely to prove of great utility in the arts and manufactures. He first noticed the substance in Singapore in 1822, in the form of whips, and there commenced his first experiment. In 1842, being again stationed at Singapore, he followed up the subject and recommended it to the notice of the Medical Board of Calcutta for the making of splints and other surgical appliances, which recommendation the Board highly approved of. He also sent specimens and information concerning this substance to the Society of Arts of London. This Society took up the subject most warmly, and on Dr. Montgomerie's return to England in 1844, he lectured on the subject, and was honored with the Society's gold medal. By some, the honor of introducing gutta percha to the notice of the commercial world is claimed for Dr. (afterwards Sir) José d' Almeida, who in 1843 sent a specimen as a *curiosity* to the Royal Asiatic Society of London, but, after careful comparison of dates and other materials, priority is most clearly in favor of Dr. Montgomerie. In some of the earlier journals the Society of Arts of London is accused of injustice in passing altogether over Dr. d' Almeida, the allegation arising in confounding that Society with the Royal Asiatic Society of London. Dr. d' Almeida as I have said, only looked upon the substance as a *curiosity*, whilst Dr. Montgomerie was impressed with its great commercial utility and took the most effectual means to bring it before the public. The action of the Society of Arts soon brought the substance prominently forward, and patents were speedily taken out. Nothing, however, was known of the botanical history of the plant till Mr. Lobb, a Collector in the service of the Messrs. Veitch, the eminent nurserymen, forwarded a specimen to Sir W. J. Hooker, who named the tree as *Isonandra gutta*. Mr. James Motley also paid much attention to the subject whilst at Bangermassing, and Dr. de Oriese published a list with descriptions of no less than 10 plants yielding this substance. Unfortunately the collections of Dr. de Oriese, which I examined at Leyden, do not solve the question as to how to identify the products with the plants producing them.

Gutta percha, as it appears in commerce, is of a reddish or yellowish hue, nearly as hard as wood, receiving more or less readily the impression of the nail, and of a porous structure. When cast or rolled it assumes a fibrous structure and acquires a tenacity in a determined direction. At a temperature of 32° to 77° Fahr., it has as much tenacity as thick leather, but is not at all elastic and less flexible. In water towards 120° Fahr.,

it softens and becomes doughy, although still tough; at 145° to 150° it becomes soft and pliant, and in this state it assumes all the elasticity of caoutchouc, but does not retain it long as it becomes again hard and rigid on cooling. It is highly inflammable and burns with a bright flame, and has electrical properties in a high degree. Gutta percha, like many other milky juices, is found in the *Cinenchyma* or *Laticiferous* tissue; a series of tubes forming an irregular network, and found in the greatest abundance in the middle layer of the bark. By this it will be seen that to get at the milky juice it is only necessary to cut through the *bark* as it does not exist in any appreciable quantity in the wood itself.

The question of the native names of the different varieties of gutta percha is most important; yet each district has often its own peculiar name, and many of the names we may mention may yet prove to apply to the same tree. As to the term "gutta percha," in spite of what has been urged by Oxley, Logan, Seemann, and others, it has now become a collective or generic name, and must be received as such. On the other hand the term "gutta taban" is *not* a generic term in any sense of the word, but is the name of a particular variety. The following is a list of some of the varieties of gutta percha, together with the localities where found, and the scientific name, where known:—

1. * Gutta Taban, Percha, Niato, Durian, Balam timbago, Dadauw [*Dichopsis* (*Isonandra*) *Gutta.*]

This tree grows in Malacca and the Malay Peninsula generally, Sumatra, Borneo, &c., and attains a height of 60 to 80 or more feet, with a diameter of 2 to 4 or 5 feet. The leaves are universally egg-shaped and entire, pale green on the upper side, and covered beneath with short reddish-brown and shining down. The flowers are arranged in clusters in the axils of the leaves. The fruit is eaten and a vegetable butter prepared from the seeds. There is also a variety named *oblongifolia* found in Borneo.

2. Ngiato putih (putih-white) (*Dichopsis macrophylla.*) Yields a second rate gutta. Borneo.

3. Kotian (*D. Motlleyana*). Used for adulterating better kinds.

4. Benton (*Payena dasyphylla*). Second rate gutta. Borneo and Sumatra.

5. Percha Waringin. Under this name the best variety of gutta is known on the Kapuas River in Borneo.

6. Nettu. A second class gutta. Borneo.

7. Ploot. A third class gutta, Borneo.

8. Kalapeieh lanyut. Said to be the name of the very finest we receive. Borneo.

9. Kalapeieh Mookas. Next in quality to No. 8. Borneo.

10. Kalapeieh Kapur. Not so good as No. 9. Borneo.

11. Daging. Gutta Daging comes nearer to Balata than any other substance I have seen in the Malayan Archipelago, and might be used for the same purposes. "Daging" means "flesh" and well describes the gristly character of this variety. Malay Peninsular.

12. Muntah. Getah Muntah means "raw" or "unprepared gum," and the term is equally applicable to the unprepared gutta of every variety. It may be of the best quality or of the very lowest kind; whichever it be, if not prepared speedily it loses all its value by becoming resinified.

There are, beside the above, many other species of the genera *Dichopsis Chrysophyllum*, *Sideroxylon*, *Mimusops*, &c., which yield gutta percha, but have not been determined yet. There are also many native names of other varieties, but as their qualities are very inferior and used only for adulterating better qualities, it is needless to mention them here.

As to the climatic and geographical distribution of the trees yielding Gutta Percha, it may be stated that the trees are very restricted in their natural habitat, that is to say, between 6°N. and S.L. and 100° to 120° E. L., whilst the finest varieties are said only to be found between 4°N. and 3°S. with a temperature whose outside limits are 66° to 99° Fahr., and a very moist atmosphere. These limits are well within the Isotherm of 80° Fahr. All accounts agree that gutta percha trees flourish best in a moist temperature, in light loamy soil at the foot or slopes of hills and surrounded by primary (*not secondary*) jungle.

* All the native names are prefixed by the Malay term "Gutta" which means "gum."

As Gutta Percha trees are indigenous to Singapore (although only two or three trees are now to be found on the island) a slight sketch of the climate may be interesting.

The Singapore year may be divided into three periods of four months each:—

1st. From January to April, during which the rainfall is very variable and uncertain.

2nd. From May to August, which may be called the *dry season*, and is the period, as a rule, in which the rainfall is least.

3rd. From September to December, which may be called the *wet season*, and during which, as a rule, the rainfall is greatest.

The total yearly rainfall for 1869 to 1873, furnishes the following figures:—99·63, 123·24, 109·45, 75·30, 85·60. For the same period the thermometer gave, highest:—92°, 93°, 91°5', 92°, 92°5', and the lowest as:—69°, 69°, 67°, 68°5'.

The collection of gutta percha generally takes place directly after the rainy season is over, as in the dry season the gutta does not flow so readily, and during the rainy season the collectors are more liable to attacks of ague and jungle fever, and often when cutting down a tree a heavy rain will wash away the gutta as it flows out. At times the collectors go in companies, often receiving advances in money, cloths, food, and tools, to be afterwards deducted from the proceeds of their expedition, although cases are not unknown where the trader who makes the advances loses principal and interest from the non-success, death, or knavery of the collectors.

The yield of a well-grown tree of the first or best variety is from 2 to 5lbs. of dried gutta, such a tree being about 30 years old, 30 to 40 ft. high, and 30 inches to 3 ft. in circumference. A full grown tree of 100 to 140 ft. to its first branches has been known to yield 50 to 60lbs. of gutta. Gutta, however, unless most carefully prepared, loses within 6 months 35 per cent. of its original weight.

The method of extracting gutta percha, is much the same amongst the Malays, Chinese and Dyaks. The trees are cut down just above the buttresses or *banees*, as they are called; a staging being erected for this purpose. The tools used in felling are either "billiongs" or "parangs." A "billiong" is a chisel-like axe lashed to a handle by means of rattan, although Chinese axes are sometimes used, and are regularly 'wedge' shaped. A "parang" may be described as a long bladed knife or sword. As soon as the tree is felled the greatest haste is made to lop off all the branches, the natives asserting that if this is not done all the gutta would ascend to the leaves. The next operation is to cut and remove narrow strips of bark about one inch broad and about 6 inches apart. These cuts do not extend all round the tree, the under part of the tree being buried in the soft earth in its fall. Some natives also strike the bark with mallets in order to accelerate the flow of milk. The milk, or gutta, flows slowly (changing colour as it flows) and rapidly concretes, and is of a different colour in different varieties, varying from a yellowish white to a reddish or even brownish tinge. The gutta as it flows is received in hollow bamboos, doubled-up leaves, spathes of palms, pieces of bark, coconut shells, or even in holes scraped in the ground. Only two-thirds of the gutta is thus extracted, as one-third is buried in the ground. If the quantity collected is small, it is prepared on the spot by pressing it together in the hands into a mass, or making a hole or loop in the mass to carry it by. Often it is sent into the market in this state, and is then known as "raw gutta," "white Borneo" or "gutta muntah," the latter word meaning in Malay, "raw or uncooked." If water gets into the milk the gutta becomes stringy and is considered deteriorated, but after boiling appears to be quite as good. Sometimes the gutta is kept in a raw state for a month or two, before undergoing preparation by boiling, but I firmly believe that to preserve the gutta in its best state, the gutta should be boiled *immediately* after collection. The boiling is generally conducted in an iron pan or "kwali," either cast or wrought, about fifteen inches in diameter and six inches deep, with two handles riveted on. Those of Siamese manufacture are generally preferred. The boiling is either with simple water or with water to which lime-friut juice or coconut oil is added. It is said that if about one pint of lime-fruit juice is added to three gallons of gutta milk, the latter congeals or coalesces immediately on ebullition, and that this addition expedites the preparation very materially.

When the gutta arrives at the port of shipment, before it is exported, it generally undergoes an examination and classification into suitable parcels, according to quality. As it is received it presents great diversities as to appearance, shape, size, and colour; from crumbling, hardly coherent, whitish or greyish "raw" or gutta muntah fragments, to hard reddish or brownish blocks as hard as wood. Sometimes it is made up into all manner of grotesque representations of animals, and nearly always adulterated to a large extent with sago-flour, saw-dust, clay, stones, &c. The Chinese are great adepts at classifying and assorting gutta, and frequently "reboil" the gutta, by mixing small parcels of different varieties up to a certain "standard sample." This is done by cutting or chopping the guttas into thin slices and boiling in water in large coppers, keeping the gutta constantly stirred with poles, and adding good gutta and even cocoanut oil to give the product a better appearance. When sufficiently boiled, the gutta is taken out of the pans, pressed into large moulds and is then ready for shipment.

The imports of gutta percha into the United Kingdom amounted to 26,359 cwts. in 1877, valued in the Board of Trade Returns at £238,327, and the Market prices per lb. during the six months ending January 1878, ranged from 6*d*. to 2*s*. 9*d*. according to quality and freedom from adulteration and admixture.

(*To be continued.*)

REVIEW.

"NEW COMMERCIAL PLANTS WITH DIRECTIONS FOR THEIR GROWTH AND CULTIVATION."*

THIS publication supplies a long felt want and fills up a most important gap in commercial literature. It is well known that there are vast numbers of plants which have been proved to be of great use, but their usefulness not being generally known and only noticed in some scientific journal or report, the plant continues to "blush unseen." Those who have had to study the history of any new product which suddenly comes into the market and proves itself of great practical utility, are often struck to find in some ponderous tome, a full account of its uses and properties, published years and years previously. The object of the publication under review is to bring together the scattered literature likely to further the cultivation of plants for purposes of agriculture, horticulture, and medicine, and the manufacturing arts generally. In the numbers before us we have notices of the Liberian Coffee, African India-rubber, Turkish Tobacco, Chaulmoogra Oil, Mahwah Tree, Cocoa, New Forage Plants, and amongst many others a notice of the well-known Papaw Tree, about which so much has been written lately that we trust to return to the subject in an early number. Each notice treats of the operation of sowing, method of cultivation, management and preparation for the market, and the more important plants are illustrated with capital plates.

As to the commercial aspect of the question, that of supplying seeds and plants, Mr. Christy must be complimented on his pluck. The obtaining of new plants for experiments in acclimation has generally been looked upon as a State duty, as the costliness of expeditions are generally beyond the means of private planters. Nurserymen as a rule fight shy, and if one appeals to a Botanic Garden, he generally finds that only one or two (if any) examples are to be found. Still, many planters have a piece of spare ground, and if a few plants were purchaseable at a moderate rate, many too would like to experiment for themselves. In sending cases of plants say from America or from Africa, one great cause of mortality has been that they were sent to England first, before transmission to India. This, Mr. Christy has arranged to remedy by means of his agents who send direct to the ports where they are required. Altogether the scheme is a good and sound one and should prove of great practical utility.

The publication should be in the hands of every one who takes an interest in the subject, and we trust that it will not be long before another number is issued. The information contained in these first three is reliable and trustworthy,—praise that can so seldom be truthfully bestowed.

* By Thos. Christy F.L.S., London, Christy & Co. Nos. 1, 2, and 3, pp. 16, 14, 40, 1878-80. 8vo.

EDITORIAL NOTES.

AN esteemed correspondent from Burdwan writes us on the subject of the introduction of the American plough into India. We are sorry we cannot find room for his lengthy letter. We shall, however, give him what information we have on the subject. The American plough has in our opinion four drawbacks. It is too heavy; it is too costly; it has two handles instead of only one; and it is so foreign in general appearance to the ordinary *hul*, that its adoption cannot fail to be hindered thereby. What is wanted in India, is an improvement of the ordinary country plough, and this is being attempted with success we believe. If our correspondent has ever watched a native ploughman endeavouring to guide a double-handled plough, he will see at a glance what we mean; that the difference between that implement and the ancient Indian *hul*, is fatal to its introduction. There are several improved native ploughs in the market at present, and we would advise our correspondent to give them a fair trial before investing in foreign implements.

DR. W. W. HUNTER recently delivered an interesting lecture upon India, which may be regarded as in some sort a counterblast to the exceedingly optimist addresses which he delivered last year. Those who have lately made so much fun of Mr. Caird and his careful criticism on the present condition of our great dependency will perhaps be a little surprised to find that Dr. Hunter, an official of officials, and now Director-General of Statistics to the Government of India, takes almost exactly the same view of affairs as the much-ridiculed Famine Commissioner. It is impossible, indeed, to glance through Dr. Hunter's grave statement without being struck with the fact that they justify almost everything that has been said by the writers of the so-called pessimist school. For Dr. Hunter tells us that the population of India has increased to an enormous extent under our rule, and as a result "the husbandman has now to wring a subsistence out of inferior lands which he would not have touched 100 years ago; the good lands have deteriorated for want of manure and want of rest, and the cattle have degenerated from lack of pasture. The result is that the cultivator gets a smaller average return for his labour, and in this way the struggle for life has been rendered more severe to masses of the population." Dr. Hunter will not say with the facts before him, the "the case is hopeless;" but we have not yet discovered, or at any rate applied, the remedies. The low standard of comfort seems, as in Ireland, and as we have sometimes seen in times of depression in our great cities in England, to increase the expansion of population. In the Native States, which enjoy equal peace with our own territory, thanks to our supervision of the whole country, this same pressure of the population on the means of subsistence is not felt. For whereas the average population over the greater part of our territory is 243 persons to the square mile, in the Native States there are but 89 persons to the same area. It is indeed, but too true, that we are standing aside and watching "the pitiless operation of economic laws whose force no man can stay." Not at once; but the effects Dr. Hunter has noted come, as he himself points out, by cause.

IN the official year 1879-80 the Pegu province (British Burmah) exported 728,384 tons of rice, husked and unhusked, to foreign countries, as compared with 648,594 tons in 1878-79 and 579,770 in 1877-78. This increase is satisfactory, and as population increases, new lands are taken up, whilst additional rice-mills, worked by steam, are every year being erected in nearly all of the principal ports. We may confidently expect that we shall soon witness a million tons annually shipped to foreign countries, seeing that Burmah rice is in greater favor with consumers than Siam or Cochin China grain. The removal of the export duty of three annas per maund would doubtless at first tend greatly to stimulate the export trade, whilst higher freights and advanced prices paid for grain would probably soon make up the cost to the consumer in foreign countries to the present rates. The opening of the Suez Canal has done a good deal for Arracan grain, which, being softer than the Pegu description, does not stand a long sea voyage so well as the grain exported to Europe from Rangoon.

EUROPEANS who have not been in Burmah have perhaps never seen the "glutinous rice," the sale of which at the Yandoon bazaar was recently stopped by Mr. Fox, Assistant Commissioner, for the ostensible reason that its use when cholera was about, was dangerous to the public health. This glutinous rice or *koukneen*, as it is called throughout Burmah, is what nine out of every ten Burmese houses begin their daily food with. It is very often cooked in bamboos, and forms, with a little scraping of cocoanut, a very filling meal for *chota hazree*. A Burman proceeding on a short journey will not take the trouble to carry cooking chatties with him, nor would he think it worth while to cook curry and rice when, for two pice, he can get a full meal of *kouknean* which will satisfy and nourish him at the same time. To a European unaccustomed to its use, this glutinous rice would doubtless be indigestible and insipid, but how can we imagine that a grain so universally used by the Burmese is bad for them. One shipment of glutinous rice was made, we believe, some years ago from Rangoon to Europe by one of the local firms. We presume the result was not a commercial success, as it seems never to have been repeated; but now that steamers deliver their cargoes from the rice ports in 40 days from the date of shipment, it might be advisable to try it again, as we should think, from the favor with which glutinous rice is received by Burmese, it must contain greater nourishment than any other description of rice exported, and would doubtless at home be used for biscuits, puddings, &c., to a large extent if it was more generally known.

THE world is crowded with plants not as yet fully utilized. It is the charm of Chili, says a South American journal, that somewhere within the country so many products of widely different lands will thrive and be at home. Horticulturists should always give their attention to whatever appears worth planting on a small scale, to test in hope of a wider future. Among these there is the Anuatto plant *Bixa Orellana*, which grows in the valley of the Amazon. It is seldom over 12 feet high, and forms a round bush having heart-shaped leaves. The dull red fruit is covered with prickles, and grows on the tips of the limbs; and each fruit contains about 50 seeds, covered with red pulp. In another and hardier variety growing in portions of Peru, the fruit is yellow. The flowers of both species are handsome, and the Bixa would form an interesting shrub for the lawn. The seeds are tied up in little bags and dipped in stews. The seeds are used to make a dye, and are worth 40 dols. to 50 dols. a barrel. Some years ago the editor of the *Florida Agriculturist* distributed a quantity of seed in that State, but we do not know with what success. Decidedly, however, it is advisable to try Anuatto on this coast.

THE fuel question in the Darjeeling district has become a most serious one of late years, says the local paper, and especially with regard to firing tea. It is true that several machines for thoroughly drying tea and at the same time economising fuel have attracted the notice of planters of late years, and although much has already been done in this direction, all the drying machines hitherto tried in this district are, we are sure, susceptible of very great improvement as regards cheapness, economy of fuel, and drying capabilities as regards capacity to fire off an increased amount of withered leaf in a given time. We have no doubt but that in the course of a few years all needed improvements, will be effected, and we look forward with confidence to the not very remote future, when, with some perfected tea-drying apparatus, the tea planter will be able to dry his hundred maunds of leaf a day with an expenditure of about five maunds of fuel.

NOW that bone has come into such great requisition as a manure for coffee, a large trade in bones is carried on between the bone crushing establishments in Beypore, Calicut, and elsewhere, and traders in all parts of Southern India. The bones are forwarded in a whole state, generally, and broken up afterwards at the crushing establishments. The bones used we need hardly say are those of animals and birds which have either died, been slaughtered, or fallen prey to wild beasts. But the other day a case occurred, the *Bangalore Spectator* informs us, in which human bones were consigned as manure. A firm at Beypore requiring a large quantity of bone for manure, a native at Gooty consigned to them by rail a number of human skeletons, in pieces. The bones had evidently been dug out of some pit in which victims of the late famine had been buried. The trainage alone on the consignment, amounted to some two hundred rupees, it would seem. On arrival at Beypore, the firm to whom this ghastly freight was consigned, had the same thrown into the sea. Some of our modern philosophers, however, would be inclined to argue that human bones could not be better disposed of than as manure.

WE may expect, oberves the *Civil and Military Gazette* that the introduction of agricultural banks will find an early place among the commercial and industrial questions to which Lord Ripon hopes to devote the better part of his Indian career. It would be difficult to conceive a plan which, if intelligently carried out, would confer greater benefits on the cultivating classes. The germ of the institution in fact exists in the present system of tuccavi advances; but there is by no means a general agreement, among writers on the subject, that agricultural banks should, like the *tuccavi* system, be purely and solely under Government control. As is well known, the utility of the latter is seriously impaired by formalities rather perplexing to the uneducated peasantry for whose benefit it has been invented. Speaking for the Bombay side, a contemporary believes that agricultural banks lending at five per cent. would, if carefully managed, yield a very fair dividend to their shareholders.

THE trade in jute has shown great expansion. The exports in 1854-55 were valued at £229.241, while in 1879-80 the value of raw jute exported was £4,370,032, and of jute manufactured into gunny bags £1,091,366.

SELECTIONS.

THE TODDY PALM.

THE local Government has before it a recommendation from its Board of Revenue, to encourage the more extensive cultivation, in these provinces, of the toddy palm. The recommendation appears to us worthy of serious consideration on several grounds, not the least being the probability of a considerable increase of revenue. The toddy palm grows easily enough in many parts of these provinces, and its toddy, or *tari* as it is called in excise phraseology, is, according to native ideas, the least injurious of country intoxicants. The tree certainly takes a considerable number of years to attain a size at which it can be tapped without serious injury to its vitality, but in the long run it must yield a not inconsiderable return. Its rate of growth and longevity vary under different climatic conditions, but in the central *duab* of these provinces it is believed that it may be tapped properly (this is often done earlier) in its twenty-fifth year, and thereafter in two out of every three years, for from thirty to fifty years more. Considering that this species of palm tree, when standing singly, throws no shade injurious to crops, that it will grow on any odd scrap of ground (in ravines for instances, where, nothing in the shape of a crop is possible), that once established it needs no further care, and that if grown plantation-wise it can, and with advantage to the trees, be grown as close as from 40 to 50 trees to the acre, its growth might, it would seem, be advantageously encouraged, and in its arboricultural operations Government itself might in some places set the example. The tree yields in abundance a popular and comparatively innocuous beverage, which can be sold very cheap, and the duty on which would, the Board thinks, swell the revenue of the province materially with the least possible harm to the people. It would also, at one season at any rate exercise an effective check on illicit distillation. Toddy, or *tari*, to the natives is what beer is to Englishmen, as compared with spirits. Many people drink *tari* who do not drink spirits, and it is very doubtful whether even a very large increase in the sales of *tari* would very much affect the sale of *licit* spirits, though, as the Board thinks, it certainly would affect that of the weak home-made illicit liquor.—*Indian Herald.*

JUTE IN EGYPT.

REFERRING to the movement for the cultivation of jute in Egypt, the *Egyptian Gazette* says that it seems probable that the soil and climate will prove favourable to the plant. Some Bengalee coolies are expected to arrive shortly to teach the fellaheen not only how to cultivate the plant, but also how to separate the fibre. Jute will present to the Egyptian agriculturists, says our Alexandria contemporary, many advantages over cotton. It occupies the soil only four months instead of eight or ten like the last-named plant. The cost of cultivation is proportionately less expensive, and the process of reaping, steeping, and separating the fibre can all be completed in less than a month by the fellaheen. In consequence of the shorter time that jute occupies the land also, its cultivation is less exhaustive to the soil than that of

cotton. If jute can be cultivated on the saline marshes, the importance of the result will be very great, as a considerable part of Egypt consists of such lands, which it has been found impossible to utilise hitherto. In Bengal, jute flourishes in similar positions, but it must be admitted that the soil is not there saturated with salt to nearly the same extent as in Egypt. The Dundee manufacturers will be glad to have an alternative source of supply besides Bengal. Mr W. Grant, who has been engaged in promoting jute culture in Egypt, stated in a report published by the Egyptian Agricultural Society a few months ago, that where the experiments had been conducted intelligently and under favourable conditions, the plant has attained proportions unknown in Bengal. The *Gazette* considers that the more or less successful cultivation of jute in Egypt is, in fact, assured. The proximity of Egypt to the chief consuming countries will, of course, give the Egyptian cultivators an advantage over those of Bengal in the items of freight and insurance charges for carriage to the markets.

THE KULSI AND CHARDUAR PLANTATIONS.

CAOUTCHOUC growth in these plantations has been on the whole very successful for the year under Report. In the former 45 strong and healthy seedlings (two rows) were planted out from the seed nursery of the previous year, and their flourishing condition is directly attributed to the soil which is found to be of a better quality than that of the older compartment. Six seed-beds, aggregating 915 sq. feet, were prepared in the usual way, and 5 seers of seed collected in Gowhatti; when sown it germinated 4,000 plants. Of these, however, one-fourth have since succumbed from various causes, leaving about 3,000 plants alive at present, besides 328 cuttings made in December 1879. As in previous years the deer have contrived to do considerable damage to the younger seedlings, while in March last a herd of twenty wild elephants which passed through the plantation, caused great havoc, destroying no less than 28 fine trees, while pigs have also occasionally made their way through the fence; but the damage on the whole has been less than in former years. In the Charduar plantation no extension has been attempted, although the new compartments (composed of 2,747 mounds thrown up in the first eight) are ready to be planted. In addition to this 4,521 seedlings have been transplanted from the nursery into the plantation where the growth of the plants has been vigorous. The fencing, which has been strengthened by an additional line (round the interior) of three-year old cuttings, has answered the purpose very well, but the deer have proved themselves if anything, more troublesome than previously. Laxity on the part of the forest guards set to watch has also tended to increase the inroads of deer and other wild animals.

There is no doubt that keeping the deer out of the plantation is the only difficulty remaining in the growth of caoutchouc trees: and, as last year's experience has shown, the fence instead of lasting three years will not last longer than two.

It has been found by experience that trees several years old can be transplanted with as much safety as younger trees, and the Conservator has arrived at the conclusion that plants must remain in the nursery much longer, until they have reached such a size that deer can no longer harm them. By doing this, it is hoped to be able to do without any fencing, and, although the transplanting of such large trees will be more expensive and the cost of nursery work be double or treble of what it is now, all this will be more than counterbalanced by the saving in the cost of fencing.

The expense of moving trees can further be reduced to a minimum by having a separate nursery for each compartment. Nothing certain however can be said until this method has been tried, and meanwhile regular hunting of the plantation by Miries with trained dogs has been started, and by this means the deer are kept down.

TREES YIELDING INDIA-RUBBER.

CENTRAL American Rubber Tree.—(*Castilloa elastica.*)—*1, Locality, Soil, and Climate.*—The very extensive geographical range of this tree shows it capable of existing under considerable varied climatic conditions. The forests in which it grows are usually at or near sea-level, but it has been observed at an elevation of 1,500 feet on the Pacific coast. The soil varies, but the plant avoids marshy or boggy land, appearing to prefer warm deep loam or sandy clay, and especially affecting the margins of small running streams where it grows in little groups. A dry or a rainy climate seems equally suitable, but a high and equable temperature, which does not sink below 60° F. at any time, is essential.

2. *Propagation and Growth.*—This is a very much larger tree than those above described, being, when fully grown, of the imposing height of 160 to 180 feet, with a stem of 12 to 15 feet in circumference. It grows very rapidly. At Henaratgoda at two years of age it was 23 feet in height. The bark is thick, and the wood soft and readily decaying. We received but a few plants of this species in Ceylon, and have had little experience in its management. No flowers have been yet produced, and Dr. Thwaites did not find cuttings of the ordinary kind to succeed well. We are now, however, endeavouring to propagate at Peradeniya by various other methods. Mr. Cross has the following remarks:—"Trees in good situations will produce seeds early, but these will require to be planted without delay, as drying destroys their vitality." The tree is stated to flower in January and the fruit to be ripe in April. "Stout branches cut into pieces each possessing a bud and covered lightly with soil, will generally be found to grow. Strong cuttings a foot in length and furnished with buds, when planted in the usual way, will become strong plants sooner. However, the propagation of this tree will not be found so easy as the Ceara rubber. In the planting out of young plants, the petiole or leaf-stalk of the lowest or oldest leaf should be buried in the soil. By following this simple rule the plant commences to grow at once, its growth is vigorous, and the trunk symmetrical. But if at the period of planting there is much bare stem above ground, then growth is usually slow, the plant remains 'leggy' for some time afterwards and never makes a good tree. The plant has a curious habit of dropping its young branches, which disarticulate by a regular joint, like deciduous leaves, and leave a clean scar on the surface of the stem. From what has been said above as to its native sites, it would seem that our south-western coast would present many favourable localities for this valuable tree.

3. *Collection of the Rubber.*—Milk is abundant and flows readily, but it is of a somewhat more watery consistence than that of the Para rubber. In consequence of the large size of the trees it is the practice of the collectors in Panama and other parts to cut them down. A grove or ring is first cut round the base of the trunk and the milk received into large leaves. "The tree is then felled, and rings or channels are cut out around the prostrate trunk at about twelve or fourteen inches apart," and the rubber allowed to run into leaves or vessels. In Nicaragua the trees are tapped with sharp axes in various ways, and the trees so much injured that the process is performed at intervals of three years. The milk is received into iron pails. It does not appear that this species is tapped until it has a diameter of sixteen or eighteen inches, which Mr. Cross thinks might be attained in six years.

In conclusion, a few words may be said about the preparation required to fit caoutchouc for the market. It is clear that mere exposure to the air is sufficient in some cases to effect the coagulation of the milk into a solid mass. This is all the preparation apparently that the Ceara rubber receives, which comes into the market in bales consisting of the rolled up strings pulled off the trees. But it seems that a decomposition is liable to occur in the milk if exposed in any quantity, and it is usually desirable to reduce it to a solid mass as quickly as possible. For this purpose the cautious application of dry heat is the best; the best Para rubbber is prepared by being poured over a flat paddle-shaped mould, which is held in the thick hot smoke from burning wood and palm-nuts till it solidifies, then slit down one side, the mould taken out and the "biscuit" hung up to dry. In several parts of Central America coalescence is effected by the addition to the milk of the juice of certain plants (especially of *Colonyction speciosum*, which is a common Convolvulus here in Ceylon). This causes the separation of the caoutchouc, which floats in the liquid like a mass of soft cheese, and has to be pressed and rolled to get rid of the fluid still remaining in its substance.

Probably carefully conducted evaporation in shallow pans by artificially regulated heat would be found an effective method.

The purity of the prepared rubber being a matter of first importance, all pieces of bark and earth should be removed by passing the milk through sieves. Small pieces or thin sheets of caoutchouc are preferred to large masses in the market from the facility of estimating the purity of the article.

Absolute dryness of the rubber is also a point requiring the greatest attention, and may require hydraulic pressure for its thorough attainment.

As much as 129,163 cwts of caoutchouc were imported into England in 1874, of which 70,866 cwts were American and obtained from the plants here under consideration. The value of this latter was £1,007,4 13. The demand for the best sorts is constantly increasing. On the relative market values of the various kinds of India-rubber, reference may be made to the excellent "Report on the Caoutchouc of Commerce" by Mr. J. Collins, and printed for the Indian Government in 1872, to which I am indebted for some of the above information, and to a paper by Mr. C. R. Markham in the *Journal of the Society of Arts* for April 7th, 1876.

I may be permitted to add that it is gratifying to reflect on the prominent share which the Royal Botanic Garden at Peradeniya, under the care of my distinguished predecessor, Dr. Thwaites (as detailed in his Reports from 1875-1878), has taken in the acclimatization of these valuable trees of the western hemisphere in Burmah and India; where as well as in Ceylon, it may be confidently expected that they will become a valuable source of revenue.—*Henry Trimen, Director, Royal Botanic Gardens, Peradeniya*, in *Journal of Applied Science.*

REFORM IN OUR AGRICUTURAL FARMS.

A PERUSAL of the annual reports of the Government farms scattered over the country and maintained at rather heavy cost, will convince one that we are going the wrong way to work in the matter of agricultural improvement. We open out a farm, and at once appoint a highly paid officer to look after it. This officer may or may not be a practical agriculturist; he may not even possess a spark of enthusiasm

for his work. Nevertheless a place has been found for him, and there we find him year after year producing a much smaller outturn of grain than the rayats around his farm. We read, for instance of an eminent agriculturist in charge of one of these farms, speaking quite complacently of his outturn of 33lbs. of cleaned cotton per acre, and of 300lbs. or under four maunds per acre of jowari after years of experimenting. With results of this nature we are pretty sure to be asked in the Resolution on the report, why it is that the rayats will not learn at these farms. A few seconds' reflection would tell any man that the rayats do not wish to learn how to produce a crop of 300lbs. of jowari or 33lbs. of cotton per acre. The cultivator usually sells his cotton crop at about 5lbs. per rupee, so that this crop may be worth gross about seven rupees while it will have cost him ten to twenty rupees to cultivate it. One farm in the west recently produced 531lbs of cotton per acre, and how another Superintendent can placidly sit down and acknowledge to having made 33lbs. per acre passes our comprehension. If our farmers are ever to benefit by such experimental operations, they must be conducted on principles compatible with common sense. We must show the farmer, in a manner not to be doubted, that if he spends one rupee extra in manuring, irrigating, or deeper ploughing, he will assuredly receive two in return, and this must be no theorizing. We must actually spend that rupee and earn the other two before his very eyes. Then he will believe; but what is he to think when he sees a great Governmental institution presided over by a highly paid and presumably well qualified officer spending sums of money quite beyond his power, and obtaining worse results than he, with his impecunious position and primitive means of culture? He naturally supposes that his own old fashioned plan is the best after all. This is the point where Sir Ashley Eden's remarks must have told with effect. He complained that nothing of a satisfactory nature resulted from the pretentious efforts being made under Government patronage, and there is a deal of truth in the remark. Year after year we have voluminous reports of what has been done, and how climatic influences prevented the achievement of better results, but what do we learn that is of any practical benefit? Absolutely nothing. The dilettanteism which is characteristic of much of our official work is clearly seen here, and here, if anywhere, we want practical men and practical measures. There is little use in pointing out the patent fact that the rayat is ready to follow new ideas and new methods; he must first of all be convinced that they are improvements on the old.—*Englishman.*

EXPERIMENTS WITH INDIAN WHEAT.

(To the Editor of the Times of India.)

SIR,—I shall feel obliged if you can find room for the insertion of the enclosed report upon the cultivation of Indian wheat at Brisbane, Queensland. Dr. Bancroft wishes to ascertain the latitude and altitude at which the different kinds of wheat mentioned in the report are cultivated in this country. Perhaps some of your numerous readers may be able to supply the desired information.—Yours, &c.,

W. DYMOCK.

Malabar Hill, Dec. 6

The following interesting account by Dr. Bancroft of his experiments with varieties of Indian wheat was read at the last meeting of the Council of the Acclimatisation Society:—

Having gathered some of my experimental patches of Indian wheat, I avail myself of this opportunity of relating some of the results obtained. Last year I had no Indian wheats, and sowed on the same experimental ground Adelaide and English wheats. Neither of these arrived at the stage of maturity to furnish ripe grain. A few shrivelled seeds were formed which were allowed to fall on the ground. The sowings of these wheats of last season were arranged in various ways to determine as to the source of the rust germs. Some of the wheat was even grown in soil that had been heated to redness, yet even here the plants became rusty at the same time as those sown otherwise.

In the past season I have confined my experiments mainly to sowing eight varieties of wheat from Bombay, supplied by Dr. Dymock, and three from Mr. Anthony, of Lahore.

All these, of the sowing of May 13, 1880, are now harvested, October 14. Some of them have been ripe about one month.

No. 1—*Karam bansin*—was ripe September 19; it has a short straw, smooth chaff. The grain is small and plump. A second variety, in the same seed, had reddish chaff and a larger grain.

No. 2—*Karachi pisi*—yields heavily. The grains are wide apart; chaff white, smooth, and bearded. This variety I take to be one of the best, and strongly to be recommended for sowing. It has been ripe about a fortnight.

Dr. Dymock says this makes a good flour. The grains are somewhat heavier and better develloped than the original seeds, some of which I have kept for comparison of all the varieties.

The skin of all the new wheats is a little redder than the original samples, a circumstance I cannot yet account for.

No. 3—*Kandwah*—White chaff, long awns, heads short, grain very large. Not so prolific as No. 2, Dr. Dymock says this is a first-class wheat.

No. 4—*Lashkari*—Robust-growing wheat, with velvety chaff and long awns; grain equal to the original sample, but darker.

No. 5—*Bansir.*—Recommended for macaroni making. Has black awns, and very robust growth. This is a very large wheat.

No. 6—*Pisi*—is said to give good flour and little bran. In this sowing there came up four distinct wheats, one white, awnless, and much like English wheat. The grain is small and round, more sparingly a red chaffed beardless form, with heavy fine grain. A third white-chaffed awned wheat, which when cleaned has a dark skin. The fourth is a bearded wheat with red chaff. Those apparently the best are the two first. The grains are somewhat better than the original sample.

No. 7—*Pisi*—comes up under three forms, one robust, with black beards and very large grain; a second with white chaff and awns, and small grain; and a third, velvety chaff and grain of middle size.

Nos. 8, 9, and 10 were sown near a tree, and are very poor. I shall be able to report better of them in my second patch, not yet harvested.

The wheat grown in Toowoomba, brought here by Mr. Saxon, and described as of Indian origin, I find much later. A few stools of Adelaide wheat are much ranker, and far from ripe. The success attending these Indian wheats is so encouraging that it appears to me a most important question now presents itself to Brisbane agriculturists—can wheat be grown to profit in this neighborhood? So far as my observations now go, there appears to be no doubt that several Indian wheats will grow here, yielding heavy crops, ripening before the time that rust appears. These grains do not fall out when ripe, so that harvesting need not be hurried. The grains are uniformly harder than European wheats, and will suffer less from the attacks of weevils. For the making of the wheaten meal now produced by Mr. Pettigrew these wheats may be very suitable. That the Indian wheats will be quite as good for flour making as Adelaide wheat time alone will tell. That they will prove good food, and suitable for our colonists, there can be no doubt in the mind of anyone seeing the samples placed before you.

THE TIMBER TRADE; ITS EFFECTS AND THEIR REMEDY.

THE statistics of the timber trade would seem to show that a suicidal policy is being followed. Year after year the quantity of timber imported into the London market, is increasing and with this increase the prices of almost all sorts rise. Thus, we find deals from Northern Europe quoted at £18 to £19 per standard as against £14 to £16 last year; and so on with other classes of timber. Our object is not so much to draw attention to this advance in price, *per se*, as to look at the cause. The leading cause of the great advance in the value of timber is not so much the heavy demand that exists for it, as the increasing difficulty of procuring the supplies. In the early days of the American timber trade the article was cheap, because the lumbermen could procure it at their very doors almost. Now the forests are being denuded so rapidly, that in a very few years, timber promises to be almost as valuable as some of the precious metals, unless indeed some generally adopted steps are taken, not perhaps to arrest the consumption, but to renew the forests which are being so mercilessly plundered. For the first nine months of the years given, the timber imports into London alone have been:—

		Loads.	Value.
1878	...	4,089,000	£10,363,000
1879	...	3,324,000	£ 7,352,000
1880	...	4,675,000	£11,723,000

When to this is added the consumption of the other ports, it will be seen at once how enormous is the demand made on the forests of America and Northern Europe. As for India's share in providing this timber the following statement of the English imports of teak speaks volumes:—

1878	...	...	...	...	11,900	Loads.
1879	...	...	...	...	8,200	„
1880	...	...	...	...	3,400	„

The reason of this declension is not a weaker demand, but an insufficient supply. British Burmah is almost denuded of this valuable tree, and supplies are now coming from native Burmah, and are intermittent, hence the advance in price, which rose from £8-10 to £10-10 in 1879, to £13-10 to £14-10 in 1880. What little timber remains in British Burmah is reported to be small in size. The teak forests are now, too, strictly preserved by the Forest Department. As soon as political changes lead to the opening up of independent Burmah, the price of teak will fall, and the customary work of denudation will go on, till a time come, when the supplies shall again become scarce. And all this time what, we would ask, is being done to replace the valuable forests. Absolutely nothing. We forget the maxim of the laird of Dumbiedykes, "Aye be sticken' in a tree, it will grow when ye're sleeping." The forests of the world, occupying tracts not likely to be used for agricultural purposes, are ample to meet the market demand for timber; but if this is to continue, they must be renewed. Apart from the commercial view of the case, there is the more important consideration as to the manner in which forests affect rainfall. On this there may be a difference of opinion, but only on details; the general principle is acquiesced in by all, that a reduction of forest land means a denudation of the soil, and thereafter a fitful and deficient rainfall. This, again, means distress and famine. It is easy to renew the forests, if the work be gone about in the proper way. An expensive and scientific Forest Department will never effect it alone, unless some wide and general scheme be devised, whereby the great bulk of the people can be interested in the movement. In India the authorities of some districts in the Punjab have gone the right way about this, and will not fail to be successful. They offer a small sum to the villagers for every tree planted and tended for four years, it being rightly considered that by that time, the young tree will be quite able to do without any special care, the shoots being beyond the reach of wandering cattle. Every villager therefore, who produces a healthy four year old tree, receives his reward. The trouble to him is almost *nil* and the guerdon tangible. If this practice were generally followed all over India, a vast improvement would be observable in the climate 10 or 15 years hence. There are immense tracts of land in India, chiefly of a hilly and stony character, which are admirably adapted for forest growth and which at one time were probably covered with forests. These should all be planted out with suitable young saplings. The money thus spent would come back to Government with heavy interest in after years. A block of forest is needed in the neighbourhood of each village. From this the labouring man could draw his supplies of firewood, which

after a very few years, he could do without injuring the forest in any way. The manure, now used in the form of *oopla*, would thus be set free for its more legitimate uses and in every way, we should benefit by the change. This system of village forests need not interfere with agricultural operations, as there are usually large portions of land, such as gullies and gravelly land, which are not well adapted for cereal crops.—*Indian Daily News*.

TEA AND COFFEE STATISTICS.

THE official statement of the *Moral and Material Progress and Condition of India* during 1877-78, contains the following as to tea and coffee :—No statistics for the whole of India have been received of the tea cultivation in 1877-78. It was estimated that the total area under tea in Assam, Bengal, the North-Western Provinces, Punjab, Madras, and British Burmah, was 145,000 acres in 1876-77, and that the approximate yield was 29,500,000lbs. During 1876-77 the quantity exported from British India was 27,784,124lbs., valued at £2,607,425. In 1877-78 the quantity exported rose to 33,459,075lbs , and the value to £3,044,571. As regards the quality of the tea produced, there was a decided falling off, and the prices realised in London were less than they had ever been. The increase in quantity was mainly due to the circumstance that three years previously there was a great extension of cultivation, and the plants were coming in 1877-78 into full bearing, and greatly increasing the supply. Owing to high prices in former years, a tendency was developed in the manufacturer to sacrifice quality for quantity. This in the face of the large competing crop from China depressed the value and the general result was that, although the export of tea showed an increase in quantity, the pecuniary result was not so satisfactory as in previous years. Almost all the tea from Bengal goes to the United Kingdom, the exports elsewhere being trivial in comparison. Tea in Bengal is cultivated to a greater or less extent in the Cooch Behar, Dacca, Chittagong, and Chota Nagpore divisions. In 1877-78 there were in the entire province of Bengal 2,211 tea gardens, situated in altitudes varying from 13,000 to 5,000 feet above the level of the sea, covering an area of about 63,000 acres, and producing about 6,000,000lbs. of tea. Great difficulty continued to be felt in Assam in getting information from the planters as to the state of tea culture in the province. Altogether 1,718 estates, with a total area of 736,082 acres were held for the purpose of tea cultivation under different kinds of tenures, but only about a seventh of the entire area was actually planted. The total outturn of tea during the year was returned at 23,352,298lbs. Owing to the widest divergence of opinion in the matter among the planters, it was found impossible to give figures showing the cost of cultivation and manufacture. Prices received for tea during the year were generally low, owing to the London market having been flooded with coarse tea during previous years. Machinery of all kinds was being introduced into all the large gardens in the province. Further extension of tea cultivation in the Punjab was made during 1877-78 the area planted increasing from 8,060 acres to 10,046 acres, while the yield of tea rose from 761,561lbs. to 1,118,166lbs. The average yield of all the land planted was calculated at 111lbs. an acre. There is one small tea estate in the Akyab district of Arakan in British Burmah, and, when the sources of that district are better known, tea planting will doubtless be extensively introduced. The area under cultivation during 1877-78 was 150 acres, on 120 acres of which there were mature plants. The yield for the year was 25,000lbs. of tea, mature plants producing about 209lbs. an acre. Wild tea plants are found in parts of the Tenasserim division where there is little doubt the cultivation of the plant would succeed well. A little tea is grown in some of the coffee estates in Coorg. The extent of land under cultivation of tea in the Madras Presidency was 3,112 acres in 1876-77. In 1877-78 the season was favourable for the cultivation of the plant throughout the Neilgherry district, and the exports consequently increased by about 36,000lbs. in quantity and £2 600 in value over those of the preceding year.

INLAND EMIGRATION.

THE report on Inland Emigration in Bengal for the year 1879-80 is full of encouragement to the large class interested in the tea industry, for it tells us in unmistakable terms that the labour difficulty is in a fair way to be surmounted. The present low range of prices of tea may be considered as but a temporary difficulty ; and although the prices obtained ten years ago may never again be the rule, the present abnormally low scale will not old good much longer. The depression is the result of certain causes—among them ,of over-production—and the losses at present being sustained by tea proprietors will go far to remove that cause, as under the influence of negative profits and positive losses, extensions are all but at an end for the time. At home, on the other hand, the consumption of Indian teas is slowly but steadily increasing, and new markets are being found for the produce as well. The labour difficulty is, however, a chronic one, and has pressed very hard on the planter for many years. At no time, perhaps, has the pressure been so much felt as at present, and hence we hail symptoms of its approaching termination. An artificial supply of labour is at all times an unsatisfactory one, and in this instance it was hedged around with so many legislative enactments as to make it a severe burden to the employer of labour. The new route to Assam by the Northern Bengal Railway to Kaunia, leaving only a short break to Dhubri, at once opens up a means whereby the coolie can, if he choses, find his way to Assam without the intervention of any Government or *quasi*-Government official. And the emigration returns, coupled with the records of registration at Dhubri, tell us that the coolies are taking advantage of this route in ever-increasing numbers. It must, however, be borne in mind that Dhubri is only the gateway of Assam, and having reached that station, these emigrants have still a long journey before them ere they reach the gardens higher up the valley. The distance to Debrooghur being about 4 0 miles, doubtless we shall soon have a light railway to remedy this ; but in the meantime, and in spite of this physical difficulty, 26 per cent. of the coolies imported during 1878-79 found their way on foot by Dhubri and in 1879-80, 37 per cent. At present there is a serious drawback to the success of this scheme, and it is the heavy mortality which this route seems to entail.

The following statement will show this at a glance :—

Percentage of mortality, 1879-80.

Contractors' coolies	·62
Sirdaree coolies	1·81
Non-depôt coolies	4·69
Dhubri coolies	4·67

This is the percentage of deaths during the journey up. The deaths on the Dhubri route amounted in 1878-79, to 7·96 per cent., so that matters may be mending, although it must be borne in mind that the year under notice was an unexceptionally healthy one. The causes of this heavy mortality is doubtless the extreme poverty of the immigrants, and the absence of sleeping accommodation *en route*.

Exclusive of the number registered by the Dhubri route, the total number of immigrants was as follows—two years' statistics are given for purposes of comparison :—

	1878-79.	1879-80.	Decrease. Coolies.	Decrease. per cent.
Depôt coolies ...	13,795	7,601	6,194	45
Sirdaree coolies ...	11,917	4,625	7,292	61
Non-depôt coolies ...	2,439	1,224	1,115	46
Total	28,151	13,550	14,601	52

Two causes operated to bring about this decrease : they were—the depression in the tea industry, and the contended and comparatively comfortable condition of the people in those districts whence labour is usually drawn. Sundry complaints having been made as to the low type of coolies now being forwarded, the Lieutenant-Governor disclaims all responsibility as he truly points out the medical officers who examine the coolies do so with a view to see " that the emigrants are in a fit state to travel without immediate dangers to themselves, and without being a source of danger to the public, to their fellow-voyagers or to the populations among whom they are about to sojourn." He affirms that the responsibility for this should rest on the agents or employers of labour. An experiment is being made of " transferring the provisioning of the coolies to the Steamer Companies, who will also provide for their medical care and treatment." This ought to work well, and the result will be watched for with interest. The reduction in the number of coolies being forwarded by contractors has led to the number of contractors falling from 20 to 10 four of whom are special agents on behalf of particular firms, leaving six general public contractors. During the year several stringent measures of reform were introduced into the administration of the depôts in Calcutta, with the result that the mortality in the depôts which, in 1878-79, was 2·27, fell in 1879-80 to ·46 per cent. The deaths among coolies, while on the steamers on the Assam route, were as follows—

	Coolies carried.	Deaths, per cent.
1876-77	14,646	1·46
1877-78	17,366	2·96
1878-79	16,495	3·78
1879-80	6,333	1·05

showing an improvement, which, however, may be partially due to the absence of crowding, a very much smaller number having been carried than formerly. The number of trips made with coolies was 70, giving an average of 90 per trip, whereas, under the influence of a heavy traffic, those vessels must occasionally have carried far higher numbers.

LEPIDOPTERA.

WE have received the following paper on silk producing and other *lepidoptera*, by Alfred Wailly (Membre-Laureat de la Societed, *Acclimatation* de France). 110, Clapham-road, London, S. W. England ,—

During several years, I have studied and reared many species of silk-producing Bombyces and other *lepidoptera*. My reports on this subject have appeared in various numbers of the " Bulletin de la Sociétéd, Acclimatation," Paris ; the " Journal of the Society of Arts," and " The Entomologist," London ; " Isis," Berlin ; " The Scientific American," New York, &c.

The sending of living cocoons and pupæ (which I purchase every year) has always been successful when they came from North America, but as it has not been so with respect to living cocoons sent from India and South America, I shall make a few remarks on the sending of live cocoons and pupæ from India, and other distant countries to Europe. The time of

sending these live insects should be, from about the beginning of October till about the beginning of April, so that the cocoons should not be subjected to the heat during the whole time of the voyage to Europe.

On the cases containing the pupæ and cocoons, there should be written in large letters; *Living pupæ or cocoons of silkworms*, and request to keep them in the coolest place inside the ship.

The cocoons should be well packed in straw, hay, moss, or anything that will deaden the shocks to which the cases may be subjected. Bare pupæ of *lepidoptera* must be placed in bran, saw-dust of fine moss. All should be sent, as soon as possible, after their formation.

Small quantities of cocoons and pupæ, should be sent by sample post, in registered boxes, not exceeding 8 ounces in weight, each; the boxes must be strong, and it is best to tie a label to each box and affix the stamps to the label.

Persons living too far inland to send living pupæ, may send dead specimens of the prefect insects: butterflies and moths. These should be in good condition and placed with folded wings in paper envelopes. As it is well known, butterflies are caught with a net; and they should be killed immediately they are captured, which can be done by carefully pinching the thorax of the insect when its wings are folded. But moths, having large bodies, would be injured if treated in this manner; they are killed by being put into a bottle containing some cyanide of potassium, or some other poison.

It is also important when the insects in papers have been placed in a box, to add some poison, to protect the specimens from the attacks of mites "Dermestes" beetles or other paracites, also from ants, &c.

As there are a great many entomologists who make a special study of the larvæ of *lepidoptera*. I shall now pass to this subject.

The rear *lepidoptera* from the egg, the moths should be placed in cages having muslin sides, for copulation and the laying of eggs. Moisture should be maintained in the cages.

A few day after the eggs have been obtained, they should be placed under glass, with a small branch or leaves of the proper food plants, so that the larvæ should have their food ready, as soon as they are hatched.

When the larvæ are small, I rear them under bellglasses, having a few holes on the dome.

These glasses, some of which are about a foot high and even larger, rest on saucers full of sand, covered with paper. Small branches of the proper food plants are plunged through the paper, into the sand and keep fresh, even without requiring water, for several days. Larvæ of some species can be reared in this manner, till they turn into pupa state. With respect to the larvæ of several species of the larger Bombycidæ, after the first or second moult, when they have ceased to wander, it is best to rear them without the glass covering. Large branches, 1 or 2 yards long, plunged in water, are then used; small twigs must be avoided, as the foliage would become too watery and cause the death of the larvæ The larvæ should be reared in the open, but sufficiently protected, or in a well-ventilated room. Larvæ reared in the open air on the living trees, which is the best plan, should be protected from birds and other enemies. Larvæ which go in the ground to turn into pupa state, must be bred in cages having a few inches of light soil, and this plan must be adopted when the habit of the larvæ is not known.

Larvæ can be found in almost unlimited numbers on trees, shrubs, bushes, and low plants, by beating the branches or sweeping on the low plants. Larvæ which feed by night and hide themselves in the day-time, can only be obtained in large numbers, by looking for them at night with a lantern.

With regard to the sending of pupæ, and even ova of *lepidoptera*, I can say that, with a little care, and especially if those were given in charge of the captain or some other person on board ship, they could be sent to Europe from distant countries, and arrive alive and in good condition. In proof of this I can mention the fact, that in 1864, salmon and trout ova packed in a box, which was placed in the ice-house of the vessel "The Norfolk," were sent from England to Australia and Tasmania, with the most satisfactory results.

In the same manner silkworm ova, live cocoons and pupæ, could safely be sent to Europe from very distant countries, and this would be of the greatest value and interest to entomologists, for the study of living *lepidoptera* in all their various states.

THE YEAST PLANT.

THE following on the yeast plant is extracted from an article in the *Brewer's Guardian* dealing with the growth and manufacture of yeast:—

The British yeast trade, which it is anticipated will be so materially promoted by the removal of the malt-tax, constitutes to the ordinary mind one of those recondite and mysterious subjects which it requires some special mental qualifications to be able successfully to grapple with. It takes more than one generation for any new idea to work its way into the popular understanding, and it is now only about a single generation since Cagniard de la Tour discovered the yeast plant. Says the *Globe*, more correctly he has been described as re-discovering the yeast plant, since it is, we believe, undisputed that Lieuwenhoek was the first to draw attention to it in 1680, but since his day the fact of the yeast being really a plant had grown dim and dubious. Philosophers attributed the action of it to chemical changes only, and one of them at least thought he saw good reason for ascribing animal characteristics to this mysterious object. About forty years ago, however, Cagniard entered upon a series of very close and careful observations, which placed it beyond doubt that yeast was a vegetable growth. He found that it consisted of an agglomeration of minute oval cells, the diameter of which he reckoned to be about one two thousand five-hundreth part of an inch, and they propagated, he found, by a process of budding.

The yeast plant is now universally admitted to be a *fungus* growing and feeding on decaying organic matter, and is met with all over the globe. Nature seems, indeed, to have very carefully provided for its universal diffusion. The mildew which forms on the surface of yeast is really the fruit, the spores of which, it has been calculated, are but one-sixth of the diameter of the pollen-dust of the fir tree, showers of which have been sometimes met with hundreds of miles out at sea. When the yeast plant comes to maturity, therefore, and throws off its spores, they are very likely to travel over a great part of the earth's surface before settling. The propagation of the plant by the budding process just alluded to is very curious. A single cell will put forth one, or sometimes two tiny projections, which presently become complete cells, capable themselves of multiplying in the same manner, and thus in a few hours, under favourable circumstances a portion of yeast introduced into a saccharine fluid will increase its volume to five or six times its original dimensions. Scientific men have made a distinction between surface yeast and sediment yeast—*surface yeast being*, they tell us, propagated by buds, and sediment yeast by spores. Beer yeast, at any rate, has been thus divided. There is, however, very little, if any, difference in the cells of the two kinds, and sedimentary yeast appears to be only a fungus developed at a lower temperature than surface yeast, into which, as a matter of fact, it is readily converted by a rise of temperature. The reason of one kind appearing as a sediment and the other a surface growth is said to be attributable to a difference in the evolution of carbonic acid gas, the rapid generation of which keeps one "variety" of yeast at the surface, while the want of the buoyancy imparted by this generation of gas is the cause of the other kind remaining as a sediment. It seems, in fact, to be not a difference of kind, but of condition.

SUGAR CULTIVATION IN JAPAN.

IT is interesting to note the steady development of non-indigenous productions in this Empire and especially that of sugar, the consumption of which article has so greatly increased in this country of recent years.

Up to the time of the opening of Japan to foreign intercourse, the cultivation of sugar was confined chiefly to the province of Satsuma and its dependency of Loochoo, and to the southern parts of the island of Sikoku, but it is noticeable that the first step taken by the Japanese in introducing foreign inventions and systems, was in the direction of improving the sugar industry, and was undertaken by that most conservative of the feudal clans—Satsuma, who introduced into their territory in the Loochoo islands extensive sugar mills from Europe at a cost of some quarter of a million of dollars. This fact we may observe in passing has its bearing on the vexed Loochoo question, and has apparently been overlooked by the Chinese Government.

The sugar establishment in the Loochoos did not succeed, principally through neglect of using proper fertilizing agencies in the cultivation of the cane, and it was abandoned far too hastily by the Satsuma officials as they mistakenly attributed the failure to climatic causes. Whereas it has now been ascertained that among many unsurpassed advantages this country enjoys in climate, soil and products, it enjoys this important one, viz., that sugar-cane grows successfully here in a considerably higher latitude than any place yet known. Whether this is due to the beneficent action of the Kurosiwo, or Black stream, or to whatever cause, it is established that the cane will grow to perfection as far north as the province of Nambu, if not higher, and that in Yesso the Beet-root will grow in perfection, whereas in France it is confined principally to the southern part.

In China, sugar does not grow successfully further north than the Chekiang (Ningpo) province, if we except a particular fine kind of Sorghium which grows on the large alluvial islands at the entrance of the Yangtze-kiang river. Japan, therefore, possesses an industy of great importance which can be developed to any extent, and this has been recognized fully by the late Minister of Finance, Mr. Okuma, and the present Minister of the Interior, Mr. Matsugata, to whose indefatigable exertions the success this industry promises to attain is mainly due. When it is considered that the import of sugar into Japan doubles itself every three years, and that last year four times the quantity of sugar was imported to find a profitable market than was imported twelve years before, and that the ratio of increase has been as stated we cannot deny that it is high time to extend this industry, and there is nothing apparently to prevent Japan becoming self-supporting in this import, if not of producing a sufficiency of the product for a considerable export trade.

The chain of islands of which Japan and the Philipines form a portion, promise to be one of the chief sources of supply in this part of the world. The great colonies in Australia draw their supplies chiefly from the Philippines and Mauritius, and there is no reason in the future why they should not import from Japan.

Before concluding our remarks there is another consideration with regard to sugar which in these days of Trade and Guild combinations ought not be lost sight of. Sugar is a luxury to the poorer classes, and has been found to be the first luxury they can conveniently dispense with on economical grounds. This fact was clearly established by the experience of the cotton-spinners of Lancashire during the lamentable civil war in America. The poorer classes in this Empire have little enough

saccharine matter in their customary food to exist upon, but they also have scant enough clothing to cover them, and we are much mistaken if sugar is not found to be the first luxury the people will deny themselves if poverty extends.—*Japan Mail.*

THE ADULTERATION OF JAPAN TEAS.

DR. ALBERT. R. LEEDS, of New Jersey, writing upon the subject of the adulteration of the Japan tea, which finds its way to America, says:—

"In the examination of teas attention was directed to the determination of the percentages of ash and of tannin; to the analysis of the ash for the discovery of foreign mineral substances, and to the examination of the structural characters of the leaves under the microscope, in order to detect the presence of other plants.

"An analysis by Mulder of black and green teas gives for the percentage of ash in the former 5·24 per cent., in the latter, 5·56 per cent., his determinations of tannin give for black tea 14·28 per cent., for green tea 17·80. While the analysis of various kinds of tea representing tea grown on various soils, in different seasons, and collected at different ages of the plant, afford other percentages for the ash and tannin, yet it is safe to say that any wide discrepancy from the above results would indicate either that we were dealing with teas containing foreign mineral substances, or with teas largely admixed with the leaves of other plants.

"A sample of what was sold as medium Japan tea yielded, according to one analysis, 6·6 per cent. of ash. A publicate specimen of the same gave 7·0 per cent. of ash. This high result pointed to the probable presence of foreign mineral matter. Under the microscope many leaves other than those of the tea-plant were found.

"Mixed tea sold at the price of thirty cents. per pound, yielded 6·5 per cent. of ash, and contained 7·9 per cent. of tannin. It was free from foreign mineral matters, but had abundance of other leaves.

"'Mixed tea sold at twenty-five cents. per pound, yielded 6·9 per cent. of ash, and contained 8·2 per cent. of tannin.

"Examinations were made of a number of low priced teas in a similar manner. After soaking, the leaves were mounted on glass slides, and compared with the microscope, both with the leaves of what was sold by the most reputable grocers of New York, at the highest prices, for genuine tea, and with the microscopic enlargements of the genuine leaves of the tea plant, figured in Hassall's standard work on the Adulteration of Food.' In the lowest priced teas it was difficult to find, in this manner, any genuine leaves whatsoever. The low percentage of tannin found in such samples likewise indicates the probable presence of a large proportion of foreign leaves.

"It is stated that plumbago, indigo, Prussian blue, clay, soap-stone, gypsum, &c., are employed either in the facing of tea or to give weight. The small percentage of iron found in the ash of the teas examined would appear to show that if the Prussian blue were employed at all in facing them, the amount must have been insignificant. The other mineral matters enumerated in the list given above we did not succeed in finding. Sufficient evidence, however, was afforded by the microscopic and chemical examination to show that while the adulterants of tea are mainly harmless they are added to such a degree as to make it one of the most adulterated articles of food.

EXPERIMENTS WITH *SORGHUM.*

THE Collector of Coimbatore has reported to the Board of Revenue on the experiment made with *Sorghum Saccharatum* during the year 1879-80. Seed was distributed to division officers, Tahsildars, and Ryots. The experiments reported are thirteen in number, the quantity of seed used in them being 60¾lbs. Of the experiments, six were in the Jungle Conservancy gardens at Coimbatore, one was in the Municipal garden at Coimbatore, one was in the jungle Conservancy garden at Udamalpet, one was in the Sub-Collector's garden at Erode, and four were conducted by ordinary agriculturists in different villages. The results are given in the following table, from which it will be seen that the outturn varied from 568 to the enormous figure of 25,836 per cent. The least quantity sown per acre was 2 lbs., the highest 24. Except in one case where it was sown in drills, the seed was sown broad-cast; information as to the weight and nature of the manure used in each case is imperfect. The experiments permit of the following deductions:—

(1) *Sorghum* grows best in alluvial tank bed soil; 25,836 per cent. was the outturn on the sowing.

(2) The next best soil for it is the best red, which gave a return of 16,800 per cent.

(3) The third best is an "ash-colored" soil, which is an ordinary or inferior black improved by ash manure; it gave a return of 10,368 per cent.

(4) The outturn is on the whole better under rain with occasional irrigation than under irrigation with occasional rain. A fall of 4 inches distributed over some twenty days during the three months intervening between sowing and reaping is sufficient, with a few occasional waterings from a well, to secure a full crop.

(5) It can be grown either in the cold season between November and February or in the early summer between March and June; the latter season seems on the whole the best.

(6) No useful result is gained by sowing *more* than 10lb to the acre, and this quantity seems on the whole to be about the best average for seed.

(7) The experiments do not give sufficient information upon which deductions can be made as to the nature and quantity of manure which should be applied to the various soils.

On the general question as to whether "*Sorghum*" is to take a place among the ordinary agricultural products of this district, the Collector remarks that it is objected to by the people more on account of its novelty than for any other reason that he can ascertain; it is alleged, too, that after hulling the Salaga of 72 Madras measures produces only 34 measures of grain, while ordinary cholum produces about 55. Some of the grain grown in the Jungle Conservancy gardens at Coimbatore was sold for Rs. 1⅝ a Salaga of 72 Madras measures, the price of ordinary cholum being above Rs. 4 a Salaga, more could not be got for it. It is proposed to continue the experiments during the coming season, and steps will be taken to make the results more indicative than those hitherto made.

NEW BRANCH OF INDUSTRY.

KURRACHEE is to be congratulated upon the establishment of another branch of industry in her midst. The Date Coffee Company of London have taken premises here and erected extensive machinery for the manufacture of coffee from dates. We have heard of wooden hams and wooden nutmegs, syrup obtained from old rags, and even of coffee made from wood, but we were not aware that this necessary article of food could be manufactured from dates. Yet such is the fact, and excellent coffee it indubitably is too. By a reference to the beforementioned wooden articles of diet we by no means wish to convey the impression that the coffee prepared by this Company in any way resembles the shams got up by our American friends or any other Yankee notions whatever. The quality of the coffee and its splendid flavour we can vouch for, having personally tried it:—it is real *pucca* coffee and no mistake about it. Mr. Eardley Mare, the Company's representative here, hopes to have his works &c., completed and his machinery in full swing in a short time. This gentleman very kindly permitted us to inspect the premises and machinery, and also took considerable trouble in explaining to us the the *modus operandi.* The process is remarkably simple, and consists of roasting the date in shallow iron trays to a certain extent and at a certain temperature; then the trays are withdrawn from the ovens, the dates permitted to cool and then are passed through a mill driven by steam power and thus reduced to a coarsish powder. We defy any mortal man who has never heard of or seen the process to distinguish this coffee, either by sight, smell or taste from the finest Mocha Coffee, and we are inclined to endorse the opinion of Mr. Mare that the date coffee is destined to supersede to a very large extent all other coffees in the market. Mr. Mare has only been two months amongst us, and every grain of coffee he can produce is already be spoken for the home market, and the first consignment has been shipped by the *Canara.* Date coffee is intended as a mixture in the place of Chicory so largely used in French Coffee. The Company mix with their product 25 per cent of Mocha coffee than the present mixture of Chicory; moreover, date coffee so manufactured does not possess the heating properties of ordinary coffee, and besides contains an immense amount of nutriment. Ordinary coffee, say Mocha or Ceylon, is sold in England at 1-6d. to 1-8d. per pound; the Company's coffee will be sold at something like half the cost, and it possesses the advantage of producing a very fine beverage from a much smaller quantity than is ordinarily used, even when pure coffee alone is employed. The Company do not in any way desire to over-rate its merits, having satisfactorily proved these in England; and the demand is so great that Mr. Mare fears it will take him some time to meet the demands of the market.—*Beacon.*

A NEW INSECT PEST.

FROM J. WOOD-MASON, Esq., Deputy Superintendent, Indian Museum, to the Assistant Secretary to the Government of Bengal, Financial Department,—No. 36, dated Calcutta, the 25th November 1880.

I have the honour to acknowledge receipt of your letter No. 254, dated 13th, but only received by me on the 18th November, forwarding a copy of a letter from the Magistrate of Monghyr, to the Commissioner of Circuit, Bhagulpore, and a small bottle containing the dried, shrivelled, and mutilated remains of some specimens of an insect that had been attacking and seriously injuring the *dhan* in the Khurruckpore thanna, and asking for my opinion thereon.

2. In reply, I beg to inform you that I have carefully examined these specimens, and I find that they consist of *pupæ, pupal skins,* and an *adult female* of a species of *Cecidomyia,* a genus of dipterious insects which includes amongst its members at least three species destructive to cereals—the famous 'Hessian-fly' (*Cecidomyia destructor,*) whose ravages were at one time so extensive that the cultivation of wheat had to be abandoned in many parts of the United States where it had established itself, and the only less formidable 'wheat flies' (*Cecidomyia tritici et aurantica*), only too well known on account of their depredations both in America and in Europe.

3. The occurrence in India of an insect-pest belonging to the genus *Cecidomyia* has, so far as I have hitherto been able to discover, never been placed on record; indeed, only a single species belonging to the family *Cecidomyidae,* or gall flies, has been described from India, and only two or three, the Indian one included, from all Asia.

4. The adult or perfect winged insects are only indirectly injurious to vegetation by depositing thereon their eggs; from these, grubs are hatched in due course which suck the nutritive juices from the plants and thereby cause the inanition of the fruit. In the case of the Hessian-fly the eggs are deposited upon the tender leaves of the young wheat

plant, and the grubs, when hatched, pass down the culms or stalks as these get mature and unfit for food, eventually taking up a position between them and the vaginæ (the expanded and sheathing leaf-stocks of the leaves), and there changing to pupæ and perfect insects. In the two species of 'wheat fly,' the eggs are laid in or upon the flowers of the wheat, in which the grubs are hatched and remain until, their feeding days are over, they are ready to assume the quiescent pupal state, when they quit the plants and pass into the earth; there to undergo their metamorphoses. In the newly-discovered India pest, on the contrary, not eggs, but living grubs, all ready for their destructive work, are thrown in force into (probably) the developing panicle or 'ear,' of the rice-plant, *Cecidomyia Oryzae* or the 'Rice-fly,' as I propose provisionally to call the species, being, in fact, viviparous instead of oviparous, as in all the other known species; the agamic reproduction of *Miastor* in the larval state forming only an apparent exception to this.

5. Affecting as it does the very staff of life of the people, *Cecidomyia Oryzae* may prove a most formidable pest, and a most careful watch should be set upon its movements.

6. I beg leave to suggest that the district officers be directed to inquire, while the circumstances are all fresh in the memories of the people, and while the injured *dhan* is still uncut, what part of the rice-plant is affected, what particular variety of the rice-plant has suffered from the attacks of the pest, and what varieties, if any, seem to have enjoyed an immunity from attack.

7. In conclusion, I may say that I have already prepared some drawings, and that I shall hereafter submit as full and detailed an account of the insect as it is possible to draw up from the exceedingly meagre and ill-preserved material that has been placed at my disposal, together with such remarks as to remedial measures, &c., as the study of the rather voluminous literature of *Cecidomyian* pests may suggest. In the meantime, this brief statement of the nature of the new enemy may, I hope, prove acceptable to the Lieutenant-Governor.

From Colman Macaulay, Esq., Offg. Secretary to the Government of Bengal, Financial Department, to the Deputy Superintendent, Indian Museum, Calcutta,—No 238, dated Calcutta, the 29th November 1880.

In acknowledging the receipt of your letter No 36, dated the 25th instant, I am directed to convey the thanks of the Lieutenant-Governor for your interesting report on the insect that has lately been injuring the rice-crop in the Khurruckpore thanna of the district of Monghyr.

2. The Lieutenant-Governor will await the further detailed report on the subject promised by you. Meanwhile, the Commissioner of Bhagulpore has been asked to institute the inquiries indicated in the penultimate paragraph of your letter, and to report the result to Government on an early date. The other Commissioners of Divisions have also been asked to state if any thing has been heard of the pest in any of the districts under their charge.

WEEPING TREES.

We have no great liking for the general class of weeping trees. They are often to our mind very questionable ornaments. They are at least curious or peculiar in style, and are adapted to peculiar situations and associations. They are, for instance, admirably fitted to adorn churchyards or cemeteries, and also for planting in an isolated manner on lawns or in the foreground of ornamental plantations, by way of contrast to the more erect and natural forms of which such plantations are usually composed. They are essentially intended to be planted in an isolated manner; their form and peculiar features can only be fitly displayed in such a position as will enable them to be viewed all round. There is a very considerable number of weeping trees now in cultivation; but many are very little to be desired except by those who are curious about these peculiar examples of the freaks of Nature. The most common are the weeping-willow, in two forms, known as the American and the Kilmarnock. Of these two forms perhaps the most distinct is the Kilmarnock variety, with fine large wrinkled leaves and close habit of growth and deep green tone of colour. But the American variety is certainly the most popular. These willows are not so long-lived as certain other weeping trees, as, for instance, the elm and the ash. Of both these there are several varieties, all of which are among the most handsome of these peculiar forms. The finest form of weeping ash is that called *Fraxinus lentiscifolia*; and being very rarely seen except in occasional nurseries, we can only express our surprise at the fact, for it is one of the most handsome of weeping trees. Having all the grace of the American weeping-willow, it has an entirely distinct form of foliage; and being a deep glaucous green colour, the plant is exceptionally attractive. It has the merit also of being longer lived than the willows. The weeping form of the common ash, which is that most usually seen, is also very handsome in its way; but we think both this and the common weeping-elm might be greatly beautified by being made use of for supporting and displaying the beautiful hardy celematises which are now so numerous. One or more varieties of these planted at the roots of a well-developed ash or elm, and well attended to with water, would quickly climb the stem of the tree and overspread and intertwine among its branches over head, producing the most beautiful effect when in flower, and at no time an ill effect. Climbing roses of the most robust and hardy types could be utilized and displayed in the same way. The only difficulty in the way is the trouble that would be caused in the establishing of the plants. Any one who cannot devote special pains and attention to the establishing of them, should make no attempt to realise such a thing as we hint at. Both the ash and the elm are notoriously difficult plants to establish anything else near. They are rapacious in their demands on the soil for a long way around the spot on which they stand, and many an excellent cottage garden is ruined by the rapacity of the roots, and by the shade of both these trees. Yet with care and special means, the object we hint at above is perfectly practicable. The first thing to do would be the preparation of a pit at the base of the weeping tree as large as is possible consistent with safety to the tree. This pit must be filled with a rich compost of a lasting kind chiefly of loam. In this compost the clematis or rose should be planted, and only strong plants should be selected for the purpose. The clematis or rose must be trained up the stem with care as the growth extends; and as from its position it is likely to get but a very stinted allowance of water, care must be taken to keep it well supplied with it, and manure water should be frequently given also.

One of the most beautiful of the weepings-elms is that known as elegantissima, a small-leaved variegated sort of great beauty and moderate growth. Besides these there are weeping forms of birch and beech, the former always elegant and beautiful, but by no means often seen, while the latter must be pronounced a somewhat stiff subject. One form of the weeping-birch deserves very special mention on account of its very distinct character. It is the poplar-leaved birch, Betula populifolia). The leaves are larger than those of the common birch, and are deeper green.

ORANGE CULTIVATION IN FLORIDA.

Mr. Consul Cridland, in his report to the Foreign Office on the trade of Pensacola and some of the internal resources of the State of Florida for last year, says that formerly in Florida, as in most of the cotton States, the whole time and attention of the people was engrossed in the cultivation of the cotton plant and the sugarcane. Fruit growing was looked upon rather with contempt, and no value was attached to the wild orange groves in the State, any more than to the same quantity of other timbered lands. In fact, very frequently the wild orange trees were cut down and destroyed to make room for cotton and sugar. Of late years, however, the people of the district named have found out the importance and profits of tropical fruit culture, and the old wild orange trees are highly prized, and are converted into sweet oranges by grafting. The difficulty in regard to orange culture is the impatience for immediate results. The orange, if cultivated from the seed, requires from seven to ten years of attention before it begins to bear; and the lack of patience and confidence deters people from starting an orange grove and persisting in its care. The quality of the Florida orange, and the excellent condition in which it reaches the Northern markets, renders it a most profitable crop. There can be no fear of an over-production of the orange or lemon, when it is considered what a vast country has to be supplied. In 1879, 4,000,000 dollars' worth of oranges and lemons were imported into the United States, and the orange crop of Florida was valued at over 1,000,000 dols. From information lately published, it is probable that the orange crop in Florida this season will be 100,000,000 of oranges, for which the dealers will give the growers 1,500,000 dols. The orange crop will double itself every three or four years; and, considering that the reports to the Governor show that there are over 20,000,000 of trees in the orange groves of Florida, in future years the crop will be enormous and exceedingly profitable, and, if the 20 per cent. *ad valorem* duty continues, will stop the importation of oranges from Sicily, Spain, and the West Indies.

AGRICULTURE IN GREAT BRITAIN.

The Agricultural returns for Great Britain for 1880 have been published and furnish much interesting information, as showing how our mother country stands as an agricultural producer. It may be said that agriculture during the past year has been stationary in Great Britain. The total amount of land in Great Britain, in 1880, returned as under all kinds of crops, bare fallow, and grass was 32,102,000 acres; in Ireland 15,358,000 acres; and in the Isle of Man and Channel Islands, respectively, 97,000, and 30,000 acres. The actual increase in land under cultivation is hard to arrive at from the returns, as their increasing accuracy, year by year shows a greater increase than actually occurs. In 1880, the total area under wheat in Great Britain was 2,909,000 acres, or 19,000 acres, more than last year—the lowest on record—though this year's crop was growing on 591,000 acres less than in 1870. The land under barley beans, peas, shows a diminished acreage this year, while that under oats presents an increase of 5 per cent. over last year, the total acreage now being 2,797,000 acres In green crops, potatoes were planted on 551,000 acres, an increase of 10,000 acres on last year, and nearly equal to the figures of ten years ago. Turnips and swedes show a slight falling off from last year; wangolds a decrease of 6 per cent, cabbage, khol rabi, &c., of 4 per cent.; and vetches lucerne, and other green crops of more than 15 per cent; the present year's figures for crops of these descriptions being less than any year since 1868. The land under flax is less than half what it was ten years ago. Bare fallow, owing probably to the large number of unlet farms, has increased in the present year from 721,000 in 1879 to 812,000 acres; permanent pasture and meadow lands have increased by 260,000 acres since last year, and now amount to 14,427,000, or about 45 per cent. of the cultivated area of Great Britain. That we are giving up corn producing is apparent by the fact that, since 1870 the increase in permanent grass lands has been no less than 2½ million acres. This is what might be expected in a densely populated country, with numerous large towns, which render the feeding of cattle and the supplying of milk, butter, cheese, &c., more profitable than the growing of wheat, which is every year imported in increasing quantities from new countries, such as America and some of our Australasian Colonies. We also find another increase that we might expect, namely, in market gardens. The proportionate acreage of the large and small holdings in Great Britain has undergone little change since 1875, when the last return of them was issued,

and are now as follows:—For Great Britain, the area held in occupations of 50 acres and under, is 15 per cent. of the total; that between 50 and 100 acres, also 15 per cent.; between 100 and 800, 42 per cent.; from 800 to 500, 16 per cent; from 500 to 1,000, 10 per cent., and in farms over 1000 acres, 2 per cent. In England there is a tendency to larger occupations, the small farms of 50 acres and under being now 14 instead of 15 per cent. of the whole acreage, and those between 50 and 300 acres 54 per cent., against 56 per cent. in 1875; while farms over 301 acres amount to 32 per cent., as compared with 29 per cent. in 1875. In Scotland, occupations between 51 and 300 acres are now 59 per cent., against 58 per cent. in 1875; and the moderate-sized farms in Wales have also somewhat increased. Turning to the number of live stock there is again little variation, to notice. Medium-sized holdings (50-300 acres) still have 58 per cent. of the cattle and 50 per cent. of the sheep of Great Britain, and the number of sheep in the small holdings is now 17 per cent., as compared with 18 per cent. in 1875; cattle on the same holdings being still 24 per cent., or nearly a quarter of the whole number.

The agricultural returns give us also some information as to the live stock of Great Britain. We notice that the import of foreign horses is largely falling off, the figures being 26,000 for 1878, 15,000 for 1879, and only 6,600 for the first eight months of the current year. Of horses and cattle, Great Britain has this year 5,912,000, as against 5,856,000 last year; but sheep, through disease, have decreased by nearly a million, and lambs by half a million, the stock now being only 26,619,000. Pigs have also decreased by 91,000 in the past year, and by 483,000 since 1878. American bacon making pig-keeping not so paying an occupation as formerly, and the necessary sanitary regulations as to their being kept in large towns also operating against their increase. In Ireland we find the total cultivated area is this year 15,852,000 acres, as against 15,336,000 last year, and 15,845,000 in 1878. In 1870, the corn crops of Ireland, covered 2,173,000 acres, while now they only occupy 17,666,000 acres. The area under potatoes this year is 22,000 acres less than it was last year and 223,000 acres less than in 1878, a gloomy enough outlook truly, as regards horses and cattle in Ireland, the numbers are pretty much what they were ten years ago, but sheep, which decreased in the year half a million, now only number three and a half million; and pigs, also, which, in conjunction with potatoes, we have always regarded as synonomous with prosperity, have decreased 20 per cent. in the past year, and now number only 849,000 as against 1,072.000 last year, and 1,459,000 in 1870. Turning from these somewhat gloomy home statistics, we find appended a few particulars from the Colonies and the United States. In Australasia there are now 2,750,000 acres of land under wheat, or two and a half times the acreage under this cultivation ten years ago, and within 300,600 acres of the wheat acreage of the United Kingdom; so are our colonies growing. In live stock in Australasia, we have, it is computed, 1,050,000 horses, 7,510,000 horned cattle, 65,400,000 sheep, 810,000, pigs; while the United States possess 11,000,000 horses, 1,750,000 mules, 33,000,000 cattle, 40,500,000 sheep, and 33,500,000 pigs—goodly numbers indeed, and which make our old world figures look small and puny, and which shew us the extraordinary vitality of the new countries,—all, be it noticed, at some time, if not now, English colonies, are peopled by an English-speaking race. The old country, if as some would have us believe, now past the prime of life and in the sear and yellow, has still good cause to be proud of her children even if they have been somewhat unruly.

A NEW METHOD OF WHEAT GROWING.

MAJOR HALLETT, in the current number of the *Nineteenth Century* contributes a startling article under the head of "Our New Wheat-fields at Home." He accepts it as proved that at the present time, and for some years to come, "the cost at which an acre of wheat can be put on ship-board at a port nearer to Liverpool than New York is, will, with freight added, be so low that, under the present system of cultivation in this country (England), it could not profitably be grown here." Major Hallett's article is so thoroughly assured, so confident in tone as to be almost dictatorial; but the remedy he proposes for the British wheat-producer is simple enough, and if as we have no reason to doubt, his data are sound, a new and prosperous era should be opening to the British farmer. The remedy proposed is this: we must produce a greater weight of wheat off a given amount of ground; and the method by which we are to obtain such a desirable result is by "tillering,"—a term which we will endeavour presently to explain. It is a remarkable fact, proved by experiment, that the "number of ears of wheat produced per acre is, in the absence of injurious circumstances, virtually the same," whether the seed be sown profusely or sparsely and in this connexion Major Hallett goes on to remark that at present proper attention is not given to the time at which wheat is sown; the farmer not being so particular as to the season at which he lays this seed in the ground as he is with others, such as turnips, mangolds, &c.; that in fact, the wheat seed is sown when it is convenient, and that the crop thereby suffers to an appreciable extent. We now come to the question of "tillering." An ordinary bushel of wheat contains some 700,000 grains, and a crop of 40 bushels to the acre contains, therefore 28 millions grains per acre, and as Major Halletts tables give him, for this sized crop, 1,306,800 ears per acre, it follows that such ears contain 22 grains each. So much for the present method of planting. "Tillering" is thus described.

"A plant of wheat consists of three principal parts, *viz.*, the roots, the stems, and the ears. The seed-grain having been planted in a proper manner, these are produced thus; shortly after the plant appears above ground it commences to put forth new and distinct stems, upon the first appearance of each of which a corresponding root bud is developed for its support; and while the new stems grow out flat over the surface of the soil, their respective roots are correspondingly developed beneath it. A plant of wheat has been known in this way to cover in May a circle 5 feet 6 inches in diameter, measured from the extremities of the opposite leaves as they lay out flat upon the ground.

"This mode of growth is called 'tillering,' and will continue until the season arrives for the stems to assume an upright growth, when tillering ceases and the whole vital power of the plant is concentrated upon the development of the ears. These will be the finest the plant is capable of producing, unless the growth of its roots has been in any way impeded, as, for instance, by those of adjoining plants, when the size and development of the ears will be found to be proportionately diminished.

"At the Exeter meeting of the British Association for the Advancement of Science of 1869, there were exhibited three plants of wheat, barley, and oats, each from a single grain, with 94, 110, and 87 ears respectively; and even these examples do not represent the *maxima* obtainable."

Now it is proved that a crop of wheat planted on Major Hallett's plan in single grains, 9 inches apart every way, produces as many *ears* per acre as does a crop sown in the ordinary method, and the advantage of the former over the latter method is that, when the plant is allowed to "tiller" an ear contains on the average 60 grains against 22 when planted in the ordinary method; *ergo*, by following Major Hallett's plan we double our crop, or, as he puts it, provide, "New Wheat Fields at Home." The paper is interesting as showing the influence of science on agriculture, and leads us to recognise the great and important fact that, if we see a supply of a commodity failing or likely to fail, we must invoke the aid of science to enable us to either increase that supply by employing new methods or by economising our use of the commodity by new inventions.

AGRICULTURAL EXPERIMENTS NEAR POONA.

(To the Editor of the Times of India.)

SIR,—As the *kharif* crop in a large portion of this presidency, particularly in the neighbourhood of Poona, was a source of great anxiety to the agricultural population this last monsoon, I think that an account of what I personally experienced in the *rôle* of an agriculturist may not be without interest to some of your readers. I cultivated in my own and a friend's compounds some small plots of dry crop land with the view of providing fodder for my animals of kinds. My friend's ground, some three acres in extent, I laid down in kulti, having previously dressed it with some ordinary village manure, principally ashes and stable manure. This crop proved a complete failure, the pulse only attaining the height of a few inches, so when the heavy rain fell at the beginning of October I ploughed the ground up and laid it down jowari as a *rabi* crop. At present this looks well and I am sanguine of the result. With my own land I managed better. One plot about half an acre in extent, was given up to transplanted "Teosinte," (Reana, *Euchlæna luxurians*). As my soil is very deep and black, it requires to be well aired during the time that it is idle, so in the previous December I had ploughed it up and cleaned it thoroughly. At the first appearance of rain in June I put some Reana seed into a bed of moderately manured black earth, and had it hand watered morning and evening. In four days it sprouted well. Towards the end of that month I got some cartloads of Poudrette from the Poona Municipality's works and spread a thin layer of it over the whole of the plot, working it in well with the ordinary two bullock hoe. By the time the ground was ready the Reana had sprung up nearly a foot high, so taking advantage of a cloudy drizzling day, I set men women and children to work, and in about ten hours got it all transplanted at equal distances of 18 inches every way. For the first ten days of July we had more or less light rain, and the young plants got well established. On the 27th July I hand-weeded the ground; in spite of the scarcity of rain during the previous fortnight the crop had continued to grow very fast, but August and the greater part of September proving very dry it had not made much upward growth; still each plant had thrown out many shoots, I counted in some places as many as twenty stalks coming from one seed, and the ground was so well covered with green that I had no more bother with weeds. Towards the middle of September I began to cut it for the cows, directing the gardener to only take off the shoots which were over three feet high, and not to take more than two or three from each stool. He took between 50 and 100lbs. per diem, but hardly made any impression on the field. In the beginning of October we had some heavy showers, as I have mentioned above, and then the Rena grew away from us altogether, and rapidly began to flower while the lower leaves became brown and dry. At first while the stalk was quite soft, cattle, horses, sheep ate every particle up greedily. but as the plant grew stronger, and the cuticle of the stem became harder, they became dainty, and every morning found many pieces of bare stalk left in the mangers, cut up though it was into short lengths. After a little time I noticed that all the brown dry leaves were also rejected, and very often the flower too. From this it seems that although Reana does certainly grow luxuriantly in rainy weather in dry crop soil, and much more so I have observed in irrigated land, yet it will only be of use ordinarily speaking for a short time, this

is as long as it remains tender. It is also evident that in well manured land, when once established, it resists drought successfully, making slow but steady growth.

I also tried the effect of some Reana seed in another plot of ground manured and otherwise prepared as the one I have just written about. Unfortunately I was not able to carry this into effect before the 14th July, and then the rain had well nigh ceased to fall. The seeds sprouted true enough; but only grew a few inches high, and I quite thought that the crop was gone, but in October when the rain reached it, it took a wonderful start, growing to the height of three or four feet, throwing out many shoots and came into flower almost as soon as the first batch. Having some of the Reana corn over, I put it into a seed bed on the 16th July and watered it twice a day, as I had done with the first mentioned lot, intending to transplant it on the first good fall of rain, but for 2½ months that opportunity never came; when it did, it was too late. The plants were put out at the beginning of October, miserable, lanky, sickly things, over two feet high. In a few days they recovered themselves and began to look more promising and of a healthier colour, but this appearance was delusive, for in a short time it began to flower, and my three batches of Reana, each raised under different conditions, and varying in height from eight feet and more in the first plot to three or four in the last, were all in flower at the same time, the latter half of October. I wonder whether this is the regular time for Reana to seed in the Deccan. At present I have left off using this fodder, not being in Poona, but the gardener has been ordered to cut and dry some with the immature seed in it and gather the seed of the remainder, drying the stalks as is usually done with jowari karba, and I shall be able to prove by and by whether the cattle will eat it in that state. It may be that when they can't get green food they will be less dainty. It is always desirable, especially in matters agricultural, to have two strings to one's bow, so on the same day on which I sowed the Reana, in my second plot of ground I got some jowari from the ryot who had just put in his seed in the adjoining field and drilled it into the lower part of my own field, so I had the opportunity of watching the effect of the season on three crops—(1) Reana, (2) Jowari both sown in black soil manured with Poudrette, and (3) Jowari sown in black soil entirely guiltless of manure. None of these crops were ever irrigated or hand watered at any time. The Jowari (2) came up in four days. Jowari (3) and Reana kept alive during the drought and eventually recovered fairly. Jowari (2) came up well and continued to grow steadily but slowly, keeping a good healthy dark green all the time; but as the drought continued I saw my neighbour's crop jowari (3) becoming yellower and yellower, and at last when the October rain fell it was too far gone to recover thoroughly and its outturn in corn and in straw was very poor. My jowari (2) has turned out a bumper in both these respects, also coming into ear very soon. From this experiment my impression is that jowari in well manured dry crop land, especially in a dry season, is more profitable than Reana as it resists drought as well, if not better, and gives good grain and good fodder. At the same time Reana, irrigated or unirrigated, yields for a short time a most valuable fodder, especially so for milch kine. How long this period can be extended remains to be proved. Next monsoon I hope to repeat these experiments, and see whether I remain of the same opinion—how many ryots can afford or obtain expensive manure, and how many can afford to plough up a failing crop and put in another?—Yours truly,

J. COUSSMAKER, Major,
Revenue Survey.

The Districts, Nov 20.

MEDICINAL PLANTS IN AFGHANISTAN.

In the Hariab district large quantities of gum exude from the stems of the apricot tree, which is collected and eaten.

The berries of *Ribes orientale*, the fruit of *Rhamnus dahuricus*, the roots of *Daphne oleoides*, when boiled, and the dried root of *Euphorbia* sp. are all employed as purgatives, being more or less common household remedies. The last goes by the name of vomit-weed, and is also used for that purpose. The fresh milk from its leaves blisters the hand when collecting it.

For local applications the castor-oil plant is cultivated in the gardens at Kurrum for the sake of its leaves, which are employed in poultices. The roots of two species of *Arnebia*, *viz.*, *A. endochroma* and *A. speciosa*, are used to relieve toothache and earache. The gum-resin which exudes from the flowering stems of *Ferula Jaeschkiana* is applied to wounds and bruises. At Alektrel a native brought me the stems of a plant, which he said was a rare and valuable medicine called "Mam-i-ran." On examination it proved to belong to some species of geranium, probably *G. Wallichianum*. This no doubt, is a local substitute for the true Mam-i-ran, *viz.*, the root of *Coptis Teeta*, Wall.

The rootstocks of *Valeriana Wallichii* are collected and sent to Gandamak for export to India, to be used as a perfume.

The juice of the leaves of *Delphinium Brunonianum* is employed to destroy ticks in animals, but chiefly when they affect sheep.

The ashes obtained by burning branches of *Ephedra* are mixed with tobacco for the purpose of chewing, or with snuff to intensify its action, and the dried and powdered leaves of *Rhodendron Collettianum* as snuff.

The following plants are known to be poisonous to the natives, *viz.*, *Datura*, *Hyoscyamus*, *Cannabis*, *Atropa lutescens*, and *Solanum Dulcamara*, and, as already mentioned, one of the three weeds found amongst wheat, *viz.*, rye, wild oats or *Lolium*, *Cannabis sativa*, is known by the natives to yield an intoxicating drug, though not employed by them.

The plants poisonous to animals are:—*Stipa sibirica*, a very common grass under the shade of trees and in their vicinity near Shalizan and similar localities; its poisonous qualities are recognised by the cattle of the country which never touch it: *Rhododendron Afghanicum* is poisonous to goats and sheep.

As far as my observations have gone no oil-seeds are cultivated, nor is any oil extracted from the kernels of the apricot or walnut. The only substance in the country which the natives call oil is a crude tar obtained by distillation from the roots of a conifer. Splinters from the green wood of *Pinus excelsa*, or portions from the roots of *P. Gerardiana*, are employed in place of lights, the pieces of the roots going by the name of *Chiragh*; meaning "lamp." In lieu of vegetable oils for food the melted fat of the large-tailed sheep is used.

The tears of resin exuding from the bark of *Pinus excelsa* and the leaves of *P. Gerardiana* are collected and used for various purposes.

The large roots of *Saponaria Griffithii* are collected and employed as soap for washing purposes, and are called Zaunah. It is one of the few herbs that grow under pine trees.

The *Isatis tinctoria* (is largely used as a local dye; its native name means the dye plant at the Mussulman festival of the Id, at which hard boiled eggs are indispensable, the roots of *Runbia Kotschyi*, Boiss, are employed to give them a bright red colour.

Prunus amygdalus, Baill, is said to be quite common by the natives, and well known to them; called by the same native name as the cultivated almond *badam*. The fruit is not eaten. The stems are employed as rods to carry in the hand by the priests, but are not used as we do walking sticks; they are considered more or less holy. In orchards a tree or two of the almond may exist, but I never saw it, nor is it cultivated to my knowledge in the Kurrum Valley.

The potato was not cultivated in the Kurrum Valley previous to 1879. It has been grown during the past year.—*Chemist and Druggist.*

CURIOSITIES OF BOTANICAL ENTERPRISE.

It is a recognised fact that no country in the world has an institution of at once as national, scientific, medicinal, commercial, agricultural, and horticultural a nature as are our famous Kew Gardens. In its herbarium may be seen the dried and beautifully prepared leaf of almost every known plant. Not hidden away in closed cases, but displayed and fully explained to the sight-seeing public of the world. Every plant that is known too to have useful application, is grown for the purpose of distribution throughout India and the Colonies; but a vast establishment such as this is, can be supported by the Government, and directed successfully by the best scientists and botanists of the age. Every planter turns to Kew directly or indirectly for help and instruction, and may feel sure that his modest request to be enlightened upon the ravages of a caterpillar, will receive as much attention and consideration as will the queries of a learned Director of one of our large Colonial gardens. Kew has done much to dissipate error, and has done her best to spread botanical knowledge, has distributed plants with lavish generosity, has sent traveller commissioners to the four corners of the earth, to the plains of the tropics, or the coldest zone of vegetation for some tiny flower or leaf that is, perhaps, a missing link in the chain of knowledge; but even Kew's great establishment is not omnipotent, and the world is a very difficult one to convince even though the great power chemistry has lately permanently engaged agriculture as her satellite. It is curious to say how often the light of science has been darkened by local obstruction or indifference. At St. Helena it is a fact that cinchona will not die; struggling against neglect and through tangled undergrowth, it had proclaimed itself as one of the hardiest trees, yet these rock scorpions prefer their New Zeland flax, and their cinchona is unnoticed and uncared for. In Trinidad, too, where this cultivation promised well, according to the report of Mr. Thyselton Dyer "nothing has been heard of cinchona lately, and the report is that it will not grow in Trinidad," this is hardly likely in the face of Mr. Morris' hopeful prophecies regarding its cultivation in Jamaica. In Java, too, a curious mistake is their determination to introduce a worthless species known as *pahudiana* which has done inestimable harm to this country's reputation as a cinchona grower. Looking nearer home, we might now wonder, why our own planters so largely planted *Succirubra*, when *Condaminea* and *Pubescens* were only to be known, to be found hardier, bigger, and of richer quality.

The great tea industry in India almost died at its commencement in the fierce controversy as to whether indigenous or China variety should be grown, and after years of fruitless dicussion, the mistake was perfected, and China tea was introduced to the great deterioration of the soft and delicate indigenous leaf. Another curious instance of conservatism that carries a lesson with it, is the determined way in which our planters of old, set their faces against any new cultivation, and swore by coffee *Arabica*, although every now and again a scientific croak from the learned one at Peradeniya warned them 'not to be greedy.' Why was not cinchona introduced years ago, and indeed why was not cacoa generally extended, when some fifteen years ago it was a visible success under the patriarch Tytler? How is it that the kernel palm and Liberian coffee were allowed to be monopolised by the negroes of the West Coast? The palms are especially remunerative and thrive luxuriantly in our low

country soil, while Liberian coffee has long ceased to be an experiment. Then regarding manufactures, how is that our Ceylon teas have been sent home so badly made that the teas, undoubtedly of fine flavour, have steadily been selling from 6*d.* to 8*d.* a lb., when it should be worth double the price of its interior China rival, and why was cinchona bark so improperly cured in the first shipments, that no London buyer would look at it; and last not least, why did we all so blindly believe that Mr. Morris had in a few months, effectually discovered the cause, life, result, and cure for leaf disease, and thus bring down bitter disappointment upon our devoted heads. All over the world mistakes mostly unavoidable, but sometimes wilful have been made in agriculture; some times brought about by following the tinkle of the bell that was on the wrong track. Well at last we have the grim consolation, *experientia docet*, and we have Kew to fall back upon; where we may learn the smallest details of cultivation, and the grandest facts of plant life. If under these circumstances the British botanical enterprise does not advance, it can only be that the British Empire itself refuses to.

ROYAL BOTANIC GARDENS, CEYLON.

THE following is the report of the Director of the Royal Botanic Gardens of Peradeniya, Hakgala, and Henaratgoda, for 1879:—

The buildings of the establishment are in very fair condition; some repairs of an unimportant character only being necessary as regards the Herbarium building and some of the smaller offices.

The road, which was under repair, as mentioned in my last annual report has been completed with the exception of some boating which will be desirable when labour can be spared for the purpose. The remainder of the roads and the walks in the garden are in good available order.

The alteration which I requested might be made in the piping bringing the supply of water into the garden, has recently been carried out, and thus a considerable area or ground can now be irrigated and made available for the construction of a scientifically arranged botanical garden, as well as for experimental purposes. It will now be possible to keep the small lake in the garden always full of water for the cultivation of interesting aquatic plants.

This department has been furnished by the Surveyor-General during the year with plans of this garden, as well as of the Hakgala and Henaratgoda gardens.

The Hakgala Superintendent reports to me that a little more work is still required for putting the arrangements for the water-supply at Hakgala into thoroughly good order.

COFFEE.—In my letters to this Government on the subject of the coffee-leaf disease since my last report, I have given my latest views on the subject and as these letters were published as Sessional Papers and have also appeared in the local newspapers, it will not be necessary for me to refer further to the subject.

Through the kind exertions of his Excellency the Governor, a considerable supply of seed coffee from the West Indies has been furnished to this establishment. These seeds have in nearly every case germinated most freely, and have produced nice healthy-looking young plants which will soon be ready for planting out. Up to the present time there has been but a very slight appearance of the leaf-disease, and it is to be hoped that this dreadful pest will not show itself to any serious extent upon this newly introduced coffee.

Liberian Coffee.—This coffee is now being very extensively cultivated in the hotter districts of Ceylon, and although it suffers to some extent from the attacks of the leaf-disease, it is hoped that this handsome species of coffee will prove a profitable investment.

Cinchona.—This cultivation has made immense progress on the hills during the last few years, and it would appear to be in many cases highly remunerative.

It will be remembered how large was the distribution of *cinchona succirubra* and of *C. officinalis* during the past few years, and how considerable the amount realised for the Government from the sales at the Hakgala garden. This selling of the plants and seeds of these two above-named species being found to be very remunerative, and the demands continuing, the planters themselves have directed their attention to supplying these demands from their own estates. It has therefore been considered most desirable that the Superintendent of the Hakgala garden should be instructed to direct his efforts particularly to the cultivation of the much esteemed *cinchona calisaya* and *C. ledgeriana* for future distribution of seeds and plants of these valuable kinds. It is interesting to know that *C. ledgeriana* grows tolerably fairly at the elevation of Peradeniya, though there is little doubt that its profitable cultivation would require a somewhat greater altitude.

Tea.—The tea enterprise continues to increase largely. Supplies of seeds for distribution are still being kept up at Peradenyia and at Hakgala to meet any demands for them which may arise.

Chocolate.—The cultivation, now a favourite one is becoming very widely spread throughout the hotter parts of the island, and bids fair to become a very profitable speculation. There is a large demand for seeds for sowing, and this demand is partly supplied from the Peradenya and Henaratgoda botanical gardens. Some enterprising planters are making arrangements for importing some of the most esteemed varieties of cacao plants from the West Indies.

Rubber-plants.—Besides sending small supplies to British India, a moderate distribution of what could be spared of *Hevea Brasiliensis* and *Manihot-glaziovii*, has been made to some planters in this island who were desirous of trying the different kinds of rubber plants on their estates. The *Manihot Glasiovii* continues to furnish ripe seeds in considerable abundance from the trees here, but although the *Hevea* and *Castilloa* plants are growing most vigorously here and at Henaratgoda, they shew no signs yet of flowering.

Mahogany.—A very considerable supply of seeds of this valuable tree has been received during the year from Jamaica. These seeds arrived in excellent condition for germinating, and a large number of young plants raised from them are growing here, and are ready for distribution to those applying for them. To the Government Agents of those provinces suitable for the cultivation of the tree have been sent, supplies of seeds with instructions as to the best mode of raising them. Some seeds have also been forwarded to the conservators of forests and others in India and elsewhere. The few old trees which are growing in this island produce seeds very sparingly indeed, so that supplies of seed from elsewhere are very acceptable from time to time. In this garden, unfortunately, the mahogany trees are liable to the attack, periodically, of a *lepidopterous* borer which checks the growth of the young shoots and consequently of the tree itself, materially.

Ipecacuanha.—Experiments in the cultivation of this valuable medicinal plant are still being continued in the Henaratgoda garden, but it must be some time before any large produce of the drug can be gathered owing to the small size of the plant and its slow growth.

Cardamoms.—Growing rhizomas are being kept up here and at Henaratgoda for sending out to applicants; but it would seem that many of the planters have now on their own estates plants to spare for disposal.

Cinnamon.—There is still a considerable demand for fresh ripe seeds at the proper time for collecting them from the trees. It must now be well known that these seeds should be sown as soon as gathered if required for germinating.

Vanilla.—Cuttings can always be supplied to those desirous of cultivating this at times very valuable plant.

Useful and ornamental trees, and flowering shrubs and herbaceous plants have been largely distributed during the year. Vegetable and flower seeds have been kept in supply as usual for the frequent application made for them.

The preliminary list of plants, &c., growing in the garden—prepared by Mr. Morris—has been printed by the Government Printer, and a considerable number of copies distributed at a charge of 12 cents. each.

The usual interchanges of plants and seeds have been made with similar botanical establishments in other parts of the world as in previous years; and contributions have been received from the Royal Botanic Gardens of Kew, St. Petersburg, Calcutta, Java, Jamaica, Singapore, and Sydney: the Acclimatisation Society of Queensland; Dr. Kirk, Consul-General of Zanzibar; the Hon'ble Mr. Leechman, and other gentlemen residing in the island.

The expenditure during the year for the several gardens of Peradeniya, Hakgala, Henaratgoda, and the Pavilion has been Rs. 32,656 and 42 cents. The receipts for sales have been Rs. 3,825 and 38 cents.

Royal Botanic Garden, Peradeniya, 18th February 1880.

G. H. K. THWAITES, DIRECTOR.

USEFUL PLANTS OF THE YUCCA FAMILY.

YUCCA BACCATA is one of the most useful plants to the Indians of New Mexico, Arizona, and Southern California. Its fruit is eaten while fresh and in a dry state. It grows from two to eighteen feet in height, and becomes a tall tree further southward, varying in diameter from eight to twenty inches. The bodies of these plants are very fibrous. Indians and Mexicans, when in want of soap, cut the stems into slices, beat them into a pulp, and mix them with water as a substitute for soap, for which it answers well. The leaves are generally about two feet in length and very fibrous. In order to remove the bast, the leaves are first soaked in water, then pounded with a wooden mallet, at the same time occasionally plunged into water to remove the liberated epidermis. Then if not sufficiently clean and white, it is returned to the water for a time, and again put through the beating process; generally the second course is sufficient. The fibres of the leaves being strong, long, and durable, are adapted for Indian manufactures; those of Southern California make with them excellent horse blankets, while all the tribes living in the country where the plant is found, use it to make ropes, nets, hair brushes, shoes, and mattresses. The plant so fibrous and so abundant, on land utterly worthless for the growth of anything more valuable, can be had for the gathering, and seems to offer a valuable material for paper manufacture. Another species, *Y. brevifolia*, while not so useful for Indian purposes, also affords a good raw material for paper. Vast tracts are covered with it, which assume a forest-like appearance about the Mojave river, Southern California. The plant produces an abundance of large seeds, which contain much nutrition, they are ground fine, and either eaten raw or cooked in the form of mush by Southern Californian Indians. The leaves of *Y. Whipplei* yield a very soft white fibre, capable of being made into a good thread. Indians use this fibre to form a padding to their horse blankets; the young flowering stems while in their tender condition are either eaten raw or roasted; the seeds are ground into flour and eaten. This plant in bloom is one of the finest garden ornaments, very common over most parts of California. Finally, the leaves of *Y. angustifolia*, which is very common in Utah and Arizona, yield the finest fibre of any of the *Yuccas*, and like all of them is

adapted to manufacturing purposes. The young flowering stems are used by the Indians after the manner of asparagus, and eaten raw or cooked, are not to be despised. The root, pounded up, is employed as a substitute for soap.—*Dr. E. Palmer.*

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday, the 25th November 1880.

W. H. COGSWELL, Esq., V.P., *in the Chair.*

THE Proceedings of the last (September) meeting were read and confirmed.

The following were elected Members :—

The Maharajah of Chirkaree, Bundelcund; the Manager of the Tarapore Tea Co., Burtall Division; and Mr. James Strachan, C.E., Kurrachee.

The names of the following were submitted for Membership :—

His Highness the Maharajah of Travancore,—proposed by the Rajah Suttyanund Ghosal, Bahadoor, seconded by Baboo Peary Chand Mittra.

M. G. Stewart, Esq., Merchant, Calcutta,—proposed by Mr. W. H. Cogswell, seconded by Mr. W. Stalkartt.

A. B. Kellie, Esq., Manager Singtom Tea Garden, Darjeeling,—proposed by Mr. W. S. Creswell, seconded by the Secretary.

C. H. Pillans, Esq., Tea Planter, Phoolbarrie, Silligoorie,—proposed by Mr. G. L. Kemp, seconded by the Secretary

Rejoined.—Dr. R. H. Perkins, Jubbulpore.

The following Gentleman was proposed, on the recommendation of the Council, as an Honorary Member :—

Captain J. F. Pogson, Simla.

CONTRIBUTIONS.

List of Articles from Bengal to the Melbourne Exhibition of 1880. From the Compiler.

A plant of *Croton Kingii.* From Mr. G. Bartlett.

Seed of *Doryanthes Palmeri.* From L. A. Bernays, Esq.

A small collection of Orchids from Sylhet. From C. K. Hudson, Esq.

GARDEN.

A report from the Garden Committee was read and agreed to. The Committee propose the erection on the west side, and contiguous to the Superintendent's house, of a substantial iron house, at a cost not exceeding one thousand rupees, for the proper display and safety of orchids, begonias, ferns, aroids, crotons of rarer kinds, &c.; and the removal of the *cutcha* shed to the south of the house, which is now appropriated principally for orchids, as it is an insecure position. "This recommendation"—the Committee observe "is quite independent of that made some time ago, for an ornamental structure in a more open part of the grounds, which they would still much wish to see carried out, if any wealthy native gentleman would give the necessary amount; the house being called after his name, as is the case in the Zoological Garden houses." The Committee next recommend some further expenditure for the purchase of certain plants of which the stock is limited, and which are generally in request. They allude to the present establishment and to the cost thereof; and introduce a few details in respect to stock, &c. They close their report with the following remarks :—

"*Manures.*—A large quantity has already been collected during the past six weeks, and further supplies are being obtained without cost to the Society, except that of cartage. The Committee propose very shortly to call Mr. Kiernander's attention to the subject-matter of their previous reports of March and April last, in connection with the Resolution of the Government of India, (Agricultural Department) under date, the 27th February 1880. The suggestions of the Committee were not carried out last rainy season, partly for want of the necessary material in shape of manures, partly to the attention of the Society having been called to the subject by the Government of Bengal, rather too late in the year, and partly to other causes."

ALOE FIBRE.

Submitted the following letter from Mr. C. S. Faddy, District Engineer, Hushiarpur, Punjab, and report on the fibre therein referred to :—

"I am sending you by to-day's post a small parcel containing

(I) Sample of Fibre.

(II) Sample of Fibre.

(III) A small length of rope. And shall feel obliged by your kindly favouring me with an opinion as to whether the fibre could obtain any value as an article of commerce in the Indian or Home markets. The plant from which this fibre is produced, grows freely all over Northern India, but no use is ever made of it by the natives. I also send a small quantity of combings suitable perhaps for tow or paper fabric."

Mr. W. H. Cogswell, a Member of the Fibre Committee, gives the following report on the above samples, Mr. S. H. Robinson, concurring :—

"With reference to the samples herewith alluded to in the foregoing memorandum, I beg to observe that the washed and heckled fibre prepared from the "Agave Americana" or common aloe is about the best I have seen being beautifully clean and well freed from the bark or outer skin of the plant, of good color, there being but a very slight tinge of greenish, which it is impossible to thoroughly eradicate without extra steeping, or the addition of chemicals, to the injury of the fibre; it is of very great length and fair strength and a really good commercial commodity, its value to-day being about eight rupees a bazaar maund."

"The sample unheckled I would value at about one rupee a maund less."

"The sample of combings, generally known as tow, could be used in this country for paper-making only, its value as such being about three rupees a maund, but in England, when spinning machinery can be applied to it, a good yarn might be produced. As a product for shipment thereto it is of greater value than being consumed locally for paper-making. For the latter, I am of opinion, it is too good and costly, a jute tow, and such like fibres, are so cheap and plentiful in this market."

ON THE INTRODUCTION OF CERTAIN FOOD GRAINS IN THE HIMALAYA.

The following extracts of a letter from Captain J. F. Pogson, dated Koteghur, 12th November, were next submitted :—

It may interest the Agri-Horticultural Society to know, that the Moravain Missionaries at Keelong, in Lahoul, are very successfully cultivating Rye, (*Secale Cereale*) in that most out of the way portion of British territory. The Rev. Mr. Hyde, was here in October, and stated that some seed Rye, was sent him in a letter from Germany, which was sown, grown, and harvested, and by several annual resowings of the produce, this new and valuable cereal has been fully established in Lahoul, so, to these Missionaries belongs the credit of doing a most useful thing, whilst we have not got beyond the writing stage. Perhaps Himalayan Tea planters will now be induced to import seed Rye, and cultivate this cereal, next year. Mr. Hyde mentioned the Quinoa seed [*Chenopodium quinoa*] sent him by the late Sir Donald Macleod and said, that the crop was harvested at maturity. The people did not fancy it as a food grain, nor do they care much for Rye. The Quinoa he held would grow best in a tropical portion of the Himalayas, Lahool being beyond the tropics and having a spring and summer very much resembling that of Canada.

You may remember that I suggested this food grain should be tried in the high ranges of hills north of Simla, at and above elevations of eight to ten thousand feet of altitude above the sea level. Thus Mount Huttoo and the Upper parts of Narkunda would have produced good crops of Quinoa. Practically speaking the experiment was so managed as to ensure failure.

I have promised Mr. Hyde, seeds of Maize, and "Maha kuddoo" and shall be much obliged if you will in due season let me have at least 100 picked seed of the pumpkin in question. Mr. Manikin, Forest Officer and Assistant Superintendent Hill States, wishes to introduce it into Kilba, and Nachar in Kunawar, and Rev. Pagel wants it for his Mission Station in Pu, in a Thibetian Pergunnah, belonging to the State of Busahir.

On the banks of the Sutledge at Kapoo the "*Sambadai* Zemindar, was supplied by me with acclimatized American Maize seed and "Maha kuddoo." The man was so pleased with his abundant maize crop, that he has preserved all the cobs for next year's sowing, and other zemindars have done the same. Now as Cuzco maize of kinds, red included, has been successfully grown at Kapoo. I have reason to believe that the very large seeded Cuzco maize grown by Colonel Chamberlain, at Ranikhet, and myself at Simla, will answer at Kapoo; therefore, if you can secure me some of this seed I will get the zemindar to cultivate it. The *kuddoo*, also flourished, and as it would have required four Paharees, to bring the largest one up hill to Kotgurh my leave was asked, as to incurring the charge, and as paying a rupee to look at a pumpkin was not necessary, I was satisfied with the description, "length 3 feet, width 1½ cubits (27 inches) weight a load for 4 men which may be called 120 seers, or 3 maunds. From Nirit 9 miles *en route* from this to Rampore, another monster pumpkin was reported. So the valley of the Sutledge agrees with the pumpkin.

I hope those who have tried their cultivation in the plains have been as, if not more, successful.

When it comes to hand I should like to obtain one or two oz. of the so called wheat rice, or more if it can be spared, as I will send some to Lahoul, (Keelong) and Pu.

In reference to the Quinoa as mentioned by Captain Pogson, the Secretary called attention to the following particulars from the *Treasury of Botany* :—

"The species to which the greatest interest attaches is, however, C. Quinoa, indigenous to the Pacific slopes of the Andes, where it is largely cultivated in Peru and Chili for the sake of its seeds, which are extensively used as an article of food. They are prepared either by boiling in water like rice or oatmeal, a kind of gruel being the result, which is seasoned with the chili, pepper and other condiments; or the grains or slightly roasted like Coffee, boiled in water and strained, the Brown coloured broth thus prepared being seasoned as in the first process. This second preparation is called 'Carapulque,' and is said to be a favourite dish with the ladies of Simla.

However prepared, the Quinoa is unpalatable to strangers, though it is propably a nutritious article of food from the amount of albumen it contains. Two varieties are cultivated, one producing very pale seeds called the white, which is that employed as food, and a dark red fruited one called the Red-quinoa. A sweetened decoction of the seeds of the latter is used medicinally as an application to sores and bruises, and cataplasms are also made from it."

Agreed—That the major portion of the fine maize from Nepaul, recently presented by Mr. Girdlestone be forwarded to Captain Pogson for trial.

CROCODILE OIL.

The Secretary drew attention to the following extracts of letters from Messrs. J. Purcell, of Allahabad and J. M. Keane, of Agra, in reference to the letter from the Eglinton Chemical Company of Glasgow, which was read at the August Meeting :—

Mr. Purcell.—"I am in receipt of your favors, dated 13th July and 17th instant, and am sorry I have no oil (crocodile) with me that I could send you for the firm in Scotland.

"In December last I had a very large quantity of Crocodile oil at Agra. I sent a bottle full as samples to several firms when I sent you some, but have received no favourable reply, and as also that of Dr. K. L. Dey being unfavorable, I gave the oil away to the native leather curers and servants, the latter used it for months for lighting purposes, and it showed a fine clear bright light. While at Mussoorie in October or November last, I also received a pamphlet from some chemical firm either from England or Scotland I am not certain, but being about to leave for the plain I mislaid it or lost it."

"At present the river is high, but about December next, I might be able to send you some oil say a 5 gallon Kerosine oil can. Had Dr. Dey's report been favourable, I could have sent you as much oil as the firm would have required.

Mr. Keane.—"I am in receipt of your favor of the 7th instant. The Crocodile oil can only be procured in small quantities from the Sansis in the Punjab. If the Glasgow firm who wish to obtain it would pay my passage to Lahore and back, I would be happy to take a trip there and obtain as much as I could for them, but it would I think be better for them to start a factory for it somewhere here or the Punjab as they could then depend upon its purity and in conjunction with it the skins might be roughly tanned and exported to Glasgow as it makes excellent fishermen's boots, but of course it would need capital. I would be happy to undertake its management if they are inclined to speculate in it."

Resolved—That a copy of this day's proceedings be sent to the Glasgow Company for their information and for such steps as they may desire to take.

RAVAGES OF THE WHITE ANT ON TEA ESTATES.

Read a letter from Messrs. Octavius Steel & Co., intimating that the white ants are causing some of the managers of their tea estates much annoyance and even anxiety, that they have not succeeded as yet in finding any effectual means of killing them off, though they have with much perseverance tried lime, kerosine oil, charcoal, and other supposed remedies without any permanent effect; and requesting to be informed of any other suggested treatment likely to check, if not stop entirely their ravages.

The following is copy of reply to the above application:—

"The subject of the distruction caused by White Ants on living plants, and inanimate objects, has been frequently before the Society at various times, and certain remedies for their removal have been suggested, but apparently with little or no effect. I may, however, mention that many years ago these insects caused much depredation on plots of sugarcane of foreign kinds in the Society's garden. Various supposed remedies were ineffectually tried, but only one had any real effect, and that was mustard cake. This was applied in the first instance, simply as a manure for the cane; but it had quite unexpectedly the effect of introducing the red ant largely into the plantation, and these completely destroyed their white brethren; so much so indeed that we were not troubled again by the latter.

"I would recommend this being attempted in your tea gardens; besides a constant hoeing round about the roots of the plants which may assist towards the exterpation of this formidable pest."

The usual Monthly General Meeting was held on Thursday, the 16th December 1880.

W. H. COGSWELL, V. P., *in the Chair*.

THE poceedings of the last meeting were read and confirmed.

The following were elected Ordinarry Members:—

His Highness the Maharajah of Travancore, Messrs. M. G. Stewart, A. B. Kellie, and C. H. Pillans.

Honorary Member.—Captain J. F. Pogson.

CONTRIBUTIONS.

1. Report on the progress and condition of the Royal Gardens at Kew for 1879. From the Director.

2. Memoirs of the Geological Survey of India, Palæontologia Indica, Ser. XI. Parts 1 2. From the Director.

3. Transactions of the Asiatic Society of Japan, Vol. 8, Part 3. From the Society.

4. Journal of the Asiatic Society of Bengal, Part 1, No. 3. 1880. From the Society.

It is agreed, on the recommendation of the Council that orders for vegetable seeds from England and America, similar to those for 1880, be given for next year. Further, that as the flower seeds have not been favourably reported on by several Members, nor by the Garden Superintendent, that the orders be distributed to several seedsmen in England and the Continent. The season in England for 1879, was very unfavourable for the gathering of flower seeds.

It was further agreed that an exhibition of vegetables and fruits be held in the Town Hall on Thursday, the 20th of January and of flowers in the Garden on Thursday, the 3rd of February.

The Secretary reported that a large consignment of Rose plants from Mr. W. Bull, had been recently received in excellent condition, only one out of 400 plants having been found dead on opening the box.

Letters were read from the Government of the Punjab applying for a large quantity of seed of *Reana luxurians* for sowing along the banks of cannals in the Baree Doab and Western Jumna Circles and for cotton seed of the Bamieh variety.

The Secretary reported that he had been able to comply partially with the request for Reana seed, but that no cotton seed was available.

From Messrs. Peel Jacob and Co., applying on behalf of correspondent in Cochin China, for full information in respect to the culture and manufacture of Jute.

The Secretary intimated that he had been able to meet this request through the kindness of the Chairman. *Agreed*, that the valuable information now given be printed in the next number of the Journal for general information.

MINERALOGY.

THE production of petroleum last year in America exceeded that of any previous year by about 5 million barrels. Nearly twenty million barrels of the crude oil were extracted. The number of new wells drilled amounted to 3,038 about the same as in previous years; but a smaller percentage of them proved to be dry or worthless, only about six per cent. as against eleven per cent. in 1878. The exports exceeded the shipments in 1878 by nearly two and a quarter million of barrels; the stock accumulated at Pennsylvania on January 1st, 1880, was 7,404,908 barrels, being an increase in the year of 3,855,191 barrels. All this looks favorable for the continuance of low prices of the refined oil all over the world, whilst it is of course not so favorable for the prospect of the produce of the wells in Upper Burmah and those recently discovered in Arracan.

THE Directors of the Indian Phœnix Gold Mining Company notify that the explorations made on the Phœnix estate by Captain Giffard, the mining engineer of the Indian Glenrock Gold Mining Company, have resulted in a very satisfactory exhibition of gold in the reef examined, which he describes as six feet wide. The Directors have secured the services of Mr. Daniel Grove, late President to both the mining boards of Bendigo, Victoria, and the Thames Goldfields, New Zealand, who left England last week to proceed direct to the Wynaad for that purpose. We also learn from the home papers that eight bags of quartz, taken from the South-East Wynaad estates were forwarded to Messrs. Johnson, Matthey & Co., whose assay shows an average of 60 oz. 9 dwts. per ton, inclusive of the Bolingbroke leader. Further certificates from the same firm and from the Royal School of Mines give the assay of leaders on the Elizabeth estate 8 oz. per ton, and on the Needlerock estate of 60 oz. and 608 oz. per ton.

THE (London) *Statesman* writes on the subject of India gold mining:—

Mr. Brough Smyth, who has returned from India within the last month, is understood to have brought with him reports concerning the gold fields of Southern India of a somewhat sensational character. Remembering how important it is to the people of India that we should lighten the burden of our Home charges upon their industry, and that the State is the great owner of the soil, we might have hoped that the Government would long ere this have ascertained for itself beyond cavil what the true value of this ancient gold fields has become, under modern processes, for extracting the metal from the soils in which it is imbedded. Mr. Smyth's "prospecting" has been confined, we believe to the Wynaad district, an elevated plateau of land lying midway between the Neilgherry Hills and the Malabar Coast. The gold fields of Mysore are declared greatly to exceed those of the Wynaad in richness of yield, and it is in the Colar district of Mysore, we believe, that the Madras Gold Mining Company (Arbuthnot & Co.) and the Mysore Gold Company have opened their "workings." The mining rights in the whole of this Colar district have been leased with doubtful propriety, we should think, to a body of private *concessionaires*, under whose "grants" these companies are "working." A recent prospectus of the Colar Gold Mining Company tells us that "from accounts and reports submitted to the *concessionaires*, 17 tons of stone raised (on the Ooregum block) from a depth of about 18 feet, and treated (with machinery not of the best), yielded 40½ ounces of gold, and again from a different though adjacent lode 9 tons gave 27½ ounces." If these reports are reliable, and gold is really to be obtained from the quartz in these quantities by the modern processes of crushing, the value of these fields must be enormous. It is a proof, we think, of the apathy with which we administer India that the Government shows no adequate sign of being conscious of what these reports mean. If these reports are reliable, instead of conceding "mining rignts" at nominal rates to parties, the State itself should work the mines in the interest of the people, and realise its Home charges, or a part of them, if possible, in this way. The attention of the Government cannot be too soon directed to this subject. Under the ascendency of Sir Bartle Frere, the Government of Lord Canning, twenty years ago, alienated in perpetuity to a body of mere land-jobbers the finest tea lands in Assam at nominal prices, with a pledge never to impose a land-tax upon them! The same folly will be repeated with these gold fields, apparently, from sheer want of insight into what their discovery means. The facts should be ascertained beyond dispute, and private concessions stopped instantly, if the workings are found to be as valuable as they are now declared to be as the State should work them.

THE WYNAAD GOLD FIELDS.

I HAVE inspected altogether twelve estates some very minutely, and all critically. I have not, however, visited every gold district of Wynaad, nor even all those of greatest public interest. A good deal of animus and scepticism has been shown in the criticism of the Indian gold movement. Outside Wynaad the Indian gold fields are spoken of by some as a myth and a "hum," got up for an occasion; it has been ramoured that Austra-

lian quartz has been brought into the country with intent not the most honourable; it has been confidently stated that the people in the gold district do not believe in the affair; all kinds of hostile sayings have been current about it; and high officialdom knowing nothing whatever about the matter, has consigned it to the limbo of all Indian rubbish. Those who visit Wynaad may be shown reefs of two to fourteen feet in width, having outcrops plainly indicated by large masses and boulders coursing in a line down the sides of hills. They can see fragments, and boulders of quartz of varying size and quality scattered about in all directions. They can be shown numerous specimens gathered in the country containing specks and small pieces of fine gold. They can have sands and soils washed before their own eyes and yielding weighable gold. They can see places from which specimens have been sent to analysts of reputation, and they can see the written or printed certificates, showing sometimes the modest yield of two or four pennyweights to the ton, sometimes the brilliant averages of one hundred to eight hundred ounces. As to the rumour concerning the importation of Australian quartz into Wynaad, I am at a loss to account for it. It may, indeed, have arisen from a distorted version of a trick, regarded here as a mere hoax, which was practised on Mr. Brough Smyth during his examination of the country. Some picked specimens were taken from Devala and carefully deposited on a property near Vellirimulla. That gentleman, however was not to be deceived by fictitious appearances as will be seen from his report on the matter. One thing favourable to mining in Wynaad is the conformation of the country. In most districts where reefs have been discovered the hills rise at least 250 feet above the water-levels of their adjacent valleys, and in many places near the edge of the plateau they reach as much as 1,000 and 1,500 feet. For this reason pumping—one of the most expensive items in mining—will seldom be necessary at first, and in certain cases not at all. Moreover it will seldom be necessary to sink vertical shafts for other than ventilating purposes. The expenses of hauling mineral up vertical shafts opening on hill tops, and of wheeling it along horizontal levels opening out at the hillsides often bear a proportion to each other of no less than six to one. So that the advantage of having mountainous country in which to mine is obvious. Timber and water, as I mentioned in my last letter are plentiful. The question of labour is of great importance. It is not enough to dispose of it by saying that "labour is cheap from 4 to 5 annas a day." In the first place the labour obtainable at that price is of very little value in mining; and in the second place most of the labour is fluctuating. It is not indigenous, but has to be imported from Mysore and the coast. The labours are exceedingly independent and work only when they please. They come to Wynaad when it suits them, and having collected together a few rupees, return to their own countries either to cultivate their land or spend their money in idleness. One company has disposed in a summary way of the whole labour difficulty by sending to China for 300 Chinamen. This, however, is a venture, the success of which is by no means certain. I have said, and I say it again, that there are estates in Wynaad, which so far as mere surface appearances indicate give great promise as mining properties. There are others, however, which give but little promise. Nevertheless in judging from surface indications one can never arrive at certainties; indeed, in pronouncing on reefs at all it is as well to bear in mind that there is nothing so certain of them as uncertainty. The reef which shows so well at the surface may be found on deep sinking to run out suddenly; and on the other hand, the outcrop that shows itself as a short narrow strip of quartz at the surface may widen out underground into a large and valuable reef. I was told some time ago by a mining engineer of considerable experience that he believed many of the reefs in Wynaad did not extend beyond a depth of 20 to 30 feet below the surface, and he stated it as his opinion that unless they reached a depth of 500 feet, they were not worth working. There is no doubt that many masses of quartz which crop up to the surface do terminate at the slight depth. But this is not always an unfavourable sign. Amongst the various signs and features of the occurrence in Wynaad of gold reefs, rich or poor, extensive or limited, there are undoubtedly indications, sufficient to show that it is worth risking some capital to have their character more definitely ascertained. The knowledge we possess of them at present is for the most part obtained from merely surface indications. But they are indications as good of their kind as those which have led to the opening out of other goldfields. And well-directed efforts to open out mining enterprises in Wynaad must be attended in many instances, with the best success. There will be failures as a matter of course. There have been some very worthless reports written on mining properties in Wynaad. There have been reports written on the mere strength of a morning's walk over an estate, and the sight of a few masses of quartz appearing above the surface of the ground, and containing, perhaps, a specimen showing visible gold. In one case a mining engineer reported on an estate without ever having seen it. The various gold companies are not likely to actually turn out gold for some time to come; estates have to be first carefully surveyed and thoroughly prospected, plans of working have to be fixed upon and matured, estimates prepared, buildings erected, machinery purchased in England brought carefully and slowly from the coast up to the ghât, and then erected on the estate—all before the first outturn of gold can be looked for—and this preliminary work requires twelve to eighteen months, or even two years. By careful and well considered working of this kind there is every hope that many of the mining concerns will prove steadily and even brilliantly successful, and will, in spite of the numerous failures which will result from reckless speculation, vindicate the character of the Wynaad gold fields.—*Correspondent of the Bombay Gazette.*

SOUTH WYNAAD, Nov. 23.

GOLD AND COAL IN INDIA.

BESIDES the paper on India, Diamonds which we have already noticed, another was recently read by Mr. Ball before the Royal Dublin Society, in which he described the distribution of gold in India. In this he gave a very clearly written account of explorations in the Wynaad region by Mr. W. King, of the Survey, and by Mr. Brough Smith, the details of which have from time to time appeared or been referred to in these columns. Mr. Ball is decidedly of the opinion that gold mining in the Wynaad and Mysore ought to pay well if completely managed. The paper mentions many other districts in India where gold is known to occur, and where certain castes make a precarious livelihood by washing for it in the streams. During his personal explorations in the hilly districts of South-West Bengal, he came in contact with several colonies of these people and found that through the accumulated experience of generations they had been able to mark off certain well defined geological boundaries within which gold washing paid them enough to live on, and beyond which it would not pay. This boundary he found to coincide with the line of separation between the metamorphic and sub metamorphic rocks. In the description of the gold-bearing streams of the Himalayas and Tibet, Mr. Ball mentions the explanation of Herodotus's tradition of the gold-digging ants, that was unexpectedly and unconscientously hit upon by one of the pundits sent over the Himalayas by Colonel Montgomerie, of the trigonometrical Survey. The story, which has been often repeated by veracious travellers like Sir John Maundeville, asserts that in a country north of India there are enormous ants as big as wolves which burrow in the ground and throw up sand full of gold. The Indians stealthily approach and fill this sand into bags which are laden on fleet camels and thus carried away beyond the reach of the enraged ants which sometimes sally forth and destroy the plunderers. These ants are really Tibetan miners who in the course of ages, have excavated enormous quantities of auriferous alluvial deposits, and who still probably carry on the work in much the same way as their ancestors did in the days of Herodotus. They work at an elevation of about 16,000 feet above the sea where the winter is terribly severe, yet they prefer to work in winter, because the frozen soil then stands without artificial support. To protect themselves from the fearful cold they have to clothe themselves in furs like Arctic voyagers, and they underground or pitch their tents in deep pit to protect them from the cutting wind. Hence the story of the burrowing ants. At a previous meeting of the Society, Mr. Ball read a paper on Indian coal and coal-mining showing the extent to which this industry has developed in recent years. It appears that at present about half the total coal consumed in India, is raised in the country and that when the Assam fields are opened out, this proportion will be considerably increased.—*Pioneer.*

NELLORE COPPER WORKINGS.

THE following reports of these workings by Mr. King, is taken from the memoirs of the Geological Survey of India, Volume XVI. part 2:—

The mineral or building resources of this part of the Carnatic have already been generally and incidentally noticed, from which it will have been surmised that they are not of any great value or importance, except locally, or because they have not been sufficiently developed.

However, the Nellore district is more particularly known in this connection as having from time to time given promise of good copper ores. The proper region of workings lies just on the northern edge of the present area, and was examined by Charles Æ. Oldham, or on the southern edge of the next area treated of in Mr. Foote's memoir; but I have failed to discover Oldham's notes, and Mr. Foote only refers to this mineral resource very cursorily. My own work did not lie anywhere near this region, so that I only saw the faintest traces, previously noticed, occurring on the right bank of the Penner, near Yarabully. However, I saw most of the specimens collected by Oldham, and these, with his verbal information regarding them when compared with the Yarabully rocks, all showed that the copper occurs in a band of hornblendic and garnetiferous schists, with which are associated intrusive sheets of trap. The strings and irregular masses and nests of copper ore occur for the most part in the traps, but they also run with the schists. There is no regular distribution of those in the traps, but the strings run across and occasionally with the laminæ of the schists. No good and tolerably continuous lode is apparent, nor has one ever been found: indeed, the general look of the rocks and of the country is most unpromising, there being very little signs of copper at the surface, the best specimens only being found among the *débris* from the old workings, while every hole that has been made only shows how all attempts to mine must have been rapidly frustrated by the influx of water.

Good big lumps of earthy-looking trap are often obtainable, with a good deal of ore distributed through them, which certainly have a very promising look, and this is about the most that can be said of the industry, for all attempts have hitherto failed to produce any encouraging returns; nevertheless I am not prepared to encourage the hopeless view generally taken of the evidences that have been brought to light by the old workers. In my experience of native workings, I have always found with the exception of the old gold workings in Wynaad, where the man had to deal, with an undulating country easily drained, that the mines have never been carried to any depth nor to any extent, as may be easily conceived

where the means of getting rid of water, or the supplying of air were not available. I do not mean to urge the oft—in difficulty or despair—suggested necessity for going deeper in mines to obtain a better result, though of course the wealth may be at a great depth ; but I question whether any of those old native mines are ever beyond 60 feet in depth, or that the galleries run more than three times that length. Again, the fact of the place having been tried under European hands, and at a great expenditure of money without success is poor evidence of the condition of a mining region in India, for it is even now difficult to obtain competent and steady hands, or, even, if they be competent to guard them against the evil and enervating effects of the climate, and it is, above all difficult to arrange for the effective administration of such work. From all I could ever learn of the working of the Nellore mines, these obstacles to progress seem to have occurred in the most exemplary manner. The money seem to have been at hand ; but neither Colonel Ouchterlony nor his brother James, nor Messrs. Hart and Simpson seems to ~~have been capable of~~ carrying on or organis~~ing the~~ administrative part of the affair, while solitude, sickness and drunkenness were too much for the miners.

The localities appear to be principally within the outlying zemindari lands of Kalahasti. Those visited by Mr. Oldham are at and in the neighbourhood of Garimanipenta (Gunnipenta) on the northern edge of the sheet and within some 24 miles of the western hills. The specimens he produced were principally copper glance in irregular masses, with strings of malachite occurring in massive earthy trap and in hornblende schists. They were all from the heaps of *débris* thrown out of the excavations which had been made near the village. The traps appear to occur as intrusive sheets running with the schists, but the ore in the latter is in nests or strings running with the foliation, and nothing is known as to the lie of the irregular masses in the traps, these all being from *débris*.

THE diamond fever at the Cape of Good Hope is likely to be revived by the discovery of an immense diamond, of which Mr. Rhodes is the lucky proprietor. The diamond was found in Griqualand West. Mr. Rhodes has refused £75,000 for a half-share in this diamond, and it is believed to be the largest diamond that has ever been found at the Cape. It is said to be of a very white and pure quality.

INDUSTRIAL AND TECHNOLOGICAL MUSEUM.

LABORATORY, OCTOBER 29TH, 1880.

Report on 15 Samples of Indian Teas received from James Henty & Co's.

BREAK NO.	NAME.	Percentage of Mineral Ash.	Percentage of Extract.	Percentage of Soluble Salts.	Percentage of Theine.
14	Dooars Pekoe Souchong ...	5·20	40·97	3·68	2·86
17	Do Broken Pekoe Souchong ...	5·10	36 11	3·10	2·42
19	Darjeeling Pekoe	5·16	38·97	3·16	1·96
20	Do Do Souchong ...	5·86	41·80	3·20	1·96
21	Do Do Do ...	5·40	36·08	3·04	2·36
22	Do Souchong	5·22	36·99	3·02	1·66
23	Do Pekoe Souchong ...	5·66	39 40	3·46	2·24
24	Assam Pekoe Souchong ...	5·20	40·12	3·04	1·66
30	Do Do Do ...	5·52	38 60	3 32	1·84
31	Do Souchong	5 20	39·27	3·00	1·46
33	Do Broken Souchong	5·60	39·40	3 20	1·98
34	Cachar Pekoe	5· 2	43·85	3 22	1·58
35	Do Broken Pekoe Souchong ...	5·36	38·83	3·18	1·93
37	Do Pekoe Souchong	5·64	40·66	3·24	1·44
38	Do Souchong	5·36	40·29	3·12	1·76
	Average of above 15 samples	5·34	39·42	3·16	1 94
	Average of 15 samples Foo-Chow Congous obtained at a recent sale in Melbourne ..	5·20	29 26	2 88	1·84

These Foo-Chow Teas are below the standard of the Adulteration Act of Great Britain.

(Sd.) J. COSMO NEWBERY.

	Percentage of Mineral Ash.	Percentage of Extract.	Percentage of Soluble Salts.
N.B. British Analysts' Standard of lowest class genuine Tea	5 to 8	30	3·00

FORESTRY.

THE SIKKIM FORESTS.

AS seen from the left bank of the Great Rungeet the destruction of forest in Independent Sikkim is going on at an alarming rate. A few years ago the whole of the hills within sight were covered from top to bottom with magnificent virgin forest ; now the hill sides are almost bare and the denudation has gone on increasing rapidly and steadily each year. This portion of Sikkim has been colonised by immigrants from Nepaul, and every one knows what an implacable enemy to trees of any kind the Pahariah is. Indeed so great is his natural propensity in this line, that he will wantonly and in a sheer spirit of mischief cut down with his *khookery* any sapling that may be handy as he passes along a road. He certainly does not, as a rule, *jhoom* as the Lepchas do, and once he has cleared a bit of ground for cultivation, will continue to raise crops on it as long as the soil gives him any return, and he has a rude notion of cultivating the land. But at the same time he gets everything out of the soil he possibly can and very seldom puts anything into it in return. On the other hand he will burn acres of forest when he is allowed, for the sake of the undergrowth which springs up after the forest trees have been destroyed, to provide fodder for his cattle or to allow of his raising crops of rice, maize, or millet. Judging from the wanton destruction of forest in Sikkim during the last seven years or so, it is only a question of the not very remote future, before the whole of this country is utterly denuded of trees as the destruction of the forest appears to increase in geometrical progression yearly. Can Government do nothing to put a stop to this wilful waste, which in a short time must infallibly result in woeful want?—*Darjeeling News.*

THE ANCIENT FOREST WEALTH OF INDIA.

IN the course of an exceedingly interesting article on the Deccan, published in the present number of the *Fortnightly Review*, Sir David Wedderburn makes some remarks on Indian Forests which we would commend to the notice of the department.

Bijapore, whose splendid ruins deserve to be reckoned among the wonders of the world, offers the fullest evidence that, two hundred years ago, the whole country around it was well covered with trees. Yet the traveller through the vast, undulating plain, which intervenes between that famous capital and the districts bordering on Bombay discovers scarcely a trace of vegetation. Every reader of old Indian literature, of the Mahabharatha, the Ramayana, for example, cannot but perceive that the India of those days was by no means the treeless, sun-scorched land which we now know it. Sir David Wedderburn may not be aware that the forest of Dandaka, to take a single instance, must have been far more vast than the Hercynian forest, which in Roman time covered Central Europe, yet of the forest of Dandaka, little remains except a few scrubby patches on the Vindhyas. Throughout the works of the Mahomedan historians, also, are scattered many indications of the existence of extensive forest tracts of which no remnants survive in our day. The subject of the ancient forest wealth of India and its subsequent denudation is well worthy of the attention of officers like Dr. Brandis and Mr. Baden Powell. The latter named gentleman in particular would find it a theme specially adapted to his facile pen. The general causes of forest denudation are perhaps obvious enough. Conservation, managed so as not only to counteract but even more than make good the amount of consumption, is, in India at least, a modern art, and there are very few arts of English importation which are more deserving of prosecution. Municipal Funds might, with the greatest advantage, be spent in tree-planting. This would not serve for purposes of adornment—itself a great consideration amidst the general baldness and monotony—but would also prove useful as regards local sanitation. The Famine Commissioner's suggestions on afforestation as a means of regulating rainfall, and therefore the yield of crops are already acknowledged as the A. B. C. of the subject. The case of Bahawalpur—we mean the town, the Nawab's large palace, and its surroundings—offers an excellent illustration in point. Fifteen or sixteen years since, the grounds round this palace were completely devoid of vegetation. At this time, they are well-stocked with trees ; and fine avenues many miles in length have sprung up in the interval, affording grateful shade, and beautifying the landscape—*Indian Herald.*

UTILITY OF TREES.

IN many instances the controversies which arise from conflicting theories are set at rest by an appeal to experience, but as according to the proverb none are so blind as those who are unwilling to see, even that is lost upon persons too obstinate to admit that they were mistaken. The utility of trees in ameliorating climates, attracting rains and preventing floods is now being generally admitted, but there are nevertheless persons still obstinate enough to deny it.

The great use of trees has made itself felt more particularly in districts where the wholesale extirpation of forests had been undertaken for obtaining timber and agricultural soil, it being wellknown for its extraordinary fertility, after being during centuries covered by layers of decaying leaves which produce the humus. As soon as the denudation from forest had been undertaken on a large scale in certain parts of North America, the climate deteriorated, and droughts never known before began to afflict them.

On hill sides trees prevent the denudation of the soil which would be washed off by torrents if it were not sheltered. The foliage of trees does not allow the rain to fall to the ground with violence, and their roots so interpenetrate it as to form a kind of net-work hindering its removal; the roots also act as conductors of water to the lower strata of the soil whence it percolates into cavities or subterranean lakes which being filled, the water again finds its way out and thus trees become the cause of springs or rivulets. Also the brushwood growing around trees acts beneficially upon the soil, which it likewise contributes to strengthen by arresting the floods which would otherwise cut it up and form ravines for rushing torrents. The destructive floods which periodically devasted the valleys of the Loire, the Rhone and the Garonne, and which had never occurred before the forests on the hills were extirpated, are now being prevented in France by the Forest Department which has undertaken the reforesting (*reboisement*) of all the mountain slopes. All who are acquainted with natural history, known that not only animate beings but also plants breathe. The process of inhalation and exhalation is peretually going on with trees; great masses of them evaporate large quantities of moisture drawn from the earth which form mists and clouds again returning to the earth in the shape of rain. Clouds passing over tall forests sometimes impinge against them and discharge a portion of their contents. Under the shade of trees the temperature is naturally always somewhat lower and the air a little more moist. Trees may be made to act as curtains against winds especially when these might be injurious to certain classes of plants. The pestiferous exhalations of the pontine marshes in the vicinity of Rome are checked by a curtain of trees, so that the agriculturists who live beyond it are not subject to the malarious fevers for which those marshes are famous.

Trees are useful also on declivities where scarcely any other cultivation can be carried on, it was however a mistake of Sir Richard Temple's government to convert all the waste land of Poona into forest preserves, but this error has now to some extent been corrected; the measure will nevertheless for some time to come be felt to be a very hard one, especially by the poor.

Not only fuel and timber will become more abundant after a few years but also the other advantages connected with forest culture, briefly alluded to above, will appear. Those who think that the measures taken by government for the purpose of reforesting the Dekkan are superfluous even if carried out with leniency, will have to live down their opposition, until another Governor comes, who may perhaps think fit to abolish them instead of only modifying them. We remember that petitions numerously signed were forwarded to Government, dwelling on the hardships that would ensue from the smoke of the railway trains passing too near the Band-stand, and against the passing of the tramway through certain localities to endanger the lives of children. Now these matters are forgotten, and nobody has any objections against the engines nor against the tram cars. When the advantages of reforesting become palpably obvious the objections against it will also fall into oblivion.

SOME RESULTS OF AFFORESTATION.

A PARAGRAPH in one of the American newspapers which we received by yesterday's mail, states that in 1841 Lord Carr planted with trees a portion of his estate in Nairnshire, Scotland, which was utterly unfitted for agricultural purposes. Lately an account was made up of the result of the experiment. It was then ascertained that no less than £16,000 clear of all expenses has already been received from sales of timber, while the land is still fully stocked with trees and annual clearings, producing a large revenue, are taking place regularly. It has also been estimated that the nett profits were as great from this formerly sterile waste, as would have been the case with the best arable land.

No better practical proof than the result of Lord Carr's experiment could, perhaps, be afforded of the splendid results obtainable from Forestation, and an example is given which should not be lost sight of here in Japan. It is a patent fact that forest trees are rapidly disappearing all over this country, consequent upon the demands to supply the requirements of railways, telegraphs, commerce, &c, &c. The resulting increase in the price of timber is now apparent, and points most unmistakeably to the not far distant period, when the warnings we have so frequently given upon this subject will be exemplified with very unpleasant distinctness.

France, it is well known to those who take an interest in Forestation, is one of the countries—if not *the* country—where the science has been practised with the most signally successful results. At the last Paris Exhibition, in order to bring the working of the department practically before visitors, the Administration des Eaux et Forets erected a Swiss chalet on the slope of the Trocadero, in which were shown illustrations of what had been doing in Forestry, and a report, arising principally out of this display has recently been issued. From this extremely interesting document, we learn that the forests of France only occupy about 17 per cent, to the total area of the country, or twenty-two and a-half million of acres, while Sweden has 43 per cent. of woodland, Russia 37, Austria 33, Germany 27, Switzerland 18, and Great Britian the insignificant quantity of 4 per cent. The forests in France are over two-thirds private property, while the Government has absolute control over only about 11 per cent.

The department has made some valuable experiments with foreign woods. The Australian blue gum prospers exceedingly in the south of France, and the marshes at the mouth of the Var have been drained, and the fever prevailing there ended by planting this species of tree. In poor soil, and as preparation for more valuable trees, the American oak has been largely made use of, and experiments are in progress with the theya tree of California, the wood of which is valuable in the manufacture of the finer descriptions of furniture.

The most important work of the department, however, has been the replanting places where forests once existed, and of the dunes or sand-hills, those dreary wastes which are associated in the minds of most of us with pictures of shepherds on stilts busily engaged in knitting. It is of course, useless to attempt to plant trees upon hill-tops exposed to the full blasts of the wind, so the plan followed by the department has been to build weirs in the gorges through which mountain torrents rush in winter. These weirs retain the water, which forms ponds in summer instead of becoming dry. By the modified action of the water so dammed back, a broad, deep layer of soil is formed, upon which first grass, then bushes and ultimately trees, grow. As soon as the bushes and trees begin to grow, others soon follow, which are protected by the first. A commencement once made in this way, it is easy to change the weirs, and the original plan can be pursued and rendered more simple by the assistance afforded by the trees already growing. In course of time the mountain becomes gradually covered with wood from the gorges. the mountain stream, too, is brought under subjection, since it supplies moisture to and in turn is supplied by the growing trees. The streamlet never dries up now, as it did when the mountain was bare and its snow waters simply rushed down in the spring to leave the land arid in summer. An example of this description is given in the case of the Torrente de Bourget. As recently as in 1868 it was only a ravine of bare rocks. The hollow has since been half filled by high stone dams. The beneficial results of the work are seen in the trees and bushes which grow to the very edge of the ravine, and in the torrent being now innocuous, and never devastating the valley below with periodical inundations, as was formerly the case.

In the portion of the report which summarizes the results hitherto attained, we read that from 1861 to 1877, 68,000 acres of land were planted with trees and 3,700 additional acres turfed, the cost being about £315,000. The report states that the comparatively small amount of work done was owing largely to the fact, that the communes and private owners had paid but little attention to the subject. It is some slight satisfaction to known that the apathy in Japan is not exceptional, and we derive encouragement from the statement that interest in Forestry is rapidly growing in France, and among the very classes who formerly looked upon the operations of the department with an indifference amounting in some instances almost to contempt.

The laws in France on the subject of Forestation appear well calculated to promote the object in view. Grants of seeds, young trees, money, &c., may be made, and compulsory replanting is provided for in the extreme cases in which such a peremptory step is considered necessary. The Government can also enter upon private property to accomplish afforestation, and if the owner desires to re-occupy the property he must repay the expenses or surrender half of the land so improved.

The planting of the sand dunes which form their nature are continually shifting, is accomplished by laying them out in sections and building strong fences along the crests. Towards these divisions fences other smaller ones lead zig-zag fashion, The sand constantly accumulates in the protected places and thus forms bulwark for the space in the rear. The area so protected is then planted with meadow grass, sedges, broom or esparto grass. These when growing, are protected by brushwood and, when once the grass has gained a footing, coniferous trees are planted. In this way many thousands of acres have been reclaimed between the Gironde and the Conbre, and it seems as if the extinction of our well-remembered shepherd on stilts was only a mere question of time.

GARDEN.

SINGLE-FLOWERED DAHLIAS.

THESE are becoming yearly more popular for decorative purposes. They are superseding the old double florists varieties completely for all purposes, excepting, of course, the purpose of competition at flower shows. They are elegant in style, extremely free in flowering, and very brilliant in colouring, remarkably more so than any of florists sorts, especially in the case of scarlets and crimsons. They may also be grown in pots for conservatory decoration and for cut-flower purposes in late autumn and early winter, with complete success. For this purpose they should be grown in pots, in the same way and by the same treatment as chrysanthemums, along with which they produce a gorgeous display when in full flower, their seasons of flowering being the same when treated together. Like chrysanthemums, they should be propagated in batches at different periods, to bloom early and late; but the propagation need not commence so early for them as for the chrysanthemum, because they want a shorter season to come to the flowering stage. They should be potted about May into 9, 10, or 12 inch pots, according to the size of plant desired and the space that may be devoted to them, and plunged in the ground

or in coal ashes in the open air, and cultivated liberally. In autumn before frost is apprehended, they should be brought indoors. They are not so hardy as the chrysanthemum, and must not be exposed to the least frost, or they will be crippled more or less. A strong, rich compost should be used in potting, but let it be well mixed and the manure well matured. They may be had in flower from July to January without difficulty.

ON THE CULTURE OF TUBEROUS BEGONIAS.

THE details of the culture of this popular class of greenhouse plants should rigtly begin with their treatment when they are going to rest. The bulk of those grown for summer decoration of the greenhouse will now be going to rest and there are one or two points of management at this period which should be clearly understood and strictly observed in practice, in order to mature the tubers thoroughly so that they may not be rot during winter.

The first point to be observed is to gradually withhold water from the root as soon as the stems and leaves show signs of decay. Begonias unlike many other plants which are tuberous or bulbous, do not show these signs of decay at the upper extremities of the shoots or stems first, but at the lower extremities. Very often indeed extra vigorous plants damp or 'fog' off close to the crown of the tuber while the upper parts of the stem and branches and even the leaves show but very little symptoms of distress. But as soon as these indications of going to rest are observed, the supply of water should also be gradually reduced. The plants should also be placed in a sunny and airy position One out of doors where they may be sheltered from strong wind, will suit them better than the more confined atmosphere of a house, or frame, as the stems die off let them be cut away, but none should be cut which are not quite dead. When the stems are all cut away, the pots should be put on their sides under the stage of a cold green house where they will not be exposed to any heat above 35 to 39 degs. but where they will not be liable to any frost whatever. In this position they will be quite safe for the winter. They should never, however, be put away in a dust-dry condition. They rot or decay as readily in extreme dryness as in extreme wetness.

The time of starting the roots into growth should be regulated by circumstances. If they are simply intended for the decoration of the greenhouse during any period of the summer, they may be brought out of the dormant state by placing them in mild heat two or three months before the time they are desired to be at their best. By attending to this point and bringing them in batches of such a number as may be required for the purpose in view a very long succession of their beautiful flowers may be kept up. But if they should be wanted for the purpose, first, of yielding a number of cuttings for propagation, as in the case of scarce and desirable sorts, they must be taken into heat early in the beginning of the year.

Having determined the time the roots are to be brought into activity, let them be taken to the potting bench, and there turned out of their pots, and entirely freed from the old soil. Every root should be carefully examined in order to detect any rotten parts, which should be cleaned away; and it the rot is of a soft nature, the affected parts should be dusted with quicklime after being well cleaned. More generally, however, the rot will be found to be of a dry sort, and the affected part will break away from that which is sound, leaving a perfectly callused surface underneath, which requires no treatment. These may be potted and put in heat at once, but the others should be allowed to lie exposed to a brisk warm air or dry heat for a day or two before being potted, so that the wounds may become quite dry and the lime crusted upon them. They may then be potted and placed with the others in temperature of about 55 to 60 degs. at night, if they are to be propagated by cuttings; but if merely to be grown into decorative plants, they should be treated to 5 degs. less at night, with, in either case a rise of 5 degs. during the day. We shall now follow the course of treatment required ordinarily for the production of plants for the purpose of decoration only, and leave the treatment of those intended for the purpose of propagation, along with the details of the treatment of the cuttings, for subsequent consideration.

At the first potting the roots should be put in the smallest sized pots. Very small roots, such as may be obtained from cuttings of the previous year may be put in 2-inch or 3-inch pots, according to the size of the roots, and these smaller sized roots should be just merely covered with soil. But in the case of large sized roots, the less soil there is between them and the sides of the pot the better: nor should these be covered with soil at all, the surface of the tuber should be just level with the soil. A little water should be given, merely a sprinkling to settle the soil about the root; but with the exception of a light dewing over with the syringe in the morning, that is all the moisture they should receive till they show inactive signs of growing, after which water must be given in proportion to the progress of growth. The temperature should remain the same fram first to last, except it be desired to push them faster than they may be doing for any special purpose. But they are plants that should not be pushed by heat for any considerable length of time. They delight in a light friable loam, rich in manurial matters, such as dried cow or horse dung, bone meal, and leaf mould. The proportion of these to the bulk of the soil depends upon the quality of the soil. Should it be poor, a third of leaf mould may be added, and a fourth of dried cow or horse dung, and to every bushel of this, about a quarter of a peck of bone meal may be given, and thoroughly well mixed. A little sharp sand if the soil is of a close or clayey sort, will be needful to keep all open an porous. When the stems begin to grow a pace, discontinue the use of the syringe over head, but keep the moisture of the atmosphere abundant by means of the evaporating troughs, and sprinkling the walls and passages with water several times a day. Stakes must be applied to the stems betimes, so as to prevent accidents. The plants must also receive additional pot room as soon as they appear to want it. They should not be allowed to become pot-bound in any degree till they occupy their flowering pots, after which they may be kept up by means of liquid manure.

THE JAPANESE CHRYSANTHEMUM ELAINE.

THE class of Japanese chrysanthemums, which for some time after its intro duction was very little esteemed, is rapidly growing in favour. The flowers of the new class were so little in accordance with the points set up by florists as the criterion of perfection of those of the older class, that it was not to be wondered at if they made little way in favour for some years after they were introduced. It began, however, to be observed that the Japanese kinds were extremely hardy in constitution, and very free bloomers. It was noticed also by some leading growers that, when well grown their less precisely symmetrical flowers were a relief and a contrast to those of the older favourites. Their merits became gradually more conspicuous through the influence of these leading growers, and attention was given to the improvement of the flowers of the class which has proved most successful in the production of certain varieties with flowers of more symmetrical perfection than those of the eartier kinds. The most valuable that has yet appeared is the one whose name stands at the head of this note. It is pure white, the purest white of all chrysanthemums yet introduced: large in size, so much when well grown as 7 or 8 inches in diameter, but most useful for cut-flower purposes when less liberally cultivated. It is now grown by market florists by the thousand for its pure white flowers, which are in great demand for decoration of all kinds in which white flowers are essential. It is naturally a late flowering sort, but by early propagation it may be had in flower as early as any of the other large flowering kinds, and its naturally late habit may be turned to advantage in prolonging the season of flowering by propagating at later periods. It may, in fact, be had in bloom from October to February if well managed in the way indicated.

Early flowering Pompone chrysanthemums. These, as a class of this popular flower, are on the increase alike as regards favour and variety. They bloom early enough to be available for flower-garden decoration in autumn, and they may be obtained in pots in flower both early and late, by means of propagating at successive periods. They are very largely cultivated now for the supply of the London flower market and other large towns.

The following selection comprises some of the best:—

Indica Alba, a white variety, very dwarf and compact in habit, with pure white flowers when flowered under glass, but somewhat creamy in tint when flowered in the open air.

Illustration.—A taller and more erect growing sort, reaching the height of about two feet; a remarkably profuse bloomer, with pale pink flowers in the open air, which come almost pure white when flowered indoors.

Delphine de Cabache.—A bright yellow sort, very profuse and of good erect habit, about two feet high.

Precocite.—Another beautiful golden-yellow variety, most profuse and early, about two feet high; very compact and branching in habit.

Crimson Gem.—One of the very earliest and one of the most profuse and compact. The flowers are small, bright bronzy-crimson, extremely well adapted for bedding out.

Bob.—Another fine crimson, of larger growth and larger flowers. The flowers are a rich deep crimson.

Helleborus altifolius, or *H. niger maximus* is one of the most valuable of hardy white winter flowers. By some it is considered a totally distinct species of Christmas rose, although many regard it as merely an improved and larger flowered sort of the older and better known species. Be its affinity what it may, there is no fair comparison between the value of the one and the other in point of usefulness for the purpose of decoration. The sort above named is by far the best, indeed it is the only Christmas rose worth growing for the purpose of cutting. Wherever large quantities of pure white cut-flowers are wanted, this should be grown in abundance. It should be grown in the open ground in rich soil in such a way as that frames may be placed over the plants when winter sets in, so that the flowers may be preserved from being tarnished by wet. It may also be potted up from the open ground and placed in the greenhouse to flower or it may be lifted from the open ground and planted in the border of a peach-house or vinery. The plant is easily increased by division, which should be done as it starts into growth during spring.

Lachenalias.—These little known bulbs from the Cape of Good Hope are deserving of more favour than, judging by the fact that they are seldom to be met with in private collections, they appear to get. They are profuse flowering, elegant things, of the easiest possible culture. They are also all but hardy, and may be grown in the open air during summer while the protection merely of a cold frame in winter is all they need if better or warmer quarters cannot be afforded to them. They are small growing bulbs, which, when well established in parts, are among the most profuse in flowering of any class of bulbs with which we are acquainted; L. tricolor, which is the best known of the group, is also the

most profuse blooming. The flowers are about an inch long, tube-shaped, and set thickly on a stout foot-stalk, the length of spike being about from two to four inches, according to the strength of the bulb. They are orange, green, and yellow, and last well when cut and are well kept in water. Their culture is a very simple matter. As to soil, sandy loam, with a liberal allowance of partially decomposed cow-dung and leaf mould, suit them well. Once potted the plants should not be disturbed for a year or two. Six inch pots are the handiest size in which to grow them. Drain the pots well, for although Lachenalias will take any quantity of water during the growing season, yet they are impatient of stagnation at the roots. Place twelve to eighteen or twenty bulbs in each pot, according to the strength of the bulbs themselves, and also according to the object in view, whether it is to establish the pots at once or to be content with thinly filled pots for a season. They may be potted at any time after flowering is over; and after potting, they should be watered sparingly till they show signs, of starting into growth. When this is observed, water more freely. After growth is finished, gradually withhold water, but do not, as is generally recommended, dry them off. They should always have as much water at their roots as will prevent them shrivelling up. They may be potted in batches with advantage from March till the middle of August; and if they are introduced into growth in the order of potting, they will maintain a very long display or an exceedingly pretty and somewhat rare flower.

TEA.

THE Pegu province (British Burmah) imported last year, 186,170lbs. of Chinese tea from the Straits, valued at Rs. 88,898 a small advance on the quantity taken the previous year, whilst the value of the importation of the larger quantity was less. This is attributed to a good crop in China having reduced prices. Some tea declared for Upper Burmah is not included in the above account. Every year there is a steady increase in the consumption of tea in Burmah by all classes, and those interested in Indian teas should surely be able to oust the inferior Chinese qualities from this market if they cared to set about it. But the Chinese importers have their agents in every village of importance in the province, collecting produce of all kinds—hides, horns, ivory, bees-wax, &c., and these men are of course most useful to their principal as pedlars or petty shopkeepers to sell the Chinese tea in the principal Burmese villages.

CEYLON TEA FOR THE AUSTRALIAN MARKET.

(*To the Editor of the Ceylon Observer.*)

SIR,—A great deal has been written, in the local prints, about the superior quality of the Ceylon tea as compared with that which usually comes from China, and it seems to have become an understood thing that our mission is to supply the Australian Colonies with a good article, but at a good big rate. Why people have got this notion into their heads, I cannot say as it is a notorous fact, that to Australia, as good, if not better, teas go as a rule, than those sent to England. After many years' residence in Australia, my taste for the China tea became acquired, and I have all along preferred it to that of Ceylon. For some years back, I have tried to improve (?) my taste, by drinking the teas made at Looleccondura, Rookwood, Kandaloya, Oliphant, and other estates, but, after all, I have gone back to the China tea with pleasure, and I feel sure that we must after our style of manufacturing the commodity, if we purpose securing the Australian trade. Most of the shipments to the Southern Colonies go from Foochow, and these are admitted to be about the finest grown The Australian dealers are *very quick* at detecting any attempt at adulteration, and a proof of this was given a few years ago, when some Hong-Kong shippers sent a few spurious consignment to the Australian market, and since then Hong-Kong teas have become unsaleable there. I believe that my taste for tea is similar to that of 90 per cent of the colonists in Australasia; my taste may be a vitiated one, but I have tried, for seven years to convert it to the Ceylon views, and having failed, have gone back to my old love, China tea. The Ceylon tea is too new, as a rule, when we drink it, but what it lacks, as far as my taste goes, is the "pick-me-up" which all Australians prefer to any spirits whatever, but it would take gallons of Ceylon tea to instil the same feeling into me as the pannikin of China tea used to do. I know that it is high treason to say anything in Ceylon against the products of the Island, but I am merely hinting that there is something which we might do to alter the flavour of our teas if we wish to secure the Australian trade, and that trade alone is all that Ceylon would require, as, in the Southern Colonies, the people drink as much tea as Ceylon is ever likely to produce. As things stand at present, we make tea in what we are pleased to consider a *perfect* manner, and we become indignant if any one hints at any improvement, or suggests that China tea is preferable. I think, however, that it will be found a difficult matter to educate the Australians, to our way of thinking, and I merely give myself as an example when I say, that, after trying Ceylon tea for seven years, I still prefer that from China, and have gone back to it, although it cost more than what I can buy Ceylon tea for. Let no one suppose that I am prejudiced against Ceylon tea, quite the contrary is the case; I have tried my best to take kindly to it but it does not compare, in my opinion, with the tea which I used to drink in Australia, and as long as we think we are perfect, we will never improve, and so we cannot secure the Australian trade, for I am positively sure, not from my own experience alone, but from that of many other Australians, that as long as our teas have their present *flat* flavours we can never be considered qualified to supply the Australian market. I know there are many tea planters in Ceylon who will simply say that it is my bad taste which makes me entertain these views, and that I don't know good tea when I get it. That I am quite willing to admit; at the same time I believe that the greater number of colonists in Australia will agree with what I say, and if our tea planters are so pigheaded that they won't be advised, but will persist in going on, in the belief that they will *compel* the Australians to come round to their way of thinking, I can only say they have a difficult contract to fulfil.

INDIAN TEA IN AUSTRALIA.

THE following is the report of the Syndicate appointed to represent the interests of the Indian tea trade at the Melbourne exhibition:—

Melbourne, 14th October 1880.

R. B. Magor, Esq., Honorary Secretary, Calcutta Tea Syndicate.

Dear Sir,—The sale of the first lot of the Syndicate teas took place yesterday with a very satisfactory result, thanks to the good work Messrs. Jas. Henty & Co. have done in assisting me to look up the trade here generally both wholesale and retail, and also thank to the publicity given to our project by the daily papers, of which I am sending you some copies. I telegraphed you the prices of some of the larger lots sold. Messrs. Henty & Co. are now sending you a fully priced catalogue. The afternoon teas at the exhibition did a good deal also towards helping the sale. They are a great success; so great that I have had to issue cards of invitation, as the general public are too strong for the resources of the court. The public will, have no doubt, taken our teas if the grocers will sell them at a reasonable price. A good opening has now been made, and it rests with the merchants of Calcutta to keep up a regular supply of the right qualities to make the trade with this colony a permanent and growing business. By the right qualities, I mean such teas as Lots 3, 9, 36, 41, 42, 48, 18, and 29, as detailed below, the two latter in small quantities, as there is only a limited demand for the finer grades. The prices realized for most of the teas are not extravagant which I look on as a good sign. As they will most probably go into consumption quickly and a demand will arise, I do not look for a lower range of prices, but this is a market which could very easily be swamped as there is amongst a great number of the trade a distress of the article which it is difficult to overcome. However, with a steady supply of suitable kinds and patience I have no doubt our difficulties with such people will disappear. Small well-made Pekoes, broken Pekoe Souchongs, and leaf broken Pekoe Souchongs with tips, are the most suitable sorts to send small boxes (about 10lbs., nett) and half chests (not more than 40lbs. nett) are the packages liked; the teas should be carefully bulked and weighed, but the weight not marked on the package as there is some difficulty with the Customs. I have been making inquiries about the chances of a trade with Sydney, but am not encouraged to send on a shipment there and hesitate to do so until I have been to see whether the great prejudice which I am told exists against our teas is a reality or only a fancy. I intend running over before selling off the whole of the Cingalese invoice, in case I may find a demand for it there. The Governor, Lord Loftus was over here for the opening of the Exhibition, and desired me particularly to make an effort to open up the trade in his colony. He thinks there is a splendid chance for it, but from others I have a very contrary opinion. The Thain has given us a good deal of trouble, as the Executive Commissioners would not see its beauties and relegated it to an out-of-the-way corner. However, with the assistance of Mr. Buck, the President of our Commission (who all through has helped in every way, giving me best position in the court for the tea show, and aiding me with advice) we have at last succeeded in getting it a good place in the grounds, and by the next mail I hope to send you a photograph of it. The two servants I brought down with me have turned out very well, and are quite an a traction at the afternoon teas. I am Dear Sir, Yours faithfully,) (Sd.) D. A. Sibthorp.

CEYLON TEAS IN AUSTRALIA.

AT the present times planters and merchants in Ceylon are more that ever inclined to take a practical view of everything with which they are connected, and they naturally feel far deeper interest in the industrial portion of the Melborne Exhibition and the prospects of a good outlet for their produce through its means, than in the most costly and magnificent collections of manufactures or works of art. We are to a great extent interested in the progress made by the Southern Colonies in that marvellous development of their own resources, which has done so much

to place them in the foremost rank of British Colonies. All this betokens a capacity for the consumption of articles in which other Colonies are interested; and it is natural that Ceylon takes a deep interest in the material welfare of the Australian people, seeing that their progress and prosperity determine their capacity as consumers of those articles which we are able to supply. The Australians are able to pour into the markets of Europe gold, copper, tin, wool, wheat, and a variety of other articles, all of the finest quality, and all finding a ready market at paying rates. Ceylon has not much need for supplies of these articles, and we shall probably look more to their wines, their horses and their provisions for an exchange for our own tea, coffee, and cocoanut oil. The enormous population of the Australian Colonies points to a large consumption of the articles we are able to produce, and which have hitherto been little known in the Southern settlements. Our coffee has indeed been shipped thither for many years past, but not to any great extent, for the good reason that the bulk of the colonists, are addicted to the use of tea, which is preferred even in the town sand which is solely 'used amongst the squatters and gold-diggers of the interior.

Australia is an excellent customer to the Chinese for their teas, consuming many millions of pounds in a year. A good deal of this it is true, is of the ordinary and cheap kind, but there is also a large quantity of the inferior class of the teas taken for consumption in the towns, and for these prices ranging from 1s. 6*d*. to 3*s*, are freely paid. When the question of tea shipments to Australia was first mooted, it was the opinion of some that Australia would only take the commoner varieties of the article at a very low figure; but this assumption was based on the supposition that our tea would only find favour amongst the labouring classes in the outlying districts working on farms or in the mining districts. The probability of good Indian and Ceylon teas coming into request amongst residence of the better class in the large towns, does not seem to have arisen. It is evident, however, from the prices quoted, that both Indian and Ceylon teas are appreciated, and are being taken into consumption at prices beyond what can be obtained in the London market. It unfortunately happens for the tea-planters of Ceylon that at the present moment the home market is glutted with cheap China rubbish teas which although not coming into competition with our own article necessarily depress the market.

We have no information as to the stocks of tea at the Australian ports; but from the accounts received of the result of recent sales shewing how readily parcels of Indian and Ceylon teas offered at auction were taken off, it would appear, that there is nothing in the state of Australian stock, to interfere with prices. The highest price realised at recent tea sales in Melborne was, as our correspondent pointed out—2*s*. 7½*d*. per lb. for a parcel of Darjeeling Pekoe. Of the Ceylon tea the highest price realised was for some half chests of Galbodde Pekoe which brought 2*s*. ½*d*. per lb. Ten half chests of Kandaloya Pekoe realised 2*s*. ½*d*. per lb. Galbodde broken Pekoe brought 1*s*. 9¼*d*., whilst Galbodde Souckong realised 1*s*. 5*d*. and 1*s*. 5½*d*., and the same price was paid for Kandaloya Pekoe Souchong. The dust and fannings from Galbodde and Kandaloya fetched 1*s*. 2*d*. and 10½*d*. per lb. In the opinion of the Melborne tea brokers there is no great opening there for dust, and they recommend that broken Pekoe be not separated, but shipped together, and that if any quantity of dust were placed upon that market the price, would fall very considerably.

As regards the best size of package to suit the Australian market, the Ceylon Commissioner gives 50lbs. as the most appropriate weight, but according to the broker's report in the same paper, they recommend packages of one uniform weight say 35 lb. nett. Quarter chests, it is said of 20lbs. each, find a few buyers, but boxes of 10 to 11 lbs. each, generally meet a quick and ready sale; whilst tea in packets of one or two lbs are considered very objectionable. Altogether the results of tea shipments to Australia must be regarded as exceedingly favourable to the growers; the prices realised leave a handsome margin of profit to the planter, and when viewed in comparision with prices obtained in the London market they will assuredly influence a good many consignments to the Southern Colonies where we have very little doubt that within a few years, Indian and Ceylon teas will usurp the position now occupied by the China article.—*Ceylon Observer*

COFFEE.

COFFEE STATISTICS IN INDIA.

"COMPLETE returns for 1877-78 of the coffee cultivation in British India have not been received. It is understood that coffee of very good quality is produced at Chittagong, where the land and climate are said to be well suited to the cultivation of the plant, but no particulars have been supplied to the Bengal Government by the planters. There are no coffee plantations in any other part of the province of Bengal, though a few plants are sometimes seen in private gardens. In British Burmah the Roman Catholic Missionaries at Toungoo have a successful coffee plantation, but no information has been given with regard to it. Beyond the fact that 128,438 acres were under coffee cultivation in Mysore during 1877-78, there is scarcely any other information available on the subject. The season was a bad one for the production of coffee, and the value of the quantity manufactured is estimated to have been only £158,952 in 1877-8, as compared with £317,143 in 1875-76. About 45,150 acres were under coffee cultivation in Coorg during 1877-78. In coffee lands there was an increase during the year of 2,658 acres of assessed land in occupation and 1,000 acres of planted land. The actual area of planted and unplanted land in occupation by European and native planters respectively, was:—For the European, 26,459 acres, and 21,757 acres; for natives, 18,681 acres, and 20,086 acres. Labour was plentiful, but owing to the reduced condition of many of the coolies, who were mostly emigrants from the neighbouring famine, stricken province of Mysore, there was a general complaint on the part of the employers that the work turned out was poor. As regards the Madras Presidency, the year 1877-78 was very unfavourable to coffee, except in the Ouchterlony valley and the South-East Wynaad; the crops there were singularly good. In the greater part of the coffee area the rainfall of March and April 1877, brought out heavy blossom, but this was destroyed by the succeeding drought. It is understood that coffee sold during 1877-78 at over £100 a ton, if of the best quality. Over 33,000,000lbs. of coffee were exported from the Presidency in 1877-78."

A SHORT ACCOUNT OF COFFEE PLANTING IN JOHORE.

THE territory of Johore, as most people in Ceylon are doubtless aware comprises the extreme southern portion of the Malay peninsula.

PHYSICAL FEATURES.—The physical aspect of the country is that of a low undulating plain, while here and there rise small ranges of hills from 500 feet to 600 feet high, covered with virgin forest, and at wider intervals, detached mountain chains shoot up suddenly to a height sometimes of over 3,000 feet above the level of the sea. It is on these mountains that land for coffee planting has been selected.

G. PULAI.—The first range to attract the attention of coffee planters was Gunong Pulai, as being the most accessible and the nearest to the town of Johore Bahru, the distance being not more than 20 miles by boat and riding road. Its highest point, St. George's Summit, is 2,050 feet above sea level, and the next in height, St. Michael's Peak, is 1,950 feet in elevation. The latter has been cleared of jungle, and a fine view of the Straits and the island of Singapore can be obtained. The survey of this range, after great difficulties, chiefly through want of suitable labour and means of communication and transport, has just been completed and its acreage is found to be 14,141a. 1r. 34p. Of this about 1,000 acres have been felled and are being planted up. On the largest of these clearings a comfortable bungalow has been erected, to the great improvement in health of its occupants who were living previously in a temporary hut built in a hollow by a stream. The coffee in this clearing was looking wonderfully well a month ago and promising well for the success of the enterprise in Johore.

BATUPAHAT.—The next start was made at Batupahat, a place about 60 miles up the coast from the town of Johore, and the same distance from Singapore. The hills here rise from the sea coast and extend inland in small detached ranges of from 6,000a. to 8,000a., their highest elevation being about 1,500 feet. They are accessible from the sea and from the Batupahat river which winds among them and its navigable for small steamers for 8 or 9 miles from its mouth.

About 200 acres are roaded and planted here, and another 800 acres were being felled and burnt off in September last, probably now in course of being holed and planted, Chinese labour in this locality being more easily obtained than in other districts.

Survey orders in this district have been issued for about 16,000 acres, a great portion of which has been completed already.

G. PANTI.—Gunong Panti, consisting of 10,807 acres, 8,307 of which have been taken up and the little plants issued, was the next to engage the attention of coffee planters. Here 200 acres are felled and burnt off, of which 100 acres on Messrs. Dew and Mackenzie's estate are partly, if not by this time wholly planted up and roaded. The top of Gunong Panti, consisting for the most part of a well watered flat 1,237 acres in extent, and cut off on three sides from the rest of the hill by cliffs 100 ft. high, is reserved by the Maharajah's Government for the purpose of establishing a sanatarium after the manner of Nuwara Eliya. Its average elevation is between 1,200 ft. and 1,500 ft.

The soil on Panti is with the exception of some parts of Pulai, with which it is identical perhaps the best of what has hitherto been selected. Starting from Johore Bahru in the morning G. Panti can be reached, the same day. Fifty miles of the distance, for the most part up the river Johore, can be travelled per steam-boat, to Kotta Tingi, a village on the river bank where a resthouse has been erected. From Kotta Tingi to the resthouse at the foot of the hill, a distance of 6¾ miles, must at present be travelled on foot, but a bridle-path is being traced and cut.

GEOLOGICAL FORMATION AND SOIL.—The formation of the country, in the portions explored by the writer, is mostly granite, passing in parts of Pulai and on G. Panti into the old red sandstone or Devonian, the soil

being remarkably free and light, so much so that a stick can in most places be thrust in by the hand to almost any depth, and in places where it has been necessary, in excavating sites for buildings or in roading, to penetrate to a depth of 8ft. or 10ft. the same character has prevailed, as shown by the roots of trees, both large and small, which even at this depth cross each other in every direction.

The size of the forest trees, far surpassing anything of the sort in the hill county in Ceylon, the absence of thick undergrowth and the number and variety of the ferns also go far to point out the richness and fertility of the soil.

CLIMATE AS REGARDS COFFEE.—The climate seems also very favourable to the growth of coffee and similar products, to judge by the thriving appearance of the young clearings on the hills and the native plantations, few however and far between, on the banks of the rivers and sea coast. Elevations seems to be a matter of indifference to the coffee tree here. In Johore Bahru, at the bungalow of the manager of the Maharajah's steam saw-mill, situated on a hill 50 feet or 60 feet high over-looking the sea, there are two or three coffee trees from eight to ten years old which are constantly loaded with crop, and this in spite of the fact that until a year ago when Mr. Watson pruned and handled them, they had been allowed to grow perfectly wild. I am told also that a few miles up the coast there is a small native plantation of coffee, the roots of which are occasionally washed by the sea at high water, in spite of which proximity they continue to bear apparently as well as if they were situated several thousand feet above it. This is doubtless as much due to the fertility of the soil as to the absence of long seasons of drought.

RAINFALL.—In the Peninsula, the rainfall varies form 4 inches to 18 inches per month, and it is rare, even in the hottest months, for a fortnight to pass without one or two light showers. In the wettest month also it seldom happens that the rain continues a whole day without intermission. At times it will rain a whole afternoon and the greater part of the night, but the morning is usually fine for a few hours when owing to the looseness of the soil but few signs remain of the previous rain, however heavy it might have been.

WIND.—Storms of wind are unknown in Johore and with the exception of occasional gusts the wind never rises above a breeze.

Means of communication are not as yet in a forward condition, but much has been accomplished and more is being done, and it is hoped that the railway from the town of Johore to the foot of G. Pulai, commenced by the Maharajah some years ago and formed for two-thirds of the distance, will be completed by the time the first crops are being gathered. At present this railway is being utilized as a cart road along a portion of its length. A cart road is intended to be constructed also in the Batupahat district, starting from the river and winding its way through the coffee estates for 8 or 10 minutes, while G. Panti will also be similarly favoured before long, it is hoped by the conversion of the bridle-road, now being traced and constructed into the cart-road it is ultimately destined to be.

LABOUR.—The labour question has, notwithstanding the efforts of the Maharajah and the planters, been the chief difficulty hitherto in Johore. At first, as is often the case on opening new estates, even in Ceylon, there was much sickness among the coolies, but this state of things has very much improved, and sickness had almost entirely disappeared when I was last up-country, the hospital established in Johore Bahru being empty.

Much delay in planting operations was naturally the result of this sickness among the coolies but now what with Malays, Chinese, and Klings, or Tamils and the energy displayed by Messrs. Watson and Falconar on Pula, and Batupahat, and Messrs. Dow and Mackenzie or Panti the work of clearing, planting and building, &c., is progressing rapidly, and the final completion of the 2,000 acres, more or less, already burnt off cannot be long delayed.

Altogether the prospects of the planters in Johore are very encouraging, and it is not difficult to foresee in a year or two, where the success of the new enterprise shall have been practically demonstrated by large crops combined with cheap labour and transport, a great rush from all parts to take the remaining available coffee land in the Maharajah's territory.—*Cor. Ceylon Observer.*

CACAO.

CACAO.

(To the Editor of the Ceylon Times.)

SIR,—In going through my shade of cacao clearing this morning, I came across one of many fine young plants nipped off close to the roots—my neighbour declares that this is not done by white ants, that the plants are first really killed by grub, and that the ants attack the plant immediately the sap ceases to flow, now this plant that was "felled" this morning was perfectly fresh, and by its whole appearance I could see that it had only just been bitten off. I searched all about the roots and round the plant, but could find *no grub*, and did find any number of white ants. I sent the plant and wrote at once to my friend and got for answer "I am convinced by long searching that primarily this bark was cut by grub, so staying the flow of sap which induced the ants to attack the tree;" convince a planter against his will, &c.

A.

Avissawelle, October 9.

CINCHONA.

THE CULTIVATION OF CINCHONA BARK TREES IN SOUTH AMERICA.

It is significant of the practical interest which the Dutch Government take in their Java gardens and the cinchona enterprise generally, that their Consul in Bolivia should have sent home the long and interesting report which has been translated for our readers from the *Indische Mercuur*, and which we, this day, republish. The Consul's information fully corroborates the statement made by Mr. Ledger to Mr. J. E. Howard which the latter embodied in the interesting paper read recently before the Pharmaceutical Society. Mr. Ledger made it clear that the very first attempt at cultivation in Bolivia followed on a suggestion he made to a bark cutter, so far back as 1849. This was in the same province of Yungas mentioned by the Dutch Consul, and so largely had Mr. Ledger's friend (and no doubt neighbours) profited by the Englishman's hint to plant the rich, but bare, cinchona forest-land, that in 1878 the cascarillero reported he had for some years been cutting on his own account from cultivated trees, as much as 100,000 lbs. of bark per annum worth, at least, 4*s.* a lb. Mr. Ledger's Bolivian friend also reported that he had tried the process of partial stripping rather than coppicing his trees, and found it to succeed fairly well, 5 per cent. being the average mortality among the trees so stripped, the bare part of the stems being covered with mud. The Dutch Consul takes us further back in his report, to shew the wasteful system under which the cascarilleros worked in the "days of old," in recklessly cutting down giant forest trees from the stems of which the bark was only partially removed, while the very valuable branch bark was entirely neglected. The great impetus to cultivation in Bolivia given in 1878 occurred, strangely enough, about the time the rush took place into cinchona planting in Ceylon, Southern India, and Java. The estimate is that, perhaps, half a million plants were put out in Yungas, many of them being planted on land ordinarily used for coca, cacao, coffee, or sugarcane. The maintenance of the cultivation therefore depends very much on the relative returns from these different products, and in most cases the Consul believes that "coca" will retain its pre-eminence as the preferable article of cultivation. Still the comparative ease with which, up to a certain point, the cultivation of cinchona can be extended in its native habitat in Bolivia, should henceforward be carefully considered. The florin being, for all practical purposes, the equivalent of the rupee (at 1*s.* 8*d.*) Ceylon planters can easily compare the estimate furnished by the Consul with their local experience. He gives, Rs. 130,000 as the cost of planting and cultivating 300,000 plants, up to their fourth year apparently. These plants, are put down in rows a 5 or 6 feet apart (1,500 to 1,200 plants to the acre), and shaded with bananas during the first and second year. Experiments made in stripping, according to the Consul, do not seem to have answered, for the cultivators say they perfer their old mode of coppicing one or two feet above the ground. We are left in the dark as to the return in bark or in the crops harvested from a certain area, but the value of the product is placed at from 5*s.* to 6*s.* 6*d.* per lb. One piece of news to us is found in the exportation from South America of "false cinchona bark" to the extent of 440,000lbs. per annum worth about 2*s.* 3*d.* per lb. from which "so-called quinine wine" is manufactured. Finally, it will be seen that in respect of cinchona cultivation in Bolivia or Perú, as in the case of coffee culture in Brazil, "*the labour difficulty*" is the rock ahead. The Dutch Consul informs us that the labour force in Yungas, for instance, is barely sufficient to work what he considers the much more certain and profitable "coca" plantations. There is, therefore, little reason to fear such competition from South America, for at least many years to come, as need deter cinchona planters in the East from doing justice to their plantations or from extending the enterprise wherever soil, climate, labour supply, and a reliable variety of plants are available.—*Ceylon Observer.*

CINCHONA NURSERIES.

(To the Editor of the Ceylon Observer.)

DEAR SIR,—Having seen a good deal of cinchona nurseries in different districts during the past two years, and having some practical experience of how miserably they fail to produce a return equivalent to expectations, it has struck me that amongst the various causes that such failures may be attributable to a want of due care in selection of seed, may rank as one of the most prominent and at the same time most easily

remedied. In cinchona clearings in Ceylon, are frequently to be seen trees not more than three or four years old, laden with blossom and looking very shock, too frequently a sure sign that they are about to die out. The seed from such trees may produce cinchona plants; but is it to be wondered if they turn out weak and sickly, dying off at an early age? There is I fear a very large quantity of such seed sold in Ceylon. What I would argue is that too great care cannot be taken in selection of seed for a cinchona nursery, the purchaser being very particular as to the origin of seed and age of parent trees. I believe this to be a point of far greater importance than the laying out of expensive sheds. I will even go so far as to express a doubt as to the necessity of going to the expense usually incurred in the laying out of cinchona nurseries, and some years, hence I believe nurseries for raising cinchona seedlings will be a thing of the past, and nothing will be used for cinchona clearings but self-sown plants. At present there are not nearly enough of such plants to meet the very large demand there is for cinchona, but might it not be sufficient in making nurseries, where practicable, to clear up a piece of jungle of all undergrowth, dig the soil well up, and sow under natural forest shade? There would doubtless be a large number of failures in such a nursery, but if only the best seed to be procured was used, I am inclined to believe quite as good, if not a better, return would be secured as is generally the case under the present system. I put forward the above opinions with all due diffidence, and shall be glad if I can only gain a due consideration for my theory from planters of ability and experience, even should the result be a unanimous condemnation of the heterodox opinions held by, yours faithfully,

SIGMA.

[Our correspondent is right generally, but we believe the drip is fatal to nurseries under forest shade. Grass, ferns, jungle branches, and coir mats, as shade, have resulted in plants whose strong roots atoned for less height above ground than those reared in sheds.—ED., *C. O.*]

CINCHONA ANALYSIS.

(To the Editor of the Ceylon Times.)

SIR,—I send you copy of analysis of some chips of cinchona *officinalis* recently received from Mr. Elphinstone as being what is called "dead bark." It appears to bear out your theory that retarded growth favours the secretion of quinine at the expense of the other alkaloids. It is called dead bark, I believe, because the trees have died in the ground; but to appearance, it was as fresh as dried bark from living trees.

	per cent.
White crystalline	
Sulphate of quinine	1·52
Amorphous alkaloids	
Soluble in ether	·77
Quinidine cinchonidine	
Cinchonine (by difference)	·45

In making the above determination, the quinine was separated in the white crystalline form, which is the only thoroughly reliable method when the bark is intended for the manufacture of sulphate of quinine.

According to some commercial methods of analysis, a greater or less proportion of what is here reported as amorphous alkaloids, would be regarded as quinia, whereas in reality it bears a relation to quinine very similar to what syrup does to sugar. Crystallisation of the quinine in the laboratory as sulphate, is the only adequate test of what can be crystallised in the manufactory. As the question is at present engaging attention, I would submit that the direct determination of the quinine in the crystalline form should be adopted in all our analysis of cinchona bark rather than the determination of the simpler alkaloid, and calculated of the amount crystallisable as sulphate.

It has two important advantages—greater accuracy, and the planter, merchant, and manufacturer know exactly what is meant.

M. COCHRAN.

Testing Rooms,

Colombo, 22nd September 1880.

P. S.—Since writing the above Mr. Elphinstone remarks:—"It is a most satisfactory analysis and bears out my expectations as to the value of *officinalis* grown at the height of ——estate. Doubtless the retarded growth is most favourable for the development of the quinine."

DR. MOENS' VISIT TO CEYLON.

DR. MOENS, the Java Quinologist, has come and gone. His stay was not sufficiently long to enable him to visit some of the most favoured districts in the Island, his tour being necessarily confined to Uda Pusellawa, Mataratta and the new districts on his way back on the return journey to Navalapitiya and Kandy. In Uda Puselawa and Bogoawantalawa, the learned traveller saw some of our best soil, and some of the finest specimens of cinchona to be met with in the island, of the *Officinalis succirubra* and the *Hybrid*. No one expected that Dr. Moens would have found the soil in Ceylon equal to that of Java, although the result of cinchona cultivation in certain of our districts and notably so on the Uva side of the country, is as satisfactory as in many parts of Java. The rapid growth and development of the trees were noticed by the traveller with admiration, and it is evident from brief notes left behind him, as well as from conversation with the proprietors of the estates he visited, he was well pleased with what he had seen in our fertile island. At the conclusion of this Indian tour on which he started yesterday, the Dr. will no doubt prepare a report of all that he had seen from notes taken during his journey, when he will be able to elaborate his ideas upon the comparative progress in the different countries he will have visited, and for the perusal of this document, we shall look with considerable interest.

The following very general remarks on his visit to the interior, are from our daily contemporary:—

"Soil, though very different from the Java soil, is very suitable for the growth of cinchona. Trees grow as well as they do in Java, and *officinalis* even better.

"Where trees are planted in suitable soil, they do not go out after some years. Where this is the case, it is due to bad soil,—or in some places to the exposure to wind.

"As to the elevation above sea level, the range is very wide. Succirubra grows best about 5,000 ft., but can be planted from about 3,000 to 5,000 ft. Ledgeriana grows in Java best from 3,600 to 5,000 ft., and It think' as the climate of Ceylon is much the same as that of Java, that the same elevation here will suit Ledgeriana best, Officinalis should be planted from about 4,800 to 6,500 feet.

"These are the best elevations, but they may, under favourable circumstances, be surpassed, either going lower or higher. 'There is nothing like trying,' but it ought to be done on a small scale at first."

It will be seen from the above remarks that Dr. Moens states the lowest altitude at which *Succirubra* may be grown, as 3,000, which is higher than has been believed to be the limit of *Succirubra* cultivation, and certainly it has not generally been considered that this variety can be advantageously grown as high as 5,000 feet, as though no doubt it may be grown higher in the Ourah districts than in others.—*Ceylon Times.*

THE CULTIVATION OF *CALISAYA*.

WE make no apology for reproducing, (on the next page,) a rather lengthy contribution to the *Pharmaceutical Journal* by Mr. John Eliot Howard, F.R.S., F.L.S., on the cultivation of Calisaya, a subject urgently and pre-eminently important at the present moment, when large areas both on the Nilgiris and in the Wynaad are being brought under cinchona. Whether the cinchona planter will derive a profit or a loss from his enterprise depends, in a great degree, upon the intelligence he brings to bear upon the subject of selection, one, unfortunately, that is not determined for him with precision, but in which he must act upon the best information available. Speculators are solicitous merely to cover an enormous surface with no matter what variety and trust to the existing *furore* to sell to advantage to some novice with more money than brains. Mr. Howard gives excellent advice when he says "that the only chance for Indian cultivation in the future consists in the choice of superior sorts and the efficacy of high cultivation." The varieties of the Calisaya are so rich in quinine that they are worth cultivating at almost any cost. Mr. McIvor, than whom no better authority can be quoted, thought this class of plants was unsuited to the Nilgiris because it developed a spindly and bushy growth, instead of attaining the proportions of a tree as in its native habitat. In the Wynaad, however, exist conditions of climate and soil that promise better success. Large numbers of the *Ledgeriana* are being introduced there at enormous cost. We have heard of planters paying as much as Rs. 500 per 1,000 for them, but many thousands of inferior sorts are also being put out, a procedure that may result in future disappointment.

The drainage difficulty is naturally solved for us and the danger from "wet feet" to Calisaya obviated by an undulating surface which carries off superabundant moisture so prejudicial to this variety. As regards high cultivation, there are happily few planters who believe that you can go on cropping for a series of years while starving the tree. We have an unmistakable instance near at hand of killing the goose that lays the golden eggs in the case of the Government Cinchona Estate at Dodabet. Since this property was opened it has been innocent of manure, while repeated crops of bark have been taken. The result is apparent in the overgrowth of lichens and the decay of the lower twigs of the trees. The condition of the plantation may not be irremediable, but the Government has demonstrated what is to be avoided rather than imitated.

Mr. Howard does not appear to be apprehensive of the supply of cinchona bark exceeding the demand, notwithstanding the millions of plants already and annually put down. The more delicate and valuable varieties of cinchona are subject to a mortality which will go far, in a few years, to confine the cultivation to the *bonâ fide* planter with perseverance and intelligence to cope with this serious drawback. Mr. Howard estimates the mortality at 90 per cent., and we have proof that it cannot be arrested

by any known means. A few years ago a whole patch of Calisaya, some five acres in extent, died out at Neddiwuttum without any visible cause for the same. It may be here as Mr. Howard affirms was the case with the plant that formed the text of his paper, that the roots struck into the gold and uncongenial subsoil. Whatever the cause this recognized mortality will contribute in no inconsiderable degree, to keep up the price of bark.

Of the astounding progress in cinchona cultivation in Ceylon. Mr. Howard takes but a gloomy view. His forecast for 1885 of the quinine market if correct, must be most disheartening to those planters who have neglected coffee for the more seductive prospects of cinchona. Doubtless much of our Nilgiri and Wynaad bark will be similarly noted as "rubbish," unless a sound selection is now made and the valuable varieties only planted. The cinchona planter, who hopes to be successful, must be constantly on the look out for sound and scientific information on the subject. The best mode of harvesting the bark is still in the region of experiment. Natural bark, mossed bark, renewed bark and root bark are matters that still puzzle the planter. It will not do for him to consign these questions to the future. He must decide at once, and on the meagre information available, or the loss may be irreparable. From Government we can get little, the generally received opinion being that as in the case of tea in the north of India, it has misled the planter, who is no longer disposed to follow its teachings. One precious document, hatched in the inner recesses of the Under Secretariat, is about at this moment to see the light. It is an epitome of Captain Campbell Walker's report on the cinchona Plantations, penned in 1878. Captain Campbell Walker denies its paternity and as the public are ignorant of the original, it is not in a position to judge of the bantling. This officer, however, is not disposed to permit a spurious production to be given to the public in his name, and the public after a bitter experience is not disposed implicitly to follow the teachings of a Government, unmistakeably in the position of the "blind leading the blind."—*Ceylon Times.*

MR. JOHN HOWARD ON THE CULTIVATION OF *CALISAYA.*

THE death and *post mortem* examination of a small tree of *Calisaya anglica* will furnish a suitable introduction to some comments on the subject of this paper.

I append a photograph of this tree taken in the autumn of 1879 ; form which it will appear that it was in luxuriant health a few months since. On returning home last month, I noticed a very unfavourable change in its appearance, and detected some white spots on the bark arising from fungus, which I knew from previous experience to a fatal indication of disease. On further examination I found that canker had invaded the plant to a serious extent ; and after trying in vain some heroic remedies, I determined to root up the callisaya, and if possible gain some useful information as to the cause of its death.

The age of this small tree was eight years. The height between seven and eight feet, but would have been much more, had I not been compelled to cut off the top some years back in accordance with the requirements of my conservatory.

Before doing this, I succeeded in taking a strip along this upper portion, and renewing the bark under moss as practised in India. The girth of the stem at the base was 9½ and inches about 6¼ inches at the submit (where cut off). The result of the analysis of the bark of my tree was as follows :—

Calisaya Anglica Quill=1·25 Sulphate of Quinine, 0·70, Cinchonine, 0·15 Quinidine.

Calisaya Anglica Stem Bark=3·20, Sulphate of Quinine, 1·50, Cinchonine 0·32 Quinidine.

Calisaya Anglica Root Bark=3·95, Sulphate of Quinine, 1·00 Cinchonine, 4·00, Cichonine 0·27, Quinidine.

This must be considered satisfactory for a tree grown under glass in England.

I send the lower portion and also the renewed summit for inspection, together with some pressed leaves showing the character of the foliage. These were taken off just before the tree was rooted up ; and I may notice as a feature of the disease, that the petiole separated with a brownish scar, the leaves falling as those of deciduous trees in autumn.

As regard the cause of this complaint, which seems generally to supervene after my cinchona plants have attained a certain age (say, as in this case, about eight years), I was not able to learn anything very definite. I suspect that the oxidation of the cinchotanic acid may take a wrong direction,* and instead of contributing to the formation of alkaloid, may produce the brown discoloured patches which extend upwards from the roots through the midst of the bark ; but the source of the mischief seems to be in the roots themselves, the small fibrillae of which perish. It has been supposed that this arises from a redundancy of moisture ; but I have two fine plants of calisaya, one of the *vera* (published as such by Sir Jos. D. Hooker) the other of *Ledgeriana*. These have shown yet no signs of the malady, though growing in the same bed of earth.

* It is important to seal up any accidental wound or amputation, otherwise the sap around is liable to injury. J.

I learn from the report of a recent visitor to the plantations in Java* that they have there 'no canker and few trees die from wet feet, for the land is elaborately terraced before it is planted with cinchona.' 'The Ledgeriana grow best in the soils of that country.' The great superiority of the Java soil possessing as it does such abundant elements of fertility, is particularly noticed. 'The weeds which are very abundant are cut down three times a year, and left to decompose, forming an additional source of fertility to the plant ; whilst in their very growth they are supposed to be useful. They keep the soil together, they catch and retain the rain and dew, prevent wash and hinder the rays of the sun from beating down on the bare face of the soil and keep it in the condition nature intended it to be in. They are also a safeguard, for if you denude large tracts of country of every kind of vegetation, except the one kind you are cultivating, you concentrate on the devoted head of your favourite type of vegetable life, all the attacks of all the enemies of vegetation which float in the air or which burrow in the ground.' So much in the defence of the weeds ; but it must be borne in mind that let them consume as much as they can there still remains enough and to spare in its richness ; 'neither the coffee nor the cinchona could possibly look better or grow more luxuriantly if they had all the elements of the soil to themselves without any contest or opposition.' In the opinion of this observer the tree will find no spot in Ceylon, excepting‡ a few parts of Uva, capable of affording it anything like the nourishments it requires to develop a bark yielding on analysis such magnificent proportion of the best alkaloids.

Too much stress, however, ought not to be laid on this peculiar advantage, for on the Nilgiris, though the trees grow bushy and spindly in habit, the quality of such bark as was yielded appeared to us excellent. Quite recently also barks of Ledgeriana has been sold in the London market (said to be from Darjeeling at the high price of 14*s.* 8*d.* per pound. The development in that climate was apparently slower, but its looks as if trees in their full maturity might rival those from Java. In this latter region it appears that 'no stem or root bark is ever exported that is not the produce of a tree at least eight years old and generally of still greater age.'†

At this age, Mr. Moens, calculates the average yield for officinalis to be 2lbs. per tree, against 4lbs. from Ledgeriana and 6lbs. for succirubra. Ledgeriana is the prince of all, for it appears that even at the low average price of 6*s.* per lb., the thirteen years old plantation, if now rooted up, would yield an average of at least £2,000 per acre. Mr. Moens make it £4,000. But there is no idea of rooting up trees which, under the processes of gradual removal and renewal of bark, will yield a perennial flow of wealth. In this respect the management appears to be much better than in British India. Mr. Moens says : 'Our 8½bouw of Ledgeriana has given within thirteen years till now 34·619 half kilograms, say 38·800 English pounds, by thinning, coppicing, and scraping.' 'And if you saw the gardens at present, you would ask where this bark had been taken, as the plantation is quite close and regular. We took only what was too much, and would hinder the growth of the finest trees.'

The size of these finest trees is remarkable. They speak of a succirubra tree of fourteen years old, 63 feet high, and 3½ feet in girth ; a calisaya tree seventeen years old, 60 feet in height and 3 feet in girth, and a Ledgeriana thirteen years old, 48 feet high and 3 feet in girth.

I will now contrast with these results others obtained in the native country of the calisaya, in consequence of suggestion of Mr. Ledger, who thus records them in a letter to me under date December 10, 1879—

In December 1849, I was at the farmhouse of a contractor of mine for delivery of a large quantity of bark, in the Yungas of Bolivia. When conversing one evening on the distance that bark had then to be brought out of the forest to where we then were, my friend observed, pointing to the slope of a high mountain on the opposite side of the gully or canon : 'In my father's time, and when I was fifteen or sixteen years old, from the sides of yonder mountain (*cerro*) we were for two years cutting the best bark I ever saw, almost all was 'rojo.' I then said : 'Such being the case why do you not then plant there 10,000 or 20,000 plants ? It is your own property, and, living near, you would in that way have a good fortune for your children.' He did plant some 6,000 by March, and in the following year 10,000 more. In reply to inquiries, his letter of September 1878, I only received in August last. He says : 'Not only I, but all the family have very good reason to remember your visit to San Jose. Since 1875 we have cut 500 quintals of bark yearly, and owing to demand, have sold at an average of 200 dollars per quintal (equal to 4*s.* per lb.), and there is "cascarilla" (bark) in abundance for ten years. We have planted many thousands of trees since you gave us the idea,—and the same has been done in Sorata.' "

I have much reason to believe that the supplies thus obtained have found their way to the English market, and that the details above given are correct. These, it will be observed, indicate a lower average quality than that of Java. This perhaps coincides with a more rapid growth of the trees, for Ledger's correspondent says : "We have not weighed the bark taken from each tree," which, however, must be much older than those in Java ; "yet I should say that many yielded 3 or 4 quintals of the three classes, *tabla, charqui* and *canuto*. The bark is not all of the best though every plant was picked."

* *Ceylon Observer*, June 17, 1880.
† *Ceylon Observer*, June 17, 1880.
‡ *Ibid* June 12.

In a subsequent letter, the same correspondent says : ' For some eight years we have stripped half the bark off some thousands of trees ; about 5 per cent. die. At first we covered the wound with plaintain leaves for a year or fifteen months. We find now it is best to plaister the stripped side with mud (barro) mixed with plenty of chopped straw of grass, and it answers admirably. When the new bark is well grown, the mud covering falls off.

I do not think any of this bark (as imported into London) has had the appearance or [illegible]sted the richness in alkaloid of the true Ledgeriana[illegible]ced, Mr. Ledger says : ' I feel convinced in my own mind that no white man would or could succeed in getting splendid seed as my faithful Manuel did. In fact, and as the good [illegible] fellow repeatedly told me, he got seed from particularly fine old trees that we had together seen and sat under. The splendid old tree in Fr. Simon's yard we often (in 1850-51) used to look up and wonder the age it could be. It was covered with silvery bright pink moss.* We put its age at over five hundred years. I have often calculated with Manuel that it would yield fully 15 qqs. dry bark of the three classes.'

It was in this district probably that Dr. Weddell obtained the specimens I have referred to in my ' Origin of the *Calisaya Ledgeriana* of Commerce, as in the years above referred to Mr. Ledger says they were together in the above districts. I do not believe these were exactly identical with the Ledgeriana, though approaching very nearly to it.

The specimens given to me by Dr. Weddell were as follows :—

Calisaya viride	}	Prov. de Yungas, 1851.
" zambita		
* " morada		
" morada		Prov. de Larecaja, 1851.

Ledger thus describes † what calls the " rojo " :—" When in flower the leaves are red underneath. When the seed is ripe and the leaves falling they are a dark purple. Old trees in particular have one the branches a species of rough moss of a brilliant scarlet colour."

This is called *Hypochnus rubrocinctus* and is represented on the Calisaya in Goebel's *Pharmaceutische Waarenkunde*. It used to be looked upon by dealers in London of a necessary indication of the best calisaya. Ledger also speaks of the red and dark green leaves as peculiar to this cinchona " I have often " he says, " seen, when in the yungas, from the fork of a high tree the *manchas* far away devoted most clearly by the wind discovering the red colour under the leaves." Mr. Ledger sent me in 1877, specimens of calisaya, two of which were of the ' rojo ' sort with white flowers ; but all were unfortunately lost in transit. The white flowering calisyas would probably be the true Ledgeriana, and gathered near the banks of Mamore ‡ I am more and more inclined to think that the true Ledgeriana belongs to Eastern Bolivia, to which district the River Mamore belongs. It will therefore be understood that the cultivation in Bolivia although comprising fairly good qualities of calisaya is not that of *Ledgeriana*, nor can it yield such remarkable results.

(To be continued.)

CINCHONA CULTIVATION IN JAMAICA.

(From the Colonial Standard and Jamaica Despatch.)

PRESSURE of matter has made it impossible for us to take earlier notice of the Planting Memorandum by Mr. Morris, Director of Public Gardens and Plantations, which appeared in the Government *Gazette* in connection with Account Sales of cinchona bark from Jamaica—sold at public sale for account of the Crown Agents for the Colonies. The result of the sale and remarks thereon are highly gratifying to all who have taken an interest in the establishment of the cinchona enterprise in Jamaica, and our readers will understand that we experience special satisfaction at the measure of success that has already been attained, inasmuch as this journal from the very beginning, expressed confidence in the practicability and profitable issue of the new industry, and did all in its power to remove the doubts, fears, and prejudices of those who condemned the enterprise and described the amounts expended in forming the plantation as money recklessly misapplied and ruinously wasted. Now that the successful cultivation in this colony of an important article of commerce has been fully established, we think it right to make suitable acknowledgment of the shrewd perception and resolute purpose displayed by Sir John Peter Grant in discovering the adaptability of the soil and situation of our Jamaica mountains to the cultivation of a valuable product which is particularly fastidious in regard to the requisite conditions of elevation and climate, and in making prompt and ample provision for the maintenance of the necessary nurseries and plantations and for giving the experiment a fair trial. It becomes us, too, at the present moment, to do justice to the energy, ability, and zeal of Mr. Robert Thomson* who underwent, so to speak, the burden and heat of the day in being called upon to assume the care and responsibility of the initiatory and tentative measures and proceedings which form such an important portion of the elements or conditions of qualified to perform the duties of an important position, and more especially to make his knowledge and experience the means and instruments not, only of advancing the scientific character and prosperity of his department, but of bringing the facts and bearings of the great natural capabilities of the colony within the practical ken and use of the general community. In the memorandum which accompanies the account sales of the last consignment of cinchona bark, Mr. Morris gives a plain, explicit statement of the results of the sales, the relative merits of the different species and the prices obtained for them, the elevations best suited for the cultivation of the several kinds of bark, and the cheapest and most effective process of drying the bark prior to shipment. The account sales, we observe, refer to a fourth consignment, but we are informed that a subsequent consignment of 6,000 pounds was despatched from the plantations on the 24th June, which would close the shipments for the current year. Up to date, not including the last consignment, the Director of Public Gardens and Plantations gives the following as the results of the cinchona sales :—

Quantity of bark shipped	...	...	21,099lbs.
Gross amount realized	...	...	£4,066 17s. 11d.
Net sum realized	...	...	£3,890 11s. 8d.

The *Cinchona officinalis* is, according to Mr. Morris' memorandum, by the far most valuable of the three kinds of bark forwarded to the Home market. For the sake of clearness and brevity, we transcribe the following remarks from the memorandum: " The prices realised were the highest yet obtained for grey bark, *viz.*, 7s. 6d. per lb. for "good quill" or trunk bank. Root bark sold at 7s. 9d. and 8s ; and twig 2s. 9d. per lb. The average price for the various qualities of grey bark *(C. officinalis)* was 6s. 5½d. For yellow bark *C. calisaya* the prices realized were 4s. 6d. and 3s. per lb.

For Red Bark " good quill or trunk bark realized 3s. 6d. and 4s. 4d. per lb. Root bark 3s. 4d., 3s. 7d., 3s. 8d., and 3s. 10d., and twig bark 1s. 3d. per lb. The average price for the various qualities of red bark was 3s. 10d. per lb. The average per lb. for the whole consignment was 5s. nearly."

The grey bark, (*C. officinalis*) as Mr. Morris remarks, " still maintains its position as the most valuable of the three," but the grey bark, like all precious commodities or products, is subject to harder and more restricted conditions of cultivation than the cheaper and more common species of cinchona. It is natural that all who wish to try their hand at the new enterprise should prefer to commence the experiment with the remunerative grey bark, but it must be borne in mind that it can be successfully cultivated only at high elevations ranging from 4,500 to 7000 feet—a circumstance which, of course, considerably limits the area of productive cultivation and the scope of industrious effort. The cultivation of cinchona seems to be analagous to that of coffee in respect of the effects produced by difference of elevation; the finer quality of each showing a special adaptation to the high mountain ranges, while the less valuable kinds flourish in greater abundance at comparative low altitudes. It is pleasant, however to know, that Jamaica enterprise will meet with a very satisfactory remark if it turns its attention to the red bark (*C. succirubra*) which Mr. Morris states ; " can be successfully grown at all elevations above 2,000 feet," the results of the sales showing that Jamaica red bark," at ten years old, is equal to the best produced either in South America or the East Indian plantations. It is right, too, to bear in mind that there is a considerable acreage of land possessing the requisite conditions for the successful cultivation of the " grey bark," and it is no small incentive to those who have the means and opportunity of planting this species, to be told that, " at the prices above mentioned grey bark," grown at elevations of from 4,500 to 7,000 feet would realise at the close of 8 or 10 years, at the rate of £500 per acre." Cinchona cultivation has, thanks to the energetic and enlightened efforts of Government, been proved to be a genuine success in Jamaica; and it now behoves private capital and enterprise to follow up the work so auspiciously begun, and add another valuable product to the unrivalled staples of the Colony.

EXTRACT FROM MEMORANDUM BY THE DIRECTOR OF PUBLIC GARDENS AND PLANTATIONS.

It is evident that where the grey bark can be successfully cultivated, it is likely to prove the most productive of the kinds at present under cultivation in Jamaica. At the prices above mentioned grey bark, grown at elevations of from 4,500 to 7,000 feet would realise at the close of 8 or 10 years, at the rate of £500 per acre.

But by a careful system of planting and cultivation, a first return should be realized from prunings and thinnings, at about the fifth year. It will be noticed that at the recent sales twig bark of this species realized. 2s. 9d. per pound, which fully bears out the possibility of an appreciable income from cinchona plantations before the trees are actually cut down or coppiced.

With regard to the red bark, (*C. succirubra*) which can be successfully grown in Jamaica at all elevations above 2,000 feet, the results of these sales show that Jamaica *Red Bark*, at ten years old, is equal to the best produced either in South America or the East Indian Plantations. If cultivated in or near coffee lands, or in moderately sheltered situations where the soil is not clayey, this bark on account of the extensive area available for its cultivation in Jamaica would become, in time a most valuable product.

The yellow bark, the produce of trees which have hitherto passed at the Plantation as *C. Calisaya*, is evidently not the true yellow bark of commerce . The prices realised, viz. 4s. 6d. and 3s. per pound though

* A tree of *Hasskarliana* aged seventeen years gave Moens 95 lbs. of dry bark.—*Ceylon Observer*, June 14 1885. *Pharmas Journ, and Trans*, March 13, 1880.

† In letter November 24, 1875.

‡ See Ledger's letter December 22, 1874.

* This is the gentleman who has just gone on a visit to the Cinchona Forests of Bolivia with, among others, a commission from the *Ceylon Observer*.—Ed., *C.C.*

success on which every new undertaking, to a greater or less extent depends.

We are pleased to find in Mr. Thomson's successor, Mr. Morris, a gentleman who by his technical training and broad liberal culture, is admirably good, point to the conclusion suggested indeed, by their appearance in the Plantations that these trees are probably a hybrid variety between *C. officinalis* and *C. succirubra*. As they appear to thrive at the same elevations as *C succirubra*, their cultivation will be kept up for further trial. In the meantime efforts are being made to introduce the true yellow barks from Java and India, and establish their cultivation in Jamaica.

The most encouraging feature in the present sales is the fact that all the bark despatched in April was "sun-dried" bark. Considerable discussion has taken place during the last six years in India, Java, and Ceylon with regard to the proper method of drying cinchona bark. Some maintain that under exposure to strong sunlight the bark deteriorates and loses some of its valuable alkaloids. On the other hand the advocates of "sun-drying" affirm that in order to preserve the chemical components of the bark intact it should be dried as rapidly as possible before any internal fermentation takes place. As cinchona bark could not be dried here *artificially*, except at a considerable cost, it was most necessary to test its value when dried by full exposure to the sun. The result as shown by the present sales, is most conclusive. In competition with artifically dried and other barks it is satisfactory to find that Jamaica "sun-dried" bark obtained the *highest drices*. It may therefore be safely assumed that cinchona bark cannot be dried too quickly or too thoroughly. To this might be added that it should be packed *perfectly dry* and despatched with as little delay as possible.

TOBACCO.

TOBACCO CULTIVATION IN CEYLON.

TOBACCO, says the *Ceylon Times*, is by no means a new introduction into this country, but lately the cultivation has received an impetus by the introduction of the finer varieties of leaf, and it is now certain that in the drier parts of the island a leaf may be picked retaining all the characteristics of the more delicate kinds. In Badulla tobacco was formerly grown to a considerable extent, and the Badulla cheroots were well known and justly appreciated; now-a-days, however, they are rarely, if ever seen, and the cultivation has been to a very large extent allowed to lapse. To Messrs. Tytler and Ingleton is due the honor of having taught the Doombera villagers how to roll cheroots, and the Doombera tobacco, although a coarse kind is so well cultivated, and the cheroots so carefully rolled, that they are now universal favorites throughout Ceylon, it is, however, evident that no high district in Ceylon will ever compete with India, or turn out leaf that can do more than partly supply the local market. To ensure a fine and delicate tobacco, a certainty of long dry months is absolutely necessary, and irrigation and heavy manuring, or at least a considerable acreage of virgin soil are also indispensable to ensure the best tobacco. In Jaffna most natives have a small patch of tobacco round their houses which is watered and tended carefully through the hot months, and the ground is manured very heavily before the young plants are put out, the leaf being worth some 31 cents, a lb. If the natives would use care in selection, there is little doubt but that Jaffna, and a large portion both of the Northern and Eastern Province might as easily be made to produce a high class of tobacco, and not the coarse leaf which is now the speciality of the Northern Province. Some time ago a friend of the writer introduced Maryland tobacco, and found that his few experimental plants thrived well, and the leaf assumed the light golden color, and the soft texture that is peculiar to the variety.

Let the Tamils, who have shewn themselves to be enterprising and industrious, give full consideration to this subject, remembering that a leaf that has the qualities mentioned is worth 72 cents, a lb. being three times as much as the present Jaffna leaf, and for their guidance let them study the following rules written by one of themselves in the Madras report for 1874.

TOBACCO.—" The plantation should have the advantage of plentiful irrigation. Such water may be somewhat brackish, as brackish water is preferable to any other. The well must be such as to afford a constant supply of water. There should be no fear of failure in this respect. Sometimes it is quite impossible to say the quantity of water required for irrigating land as so much depends on the weather climate and the quality of the soil and sub-soil. The maximum extent of land that may be safely irrigated by one ordinary spring well, about 8 feet in diameter is two cawnies. Sometimes tobacco is cultivated on the bank of a river; it grows on such land without much manure being used. The rich alluvial deposit that is accumulated there becomes an active agent in stimulating the growth of the crops. The produce so raised by means of fresh water is not esteemed for its flavour, so much so as the other raised on land irrigated with somewhat brackish water. The drawback incidental to such plantation is ravages of gubar. They attack the plants when they grow vigorously. Unless active measures are taken towards their destruction on their very first appearance the crops are seriously injured. Pick them off and kill them; this is the best preventive.

Copious falls of rain when the crops are near maturity are sure to impair their quality, for such moisture wastes the clammy exudation that form over leaves through the pores. Rainfall is highly beneficial to the crops when young.

One great point to be kept in view is to reap the crops when they have attained full maturity. The tobacco is never worse than when the plants are cut before they are matured.

Plants when cut down should be exposed to the rays of the sun for a few hours only to deprive the leaves of their bitterness, and not so long as is done in some places

The main object that should be kept in view while the curing process in being conducted is that the tobacco should be caused to sweat well and ferment of heat moderately.

My cultivation has been thus :—

While the ploughing operations were thus under progress, a separate small plot of high ground of rich soil was selected for seed-bed; this was well dug up, stirred and loosened and manured with well-decayed manure, and then smoothed. The plot was divided into twenty-five beds. The seed was sown on the 14th or 15th November. On the eve of sowing, the beds were moistened and rubbed over by the hand with a mixture of decayed cattle-dung and water. As the seeds were extremely small, they were first mixed largely with dust and then sown by sprinkling them over the surface. The beds were then covered with straw to protect the seeds from the heat of the mid day sun, because the excessive heat of the sun affects the germinating power of the seeds. The seed-beds were then watered very sparingly till the seeds germinated. The water was poured along the borders of the beds so carefully and gently that its motion might not disturb the fixture of the seeds. The seeds germinated in between five or six days, then the covering straw was removed. The seedlings were fit for transplanting when they had four or five small leaves, or when their stocks had attained sufficient vigor to stand against any fall of rain when transplanted Before they are pulled up from the beds the main thing that requires to be attended to is to divide the prepared field into small plots separated by ridges. Each plot so formed is twenty feet long and three-and-a-half wide. After the formation of the plots they are stirred, loosened, and levelled, and then marked out in rows at a regular distance, one half foot from one another, in those rows small holes were dug at a distance of one half foot from one another to insert the seedlings; after this was done the seedlings are pulled up out of the muddy soil from the seed-beds. The day before they are pulled up care is taken to keep the soil of the beds sufficiently moistened, so as to allow of the seedlings being pulled up easily. The seedlings are carefully taken up by the hand without shaking off the earth adhering to the roots. Particular care is taken that the roots be not in any way injured. They are then placed in baskets and conveyed to the prepared field, where they are inserted in the holes. The time chosen for planting is the evening. The roots with their adherent earth are carefully and completely buried up to the bottom of the stem. The holes are moistened before setting the plants; a single plant is placed in each hole with the exception of 100 holes, wherein double plants are inserted. The object of this is to replace such of the single plants as may have withered and perished, should, however, none of them perish, one out of each of the two plants inserted in the reserved 100 holes is pulled up at the time of first weeding and thrown away.

Now great attention to watering the plants is required. They must be watered regularly every alternate day, care being taken that they are watered sufficiently. The hollows found close to the plants occasioned by the action of the watering are carefully filled up.

Now the soil is hoed about the plants very carefully for the purpose of eradicating weeds; after the removal of the weeds the soil so hoed is exposed to the influence of the sun and then the plants are not to be watered for two or three days. The holes are then repaired and the plants are watered again. Ten days subsequent to this operation a second weeding is attended to.

From the day of planting the seedlings up to the date of second weeding, embracing a period of 25 days, the plants are watered from pots. On the twenty-first day small hillocks of earth are formed by drawing the soil around the plants, and then they are watered from a well by means of a picottah. The water is allowed to flow by passing through small channels cut through the fields. The water so used is somewhat brackish, It is a matter of paramount importance that great regularity and punctuality should be observed in watering.

When the plants grow vigorously they are liable to the attack of insects; sometimes the insects make sad havoc with the crops. The crops are examined every morning, and the insects found on them picked off and killed. The insects retire from their lodgement on the plants when the day becomes sunny, and lurk about out of sight

Sixty days after the transplantation, the plants begin to throw flower shoots These shoots are nipped off, so as to prevent flowering; were it not done, they would draw from the plants the sap that is essential to nutrition.* The stems that spring from the main stalk are also pruned off a few plants are left for seeds; the heads of these are allowed to shoot to their full length

The plants grow to about 25 inches in height, and the leaves to about 21 inches long and 8 wide.

The plants are known to be ready for cutting by exhibiting a hairy clammy exudation which forms over the leaves, giving them yellow blotches or spotted appearance. If the leaf be then tasted, it will be found to have a mixed sour and bitter flavour."

Registered No. 182.

THE

INDIAN AGRICULTURIST.

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT,
Proprietor.

Calcutta, 1st Feb. 1876.

CONTENTS:

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

CORRESPONDENCE.

REPLIES TO CORRESPONDENTS.

THE "KIKAR" TREE ; MANGO GRAFTS ; RED ANTS IN COFFEE ; YIELD OF COCONUTS ; CORUNDUM.

TO THE EDITOR.

SIR,—A press of work prevented me from replying to information asked for in your issues for November and December 1880, so I take this opportunity of replying to those as well as to that contained in your current issue. I do this in one letter to save space in your journal, and to relieve myself of the necessity of writing several letters.

In reply to the request contained in last November's issue from W. S. Howland, Mundapasalai, South India, I write to say that the botanical name of the Kikar tree is *Acoacia Arabia*, known popularly in English as Babool, and in Tamil as *Kuroom Valum*. This tree grows almost throughout South India, and your correspondent will have no difficulty in procuring the seeds in his own, the Madura district, by its Tamil name; should any difficulty arise, and your correspondent would care to apply to me direct, I wi[illegible] have the seeds collected and sent to him. The Babool is a very [illegible] tree ; its gum is used as a substitute for Gum Arabic ; its bark is not only used in native medicine, but also for distilling the country arrack and for tanning purposes. Its wood is strong and useful for many household purposes, whilst its seed pods are always sought for by shepherds, to feed their sheep and goats with. The Babool grows rapidly into a handsome tree, when cared for, but its drawback is that it is very thorny. There is another tree, also known as the Kikar, the *Accacia Loncophlaa* or *Veloaylum* (Tamil,) which resembles it much, except that the general appearance of the tree is much lighter ; it is put to all the same uses as the *Kuroom Valum* and also abounds in the south.

In reply to your correspondent LANGRA, in the same issue, I write to say that there are a large variety of graft mangoes to be had in the Madras Presidency, and some very fine fruits are produced about Madras, North Arcot, Salem, Bangalore, and other places, under a variety of names—such as Peter, Pussund, Dil Pussund, &c. Mango grafts are prepared for sale at most of these stations ; at Madras eight annas is asked for each plant, in North Arcot four annas, and at Salem as much as two rupees for each is asked, I believe. In Bangalore a gentleman has gone in for an extensive graft mango plantation which was valued at some lakhs of rupees, and not long ago one-half share was in the market for sale.

With regard to the question about red-ants in coffee, in your issue of December last, I fancy the red-ant referred to there is what is known among naturalists as the *Formica Smaragdina*. I would suggest that old flannel or woollen cloth rags saturated with carbolic acid oil (1 to 20 parts) be suspended about the infested trees. I would also pour some of the carbolic oil into their leafy nests, and in the course of a few days they will vanish from the locality. Your correspondent states that he has tried carbolic acid, &c., already ; but I would ask him to try it again, after the manner I have suggested, for a week or ten days, and report the result.

With reference to the question put by your correspondent, M. Hammiell. I have counted over one hundred coconuts on a single spadix (bunch) ; such bunches were exhibited at the Agricultural Show at Chingleput some years ago, and I have also seen them at the Madras Agri-Horticultural Show, but they did not attract attention and were looked upon as curiosities. As a fact, in a well tended cocoanut plantation, the average is from 100 to 150 nuts per annum per tree. The natives value the produce of a coconut tree at one rupee per annum, and at this rate they are contracted for at Madras and elsewhere, either for the sake of the nut or for drawing toddy. Toddy drawing always pays best, though the trees suffer from exhaustion, where they are not freely irrigated. A cocoanut tree is believed to throw out a flower spathe every month, or twelve in the course of the year.

In your current issue for January, a writer inquires about Corundum. This mineral is supposed to be the hardest known next to the diamond

It is met with in most parts of India, as well as in parts of Europe, and is chiefly used for polishing gems, marbles, and metals. In the Madras Presidency it is used as grind and whet-stones, hones, rag-stones for sharpening knives and other cutting implements. In Tamil it is known as *Curungi Kullou*, and in Hindustani *Curonj*. It is in general use among sepoys for cleaning and polishing their arms, &c. There are several varieties of Corundum extant; one of these is known as emery, and is extensively used in Europe for grinding and polishing metals, glass, &c. Picked stones will fetch from £10 to £20 the ton in Europe, but the natives sell it by measure. For further particulars I would refer your correspondent to Balfour's Cyclopædia, 2nd Edition, Vol. 1, article Corundum, which gives a full and exhaustive account of this mineral; it is too long to extract here.

JOHN SHORTT.

The Retreat, Ercaud 15th January 1881.

ABOUT PAPER FIBRES.

TO THE EDITOR.

SIR,—In my previous letters I have referred to three classes of fibrous plants available for paper material, *viz.*, the grasses or sedges:—those produced from what are termed herbaceous plants, of the nature of hemp, flax, and jute, and those derived from siliaceous or bromiliaceous plants such as aloe, yucca, pine-apple, and the Musa tribe (Plantains). I now desire to direct attention to another class of fibrous products, termed bark fibres, some of which offer a fair prospect of being profitably utilised for paper-making material. This, however, will depend on the assurance of a continuous and reliable supply in quantities sufficient to make them a recognised staple in the market. Having been enabled to test some of this class, samples of which are now deposited in the museum at the Royal Botanical Gardens, at Kew, I give the results of my experiments abstracted from the "*Official Report*, 1879."

"*Indian Forest Fibres.*—The important collection of Indian forest "products transmitted to Kew by the Indian Forest Department "included an extensive series of bark fibres; specimens of these were "placed in the hands of Mr. Routledge of the Ford Works, Sunderland, "to whom Kew is under constant obligation for information and "assistance in connection with the paper manufacture. He was good "enough to test them all as regards their yield when converted "into rough (paper) stock, and he has furnished us with the follow-"ing report":—

	Green yield.		Bleached.	
"1. *Banhinia Vahlii*; excellent strong fibre hemp character and tough	60	per cent.	54·7	per cent.
"2. *Bombax malabarica*; coarse, harsh, woody; tender and short, bleached ...	48	,,	37·5	,,
"3. *Butea frondosa*; very coarse and woody; rotten and short, bleached	56·25	,,	37·5	,,
"4. *Carcya arborea*; coarse, rather harsh and woody; somewhat tender, bleached ...	47	,,	45·3	,,
"5. *Eriolæna Hookeriana*; very strong but harsh; better felting property than 8 to 12	50	,,	42·8	,,
"6. *Ficus Bengulensis*; fairly strong and fibrous; rather tender, bleached ...	61	,,	54·7	,,
"7. *Ficus infectoria*; good, strong, and fibrous; fair quality, bleached	51·7	,,	51·5	,,
"8. *Grewia tiliæfolia*; strong, harsh, wiry, hard; same bleached	50	,,	43·7	,,
"9. *Helicteres Isora*; very strong, green; better than 8 and 10 to 12, bleached ...	68·8	,,	61	,,
"10. *Sterculia colorata*; similar to 8 and 11, harsh and wiry	60·7	,,	59	,,
"11. *Sterculia urens*; similar to 7, rather better	59·8	,,	47	,,
"12. *Sterculia villosa*; similar to 8, 10, and 11...	60	,,	51·5	,,

"Of these fibres No. 1 is decidedly best, possessing the characteristic "of strong linen rags, *i.e.*, of coarse flax and hemp; the raw bark is "worth £7 to £8, possibly £9, per ton; the bleached stock £20 to £22.

"No. 7 is the next best bark, worth £6 to £7 per ton raw. None of "the others are of much value for white papers, excepting perhaps "Nos. 5 and 9; say £5 to £7 for No. 5, and £5 to £6 for No. 9. It "would, however, be necessary to make a practical working trial, that "is, to make paper from all of them (excepting No. 1) before pro-"nouncing positively as to value: No. 1, I believe fully worth what I "have appraised it at.

"All of these raw barks required a very large dose of bleach to bring "them to even the low colour they are. No doubt opening them out "by willowing or teasing them, both before and after boiling, would "materially improve them. I do not consider, with the exception of "Nos. 1 and 7, it would pay to import them from India.

"*Broussonetia papyrifera*. The bark of the well-known paper mul-"berry supplies the material from which the *Tappa cloth* of Polynesia "and the bulk of the paper of Japan and China are manufactured. The "Japanese cultivate the plant very much in the same way as we grow "Osiers, and they use only the young shoots for the manufacture of "paper. A sample of the bark which came into the hands of Mr. Rout-"ledge is stated by him to be 'nearly if not quite the best fibre I have "seen' . . . 'I must admit it is even superior to bamboo" . . . . "It "requires very little chemicals, and gives an excellent yield—62·5 per "cent in the grey *i.e.*, merely boiled; and 58 per cent bleached."'

It may be well to add that the employment of the native *Dhenkee*, as recommended by Dr. Royle, with the addition perhaps of soaking in hot-water, and without recourse to the use of chemicals, may materially reduce the bulk of this class of bark fibres; otherwise, from their bulk as collected, the cost of carriage and frieght would (with some exceptions) be almost prohibitive; the presence also of the rough and, generally speaking, dark colored outer portion of the bark which is useful for paper-making would deteriorate their value. The employment therefore of the *Dhenkee* or some similar appliance to reduce them into the condition of a rough stock would be desirable if not necessary.

Some of the "Barks" of the "*Lace Bark*" tribe—the "*Daphne Cannabina*," or "*D. Lagetta*" common in Nepaul, the "*Broussonetia*" and others of the "*Morus*" or mulberry tribe—would, I feel assured, pay well for cultivation, and as the clean bark merely requiring stripping from the season shoots, with the outer skin removed, would be readily prepared for, and would fetch good value as paper material, there is every inducement to at least "prospect" in this direction. I may add that the most favorable localities for such an industry, appear to be the tea districts of India—Assam, Cachar, Nepaul, and up to Kumaon.

It may be well for me to conclude with a few remarks, pertinent to the general issue or bearing of Mr. Liotard's Memorandum. It unfortunately happens that paper-makers as a rule, know very little about botany, and it is equally true that botanists and their representatives, the reporters in Mr. Liotard's Blue-book, know but little about the technical requirements of paper-making; the consequence is that great confusion reigns, and I am afraid is likely to continue while making clear, and correctly defining, what really is the *raw material* the paper-maker desires. There is all the difference imaginable between a *fibrous plant*, and the *fibre* produced from such plant. The paper-maker knows but little, and probably cares less about the fibrous plant, but he knows well when he sees the "*fibre*" produced, and will use it, provided he can obtain it at reasonable cost (as compared with existing material) and of a quality suited to his requirements.

It is extremely improbable, however, that any English paper-maker will embark capital in so distant a country as India, for the collection and preparation of the "*fibre*" from plants of which, as remarked, he knows little or nothing, or of the remote country where they grow. I think, therefore, it is obvious that some intervention must come between the botanist and the paper-maker; and this intervention, naturally, indeed I must add necessarily, must be carried out by the native collector or cultivator, assisted by the Government or in co-operation with merchants and others knowing and having commercial relations with India itself. It is to this class therefore that my remarks are specially addressed.

THOS. ROUTLEDGE.

Claxheugh, Sunderland, 15th December 1880.

SUGAR FROM *SORGHUM*.

TO THE EDITOR.

SIR,—Some seeds of the *Sorghum Saccharatum* and *Sorghum Kaffrarium* were sown in Burdwan, in the early part of October 1880. The result was very satisfactory. They did not require any irrigation at all, and they grew very luxuriantly. Canes weighing 20lbs were crushed, from which 8lbs of juice were obtained, and the leaves were given to the cattle. Four pounds of the above juice were at first boiled, into which some quicklime was added and the impurities were skimmed off. The juice was reduced to such a state by boiling, that it was granulated on cooling; 1lb of the granulated syrup was thus obtained from 4lbs of juice. The other 4lbs of the juice were afterwards boiled from which—with the addition of some diluted milk, in order to separate the impurities, which were skimmed off as soon as they formed on the surface—I have succeeded in obtaining 1lb of raw sugar (*goor*). Being a small quantity, no crystallized sugar has been manufactured therefrom here.

The result of the above trial has led me to the conclusion that diluted milk, *i.e.*, milk mixed with water, should be added, instead of quicklime or lime water; and that sugar in sufficient quantity and of first-rate quality is obtainable from *Sorghum*, and that it will compare favourably with the best product from sugarcane grown in the most favourable localities.

The great point claimed in the cultivation of *Sorghums*, is that they can be grown in Northern India, by sowing from May to September, without the aid of irrigation at all, and that three cuttings are obtainable per year. I have obtained from 8 to 10 tons of their canes per acre fit for crushing, at a single cutting, in Burdwan. I have also found that the *Sorghum* crop requires no such care as the sugarcane plant, does; as to tie or roll up from time to time the growing stalks with their own leaves.

I experienced no difficulty in the purification of the syrup, and I should also state that no special arrangements for precipitating the impurities of the juice were necessary. I have no proper crushing mill, no evaporating range, but with a simple mill, made of wood, and a simple earthen boiler, and in another case an iron vessel ; and with the addition from time to time of some diluted milk, in order to separate the impurities, which were skimmed off as soon as they formed on the surface,—I have succeeded in obtaining the required sugar. The result of the above trial, although it was on a very small scale, induces me to make a further experiment on a large scale, in November next, and I shall be glad to write you the results. I am informed that 45 millions of acres are now cultivated with *Sorghum* in the United States of America, and that 2,000lbs. of sugar, per acre, besides molasses, is stated as being an easily obtainable outturn.

I had occasion to write to the Superintendent, Government Farms, Madras, the result of the above trials, on the 1st instant. In his letter No. C 16, dated 14th instant, Mr. Robertson replied as follows :—" I read your letter of the 1st with great interest. The result is very satisfactory. I hope that you will be induced thereby to make an experiment on a large scale, and favor me with the results for publication. There can be no doubt that the *Sorghum* crop will in time in this country, as in America, become an important sugar-yielding crop."

BONOMALY KOONDOO.

Burdwan, 20th January 1881.

NOTE.—We shall be glad to hear the result of our correspondent's further experiments. A few remarks on the *Sorghums* will be found in our editorial columns. ED., *I. A.*

PLOUGHS.

TO THE EDITOR.

SIR,—Under the head of Editorial Notes at p. 6 of the *Indian Agriculturist* of 1st January, your Burdwan correspondent is advised to give a fair trial to the improved native ploughs, of which you state, there are several in the market at present. People in this part of India, at least, will, I am sure, quite agree with you in considering that what is wanted in India is an improvement of the ordinary country plough. The native ploughs you refer to are, it is presumed, such an improvement. If they are not far more costly than the ordinary country ploughs, and can, when necessary, be easily repaired, I would recommend, on behalf of the agriculturists of this presidency, and for their benefit, that a complete description of each of the several kinds of native ploughs in question be published in your valuab'e journal, notifying their prices, the advantages to be derived from each, where they can be obtained, how long they will last without needing repair, at what cost they may be repaired, whether for repairing them professional skill such as may not be easily procured will be required, and so on. A full description, as suggested above, will, it is hoped, go a great way in improving the system of farming now in force in this presidency. The interest I take in the welfare of my countrymen wedded to agriculture, must serve as my apology for troubling you with this letter. Wishing for an ever-increasing circulation to your invaluable organ.—

R. S.

NOTE.—We shall consider our correspondent's suggestion. But we have on various occasions noticed editorially most, if not all, of the principal new ploughs, as our constant readers must be aware.—ED., *I. A.*

TASAR SILKWORMS.

TO THE EDITOR.

SIR,—Will you kindly let me know where I can purchase a small quantity of Tasar Silkworm eggs. If you or any of you readers can give me this information, I shall feel obliged.

X. Y. Z.

NOTE.—There is no market in India for the above. Some private collector will perhaps oblige our correspondent.—ED., *I. A.*

FODDER GRASSES.

(*To the Editor of the Ceylon Observer.*)

DEAR SIR,—The complete failure in growing such a thing as prickly comfrey, induced a neighbour and myself to experiment with several varieties of European grass : we cannot say with much success, as the difficulty we had to contend with was bad lay of land ; but whenever there was little *wash*, the result was highly satisfactory. Italian Rye-grass stands foremost, but does not equal teosinte, the Mexican grass, for quantity. This latter is not of course a European variety, but a tropical grass ; hence the success in growing it even in very low elevations. One reason why cattle readily eat the thick stalks, be they ever so dry, is, that the cobs containing the *seed* adhere to the stalks and the seed is like so much corn, very palatable. The fowls fatten on them, and for a while it was a puzzle to me to account for their straying into the teosinte grass field so persistently. I do not advocate the neglecting of guinea grass, but those who really desire to obtain, rich milk and so, good butter, should pay a little attention to *variety* of food, which is so essential to cattle. This can only be done by having at least four to five varieties of grass, such as Mauritius, Guinea, Teosinte, and Rye-grass. I had less cattle here ailing this year than I have had for several years past, and the only way I can account for it, is the change in their food, and to *grooming*—a thing totally *forgotten* in this Island, and yet we expect our cattle to be in as prime condition as those we see at a European show or fair.

The grass fields must be up only twice a year, shortly before the rains, and old drains should then be closed and *new* ones made. Very little manure is needed. Many fields of grass I have seen with manure lying perfectly inert on the surface. A digging fork and even a mamoty applied at a trifling cost would have astonished the superintendent in results. Teosinte grass seed must not be sown thickly and should be cropped early ; a pound of seed would do for 1½ acres.

STOCK.

II.

DEAR SIR,—Reading " Stock's " letter on fodder grasses has induced me to pen a few lines on the same subject.

Prickly comfrey grows well with us ; Australian cattle and horses like it well, but I feel bound to say I do not advise any one who has it, to feed cows that are in calf with it. Clover, lucerne, and some other English grasses grow well, but none of them will pay ; at least this is my experience. "Teosinte" I have tried, two lots of seed, first from a Colombo firm ; none grew : next from the Peradeniya Gardens : out of this lot I think there are 8 or 10 plants, so I can't say much for it as yet. Buffalo grass grows well, but is more fit for grazing purposes ; having a trailing habit, it is very suitable for binding loose earth or for the slopes of an embankment. I will now mention the grasses that I find give the best results. " Water," *alias* Mauritius grass, for ravines and swampy land ; " Guinea-grass ", almost anywhere ; " California Prairie " grass, on good or medium soils.

I quite agree with " Stock " that a variety of food is beneficial to cattle. " S." it at fault when he says in regard to *grooming* " a thing totally, I may say, forgotten in this Island." I have for years had all my better bred cattle groomed, and I know one or two others have told me they have had theirs done. As for manure, the more you dig into the ground round the roots, the larger the crop and the less refused by the cattle. Sickness.—I have had foot-and-mouth disease run through nearly the whole lot and in separate sheds, but I am thankful to say very little of any other. I believe in having the sheds thoroughly cleared every day and the drains all washed down ; stall-fed cattle must have exercise every day.

Warwick, New Galway, 30th December 1880. C. W. I.

VALUE OF TEA AND CINCHONA PER ACRE.

(*To the Editor South of India Observer.*)

SIR,—With reference to your correspondent's query regarding the valuation of tea and cinchona, I give you the benefit of my experience. I should say, if the plants are well established and planted in 18in. pits that—

2 years old	...	...	...	200	per acre.
3 „ „	...	...	...	250	do
1 „ „	...	...	...	350	do
5 „ „	...	...	...	400	do

An acre of Crown Bark.

1 year old	...	...	...	500	per acre.
2 „ „	...	...	...	600	do
3 „ „	...	...	...	700	do
1 „ „	...	...	...	800	do
5 „ „	...	...	...	900	do
6 „ „	...	...	...	1,000	do
7 „ „	...	...	...	1,300	do
8 „ „	...	...	...	1,800	do
9 „ „	...	...	...	2,200	do
10 „ „	...	...	...	2,500	do

It may be said tea has been at its lowest ebb lately : the consumption is rapidly increasing and by last advices, prices are improving.

The price of bark is not likely to fall for years to come ; the Condaminea or Crown Bark, when it yields Renewed Bark, increases in value, the yields of an acre being equal to 300lbs. at 8 shillings a pound.

I see by the Australian papers that Indian teas are now very greatly in demand all over that colony. The abominable rubbish hitherto imported from China and sold as *tea*, has been quite superseded by Indian teas, which, from their purity and excellence, are preferred to any other, and fetch very high prices in the Australian market.

OLD PLANTER.

CINCHONA SUPPLY AND DEMAND.

(*To the Editor of the Ceylon Times*)

SIR,—Refering to your remarks regarding the number of cinchona plants in Ceylon, Mulhall gives the number as 50 millions of young plants ; against 3,000,000 trees over thirty feet high in the Neilgherries. Thus, the Neilgerry plantations alone can throw into the market enough bark to supply the market of the whole world for two years.

STATIST.

OXIDISING CINCHONA.

(*To the Editor of the Ceylon Times.*)

SIR,—I notice that after eradicating leaf disease, the scientists are contemplating taking cinchona in hand with a view to the conversion of the inferior alkaloids into those of a higher value. Whether this can be done or not is a matter which is beyond the range of ordinary criticism, and I for one should not think of calling in question the power of any chemists, knowing as we do what science has done for the world. But I have a word to offer on another point, and that is the economical outlook. I notice in a local paper a remark to the effect that should these experiments prove only partly successful, they cannot fail to exercise a very marked influence on the future of cinchona cultivation and the quinine trade. No doubt they will. But quadrupling the yield of the higher price alkaloid, chemists will at once reduce its market value. *Succirubra* will be placed on a par with *ledgeriana*, and quinine will decline to a rupee a pound. These are amongst the inevitable results. Whether they are calculated to advantage, cinchona growers in the long run, remains to be seen, there may well be doubts on the subject.

Fort, Jan. 5th, 1881. QUERCUS.

CROTON SEED AND OIL.

(*To the Editor of the Ceylon Observer.*)

DEAR SIR,—Mr. Holloway's letter, with my note on the croton oil tree (*Croton Tiglium*), which appeared in your issue of the 15th instant, escaped my notice at the time. The price quoted by me (5*s.* per lb.) referred of course to the croton oil of commerce, and not to the unmanufactured seeds. There can be little doubt, however, that the seed could be produced in Ceylon, at a cost which would leave a handsome profit to the grower, and a few notes on the tree may be of some interest.

It is a native of Ceylon and India, very common, I am told, in the Maturata district, and is met with in the neighbourhood of Kandy. The seeds are in common use with our native doctors as a purgative, and are known by the Tamils as *nervalam kottai*, and by the Singhalese as *jayapala*. The fruit or seed capsule—of the dimensions of a large coffee cherry—contains three seeds, which are very similar in size and appearance to those of the castor oil plant, another representative of that interesting family the *Euphorbiaceæ;* and here we have presented to us one of the many anomalies to be found in this wonderfully-formed group of the vegetable kingdom. The castor oil plant (*Ricinus communis*), yielding one of the best and safest of all purgatives when purified, we find side by side with the croton oil tree which possesses the most violently acrid poisonous principle, one grain of the powder or one drop of the oil being a sufficient dose for an adult, while a single seed has been known to kill a man.

The croton oil plant will no doubt form a good shade or boundary tree of rapid growth, about 25 feet in height, and bearing a great weight of highly oleagenous seeds, but possessing a soft timber of little or no value. Being a native of the Island, it will be hardy and independent and like most of its congeners (*e.g.*, the *manihots*) a fast grower. Still it is difficult to imagine that there can ever be any great consumption of the oil, and from the very poisonous nature of the plant, it would not be a desirable cultivation to go in for. Both croton seed and oil are now exported in considerable quantities from Madras and Bombay, and the oil is said to be expressed and prepared in the same way as castor oil, except that it is strained instead of being boiled.

A. WHYTE.

P.S.—I find I am all behind the age again: so much for not seeing the papers. "Caution's" letter in the *Observer* of 20th instant, has just been brought to my notice. His quotation of 3*d.* to 9*d.* per lb. of seed is no doubt correct, and I see by a *wholesale druggist's* circular, received last mail, that oil is quoted at 5 per lb. as stated before. What the London market figure may be, I cannot say. The seed is said to yield 50 per cent of oil, and judging from the size of the trees they ought to be planted about 10 × 10 ft. If, therefore, Mr. Holloway can furnish us with the average yield of clean seed per tree, there will be some data to work on, in arriving at an approximate return of oil per acre.

PANCHGANI AS A FIELD FOR PLANTERS.

(*To the Editor of the Times of India.*)

SIR,—I will feel myself under obligations to your widely circulated paper if allowed to make the following suggestion. Panchgani has a very fertile soil. It is a soil in which coffee flourishes and tea might easily be produced in the valleys where the river Krishna would supply the necessary water. The only difficulty in starting a coffee plantation would be the scarcity of water, but with a little expense water could be supplied. From Lingmara seven miles away, water could be brought down in pipes. Lingmara is higher than Panchgani, and water finding its own level could easily be brought to the desired place. If a private individual were to make the undertaking he might sell some of the water to the residents, many of whom would be likely to use it for gardens, having enough for household purposes. There is no doubt that the returns of a plantation would yield an immense profit. An enterprising capitalist setting up would find it to be a profitable undertaking.

COFFEE.

The Indian Agriculturist.

CALCUTTA, FEBRUARY 1, 1881.

THE TEA INDUSTRY.

THE tea industry is passing through a crisis. In 1865 to 1867 a similar crisis ruined all save strong companies which had good financial support. At that time even the most unfortunate shareholder, if he knew any thing of the industry, knew that it was a perfectly safe one, but that it was impossible for a company in debt to tide over the difficulty; and so, many companies and private concerns went to the wall, and gardens which had cost perhaps a couple of lakhs of rupees, were thrown upon the market and found purchasers at sums varying from one to ten per cent of their cost. Then the cause was sheer recklessness; now the crisis has been brought about by totally different causes. Then, to a large extent, shareholders and managing agents were not perhaps so much to blame; as they were feeling their way in a new path, and were perfectly ignorant of many details of which they are now cognisant. Then they had no data to go upon. Now they have had twenty years' experience, and hence there is less excuse for the difficulties they have brought upon themselves. The present crisis may be attributed to three causes, all of which ought to have been foreseen and avoided. The first which we shall notice is—bad financial and general management. The principle of remunerating managing agents is financially unsound. These gentlemen have practically the complete control of the tea concerns; as a rule, they have very little work and no responsibility, and they are paid sometimes by a commission on the gross outturn of the properties in their charge, without regard to whether profit has been made or loss sustained; hence we see the anomaly of these agents getting more by way of commission and salary than the entire body of shareholders get amongst them. The latter, it must be remembered, have invested their money and run all the risks that exist. We are far from suggesting that managing agents should not be paid for their work; we only object to the present mode of paying them. It is absurd to see a company, struggling in the meshes of impecuniosity, paying handsome salaries and allowances to agents who have absolutely no risk, and who can usually carry on the work of a number of gardens with the help of an extra native assistant or so. It may be said that the agent frequently advances large sums of money to gardens, and thereby incurs a responsibility; we think we are right when we say that the agent only advances cash in the same way that any other money-lender would, on good security. He has, usually, the coming crop as his security, and as he knows exactly how things are going on, he is in a peculiarly favourable position, to see to the safety of his advance. We are of opinion however, that all advances should be raised otherwise than from agents, and if the ordinary sources from which cash is available should fail, a sufficient sum could usually be raised from individual shareholders, or even, as an extreme measure, by the creation of a small amount of fresh stock, which being looked upon as a debenture-stock, could be redeemed and cancelled when the company found itself in funds. Besides, every well-conducted tea concern should have a special fund for working expenses,—a fund sufficient to carry on operations until returns began to come in. The only way by which a concern heavily in debt on account of these advances, can recover itself, is by utilizing all profits by way of reducing that debt. This is difficult where shareholders clamour for dividends, but it is false economy to insist on receiving a small dividend, when the property is burdened with a heavy debt bearing an interest charge, at the rate of 8, 10, or perhaps 12 per cent. Pay off that incubus, allow a sufficient amount

of cash to accumulate for working expenses, and the whole concern will then, for the first time perhaps, get fair play.

Then we come to the second cause of this state of affairs. Indian tea if sent to the London market as that market requires it, will always command a fair price; perhaps not the fancy prices of 20 or 25 years ago, but still, prices sufficient to pay all concerned handsomely. To take advantage of this, we must, however, watch the market, with a view to prevent flooding it; and this is exactly what we have not done. Fancying that the high prices of former years would continue, and foolishly shutting our eyes to the possibility of the demand failing to keep pace with the supply, we have gone on extending our cultivation, and consequently increasing our exports to the London market, till stocks there, are three times as heavy as they ought to be. The mischief is done, and if the proprietors are wise they will resolutely stop extension until the consumption at home shews signs of overtaking supply, when prices may be expected to recover somewhat. In the meantime stocks can be relieved, and the market improved by our ceasing to flood it with a large quantity of low class teas. We should make as little of these as possible, confining our attention to high class teas alone, and only making such low class qualities as are unavoidable. Even these latter we should endeavour to dispose of locally, and thus we should relieve stocks at home, and keep up the general average quality of the teas we offer in Mincing-lane. Owing to this average being high, we shall get higher prices, and shall not, therefore, lose by the change. The market of great Britain just now, however, is showing unmistakeable symptoms of having passed the acme of the crisis, and consumption has overtaken demand. Should this prove permanent, which there is every reason to expect, prices will rise, and better times for the shareholder present themselves.

The third cause of the late abnormal depression is, in our opinion, the quality of the tea we make. We do not mean that our classes are not up to a fair standard; we refer to the suicidal mania for pungent tea. For trade reasons, and not because the public want it, a demand exists for this pungent rasping tea, and in obedience to the fiat of the brokers, we have pandered to the morbid taste, and have had the reward we deserve. We have gone on manufacturing a manifestly inferior article, because it was wanted by the middlemen of the trade for purposes of adulteration. We should have set our faces against such an iniquity; but—for profit, as we foolishly imagined—we encouraged the deceit. The mixture thus made has almost invariably been sold as pure Indian tea, and—as only about one-sixth to one-fourth was Indian, and *that* the badly made rasping tea,—the good name of Indian tea suffered, and prices fell. If we ask a manager to make us a sample of really good drinkable tea, it will never enter into his head to under-ferment it. He will submit it to sufficient fermentation, and will turn out a delicate sample, such a sample as would represent all Indian teas if the broker's interest were not consulted before that of the shareholder. If we wish our tea to take its proper place in the world's markets, we must return to the proper way of making it. It is a strange thing that the proverbial ingenuity of the Chinese did not enable them to find out in all these centuries, that rasping tea was the best. It was left for us to find out this fact, and to engage in the suicidal trade until we have brought the industry to the very verge of bankruptcy.

MR. MARKHAM ON PERUVIAN BARKS.

WE are glad to find that Mr. Markham has fulfilled his promise of giving a popular history of the introduction and cultivation of the Peruvian barks into India.* Although Mr. Markham in his "Travels in Peru and India" gave very fully the history, search for, and introduction into India of these plants up to 1862, yet in this later work we have so much only of it repeated and newer matter added as to give a completeness to the narrative, and the whole history is brought down to the present date, in order, as he says, that the whole question "should be familiar to Englishmen and the educated classes of India."

The world has long been indebted to the mountainous regions of the Andes for the barks from which the inestimable quinine is prepared, and the great and increasing demand for it renders a constant and never-failing supply imperative. The story of the reckless destruction of cinchona trees has often been told, and serious fears, far from being unfounded, were entertained that some day the supply of Peruvian bark from South America would fail us. The veteran Indian Botanist, Dr. Royle, insisted on the necessity of the introduction of these trees into India; but the Government took no action. To Mr. Henry Deedes is due the credit of first bringing the subject to Mr. Markham's notice. The latter says that after considering that, except in normal years of cholera, fever is by far the most prolific cause of death,—far more than all other diseases and accidents put together, amounting in fact to one and-a-half million a year—he formed the resolve to endeavour to place within the reach of even the poorest native, the best known alleviation and cure for fever, namely, Peruvian bark, and this in its cheapest and most effective form. The first step to carry out this resolve was the introduction of the quinine trees into India, and this task, as all India knows, has been most nobly and successfully carried out. The difficulties of the task thus undertaken are by no means to be underrated. There was the transit of seeds, from almost inaccessible and most hostile countries, to India; to convert these wild plants into cultivated ones, and to endeavour not only to keep up the standard of excellence but even to improve; to study their native climate, soil, and surrounding physical aspects; to compare these data in finding a fitting home for them in India; and lastly, to ascertain the best and cheapest available form for their use in medicine.

The history of the Peruvian bark trees is now pretty generally known. Of course Mr. Markham still fights with an earnestness worthy of the best days of the old Spanish chivalry, for the word *Chinchona.* This should be really the correct spelling of the genus of plants yielding Peruvian barks. It was named in honor of the Countess of Chinchona who accompanied her husband to Peru on his appointment as Viceroy of that province. During her sojourn in Peru (in 1638), this lady was ill with intermittent fever and was cured by the use of Peruvian bark. On her return to Spain she made the virtues of this bark known, and Linnaeus named the genus after her, but spelt it *Cinchona*—an unfortunate mistake truly, but too late now to be remedied.

The description given of the different bark regions—crown, red, Colombian, grey, and calisaya,—are all good, and will be read with profit and interest; and the strenuous and long-continued efforts to represent all these trees in India show an amount of perseverance rarely equalled and still more rarely crowned with success. Mr. Markham, although the formation, elaboration, and detail work is clearly due to himself, does not forget to pay every tribute to those who were his co-workers, and acted under his orders. These are Mr. Weir, Dr. Spruce (the veteran Botanist), Mr. Pritchett, and Mr. Cross—the latter having made five or six journeys, his last one being that for obtaining seeds of the soft Colombian bark trees. Nor is Mr. Ledger forgotten. He, although not under Mr. Markham's orders, yet did splendid service in the obtaining of the variety of *Cinchona calisaya* named by Mr. Howard variety *Ledgeriana*, yielding as it does the magnificent amount of 9 97 per cent of quinine. These men all worked with a zeal and energy beyond all praise. They were paid bare remuneration for their services, in the hope and expectation that should the enterprise prove successful better acknowledgment awaited them. They went with their lives in their hands, and the privations some of them underwent have made them old and decrepit "before their time." But although Mr. Markham has long and earnestly pleaded their cause—not to shew charity, but to mete out justice, and not out of the pockets of the already overburdened tax-payers of India, but out of the splendid net profits resulting from their labours—a deaf ear has been turned to all such appeals. Can we wonder that Mr. Markham speaks of his indignation at such injustice in the "treatment "of those gallant men who, amidst perils and hardships of no "ordinary kind, performed the work by which India will be so "largely benefited. Those who did the work have not received

* "*Peruvian Barks: A Popular Account of the Introduction of Cinchona Cultivation into British India.*" By Clements R. Markham C.B., F.R.S., 1860-1880, with Maps and Illustrations, pp. xxxiii; 550, London: John Murray.

"fair recompense for most valuable services. But the work itself "has conferred an inestimable blessing on the people of India, "whilst it has at the same time become a remunerative public "undertaking." But alas! everything for the good of India must give way to a "Scientific Frontier" and such like chimeras.

After obtaining the seeds and plants, the great difficulty was the selection of the site for the first plantation in India. Ootacamund was selected, and here Mr. Markham had the benefit of the services of the late Mr. McIvor, whom he styles "the ablest arboriculturist in India," and to whose care he "gladly and with perfect confidence" committed this trial cultivation. Most happily for the enterprise, this perfect accord never wavered. Mr. McIvor's success was indeed wonderful. Of the seeds committed to his charge 60 to 90 per cent germinated in burnt earth with a temperature of 60° by night and 75° by day. Latterly he even obtained better results with a temperature of 55° and 65°, giving the seeds a very sandy soil with an uniform medium state of moisture, and from his experiments he found that from *eyes* he could raise 8 to 1 as against seedlings. Happily he steered clear of the almost fatal and costly mistakes committed at first by the Dutch in Java: he found that for the health of the plant and the development of the greatest amount of alkaloid, plenty of light and air were necessary, and that dense shade was baneful. In planting out he found that a rich, loamy, rough, and very open soil was necessary, and a very slight shade at first was all that was requisite. One of the good results of cultivation soon became apparent—a sample of grey bark collected in its native habitat yielded 1·8 per cent, whilst plants raised from seeds and obtained from this very same tree yielded 7·5 per cent; and this is only one instance out of many.

Some remarks are given on the best method of harvesting the bark. "Coppicing", as Mr. Markham says, presents the most obvious method. Mr. McIvor's method of removing portions of the bark and then "mossing" over, to allow of fresh bark being formed, he thinks much too delicate an operation for other than "skilled" persons. Certainly the "renewed" or secondary bark is much richer, and it may be that its richness is at the expense of the rest of the plant. But as to the impracticability of the "mossing" by other than "skilled persons," we are by no means prepared to admit; it does not require a "skilled person" to cut off a strip of bark and then cover with moss the place from which it was removed, or, equally as efficacious, to daub over with a mixture of clay and cow-dung.

At Ootacamund hybridization seems to have first been noticed, and this may yet have a most important bearing on the improved results as obtained from the cinchonas under cultivation and proper selection, especially as analysed hybrids have yielded 10 to 12·2 per cent of total alkaloids, a result far in excess of that obtained from parental stocks. *Cinchona succirubra, C. officinalis,* and *C. calisaya* are greatly in proportion at Ootacamund, and these three species with their varieties will, we believe, be the staple growth of India; the first for special use in India itself, and the last two for export—they being the best suited for English manufacturers. Altogether this plantation has been a grand success, and all its net receipts are now profits. To none other does this satisfactory state of things owe its origin than to the late Mr. McIvor. No wonder then does Mr. Markham say respecting him:—"His monument consists in the marvellous "success of that cultivation. It is indestructible; and will last "for centuries. No man could desire to have a more noble "monument, nor one which could more fitly and permanently "record his labours." Since Mr. McIvor's death the gardens have been neglected and many valuable trees cut down, the object being to obtain large harvests without any view to the future. As to Government giving up the cultivation, now that private planters have taken the matter in hand, it would perhaps be premature. Good stocks of the best varieties must be kept up for distribution, many experiments have yet to be completed or undertaken; and this we fear it is beyond the power of private planters to initiate or to carry out.

Of the cultivation in other parts, that in Ceylon meets with its well deserved meed of praise, as do also the efforts (first resulting in failure and now crowned with success) in Java. As to Sikkim, only certain species are there found to repay cultivation; but the chief interest of this plantation arises from the fact that up to the present time the most successful attempt to carry out the last and keystone of Mr. Markham's programme—that of preparing a "cheap alkaloid"—has been made here.

Of the alkaloids found in Peruvian barks, quinine has for a long time been looked upon as the only one of value, and therefore barks containing the largest percentage have and still will realize the highest price. The other alkaloids have been almost looked upon as bye-products. The results of the Madras and other Medical Commissions, set on foot by Mr. Markham, have done much to place these other alkaloids on their proper bases and secure justice for them, and thus to help towards the solution of the problem. It is now generally agreed that in febrifugal value, quinidine is equal to quinine, cinchonidine slightly less efficacious, and that cinchonine is certainly less valuable, but that if administered in larger quantities secures the desired result. The isolation of quinine, existing as it does in much smaller percentages than is the case with the other alkaloids, is a costly and troublesome one, and a preparation containing a mixture of all the alkaloids seems to point a way out of the difficulty. Mr. Broughton's amorphous quinine met with some amount of favour from the medical profession, but the appointed committee adjudged it far too costly in its production. There are good grounds, however, for believing such judgment to have been premature, as a reasonable time had not been allowed to give the scheme a fair trial. Moreover, Mr. Broughton seems to have been unfortunately too much addicted to hostile criticism of the work of others, especially that of Mr. McIvor, whose concentration of energy on the work in hand he might well have emulated. Still, Mr. Broughton made a good beginning and cleared, to some extent, the way for future investigators.

The Sikkim plantation owes much to the warm interest taken in it by Mr. A. O. Hume, C.B., and we are in perfect accord with Mr. Markham in his pleading for a "Department of Agriculture," freed however from the many "extra duties outside the province of agriculture altogether." Mr. C. H. Wood, although holding the appointment of quinologist to these plantations for a short time only, yet has left his mark and has conclusively shown what *can* be done. He possessed the requisite qualifications in a high degree: not only was he a most accurate chemist, capable of the estimation of the thousandth of a grain, but he also had *practical* experience as to how to produce tons at *paying* prices. He found that he could turn out *Quinetum* (a most expressive term, coined by Dr. de Vrij, and meaning a collection of quinine alkaloids) at three rupees per lb., and at the rate of 10,000lbs., per annum. In 1879 there were actually sold 128,000 ozs., at 1 rupee per oz., and this, against 12 shillings per oz. for quinine, means a saving of over £60,000. The method of manufacture employed by Mr. Wood is simplicity itself, and requires no costly machinery. In all those experiments, chemistry has played a most important part, and before a species can be adjudged good or bad or fit for payable cultivation, it has to undergo this crucial test—the only test that can be applied—and every bark has to stand or fall in proportion as its alkaloidal yield is good or bad. The ascertaining of these points has entailed most laborious work, and to none is India more indebted in these respects than to Mr. John Eliot Howard, F.R.S. With the exception of a letter of thanks, what recognition has Mr. Howard received? Provincial Bumbledom (as a comic writer puts it) for obstructing a Royal party, with an address *written by some one else*, gets a knighthood, whereas such splendid and *unpaid* services as Mr. Howard has rendered are passed by! But at least we can say that India will not forget the debt of gratitude for his ready and valuable aid.

It remains only for us to say that the book has given us great pleasure. The appendices on *Caoutchouc, &c.*, we must return to on a future occasion. The index and bibliography is everything one can desire, and we would wish the book in the hands of everyone interested in the subject. As to the author, all Mr. Markham has said in praise of his associates, belongs also to him in a yet greater degree. He formed a good and wise plan and carried it out against all obstacles, whether in the form of savages or red-tapists; which are the most to be dreaded we leave others to judge. Part of his latter successes must be attributed to his having official charge of the question at the India Office—a phase for inquirers for information, like a transformation scene is to children, long to be remembered with pleasure, though soon coming to an end.

ON GUTTA PERCHA.

ITS HISTORY, PREPARATION, AND CULTIVATION.

[*By James Collins, F.B.S., Edin: &c., &c.*]

(*Concluded from our last.*)

THE collection and preparation of Gutta Percha is capable of great improvement. In the case of India-rubber trees it has now been clearly proved that 'tapping,' *i.e.*, just cutting through the bark, is all that is necessary, and that after certain periods of rest, they may again be re-tapped as is the case with the Manna tree *(Fraxinus Ornus)* of Europe. With regard to the collection of Gutta Percha, the *native* evidence is overwhelming against the practicability of "tapping:" the tree *must* be cut down. Still, this statement *may* arise from indolence,—a wish at one operation to obtain the greatest possible quantity, without a thought to future supply, or from the want of sufficient aggregation of the trees within a reasonable space to obtain a sufficient quantity to repay collection by "tapping." Gutta Percha does not flow so readily from the tree as does Caoutchouc, and also more rapidly concretes. The yield in the rainy season is nearly double that of the dry season, due possibly to two reasons,—1st, that the tree has not yet been called upon to use up the Gutta Percha in the elaboration of new tissues, and, 2nd, the greater amount of moisture absorbed causing greater fluidity. The Dutch Government tried to induce the natives to practise 'tapping,' but without effect. "Boring" has also been tried, but without success. However, 'tapping' Gutta Percha trees can only be properly tried in a well regulated plantation, and if successful, will be a great saving, as the quantity obtained by successive tapping would far exceed, in the aggregate, that of a single operation. If it be proved that nothing short of the death of the plant will suffice in order to extract the gutta, then a third more gutta could be obtained by providing wedges, rollers, or other simple mechanical contrivances, in order to allow of the extraction of the gutta on the side of the felled tree next the ground. The implements at present in use seem well adapted for their purpose, and being simple and cheap, need not be superseded.

As to the preparation of Gutta Percha, there is much to be said and also thought out by the aid of direct experiment. The utilizable products as they exist in plants is a most important question in phyto-chemistry. As to what their use and characteristics are whilst *in* the plant, we know little. Thus, Indigo does not exist as Indigo in the plant itself, but is the result of fermentation *after* the juice is extracted from the plant. In Sugarcane again, the juice, even in the cut cane, does not change, but as soon as expressed, it speedily ferments and changes, if not checked, into uncrystallizable sugar. With milky juices, the so-called milkiness is only brought about by exposure to atmospheric influences; and as soon as such exposure takes place, a new set of chemical combinations are inaugurated. Gutta Percha as it flows from the tree is a viscid fluid, acquiring milkiness and concreteness on exposure. Gutta Percha, like Caoutchouc, is a hydrocarbon and splits up, or is resolvable into two resins, *viz.*, *albine* and *fluavile*. Thus, according to M. Payen, a *good* sample of Gutta Percha gave the following results on analysis:—

	per cent.
a.—Pure Gutta (milk white and fusible) ...	75 to 82
b.—Resins soluble in boiling alcohol and consisting of two parts:—	
1.—Crystalbine or Albine, a white crystallized resin	16 to 14
2.—Fluavile, a yellow amorphous resin	6 to 14

It is thus apparent that the change of pure gutta into a resinous-like mass takes place naturally, if means be not taken to stop it. If two bottles of equally pure and identical gutta milk from the same tree be taken, the one bottle hermetically sealed and the other left exposed, the contents of the first will retain its goodness, and that of the other will become resinified and as brittle as shellac. There is also another fact to bear in mind with regard to this proneness to chemical activity in Gutta Percha. In cutting through the bark, many other vessels and cells are ruptured, containing tannic, gallic, and other proximate principles; and the presence of these no doubt accelerates oxidation. These changes I am sure can be retarded and lessened, if not altogether obviated, if the Gutta be *thoroughly well boiled*, immediately after collection; through this *not* being done many an otherwise good parcel has become deteriorated in quality or utterly useless To my mind, indeed, I think that one of the most important considerations with regard to Gutta Percha is this rapid oxidation and consequent resinification it undergoes after it leaves the tree unless by immediate preparation such change is arrested by fixation. The method of preparation has a most important effect on the quality of the product, rendering an indifferent variety, carefully prepared, of more value than a better variety not so prepared. This question is intimately connected with the possibility as to whether any of the substances which have been recommended as substitutes for, or supplementary to, Gutta Percha,—such as the Mudar, Cattimandoo, &c., of India,—can be utilized.

In the 'reboiling' of which I have spoken, the different varieties are almost invariably mixed together, and great harm is done thereby. This mixing is practised chiefly for the purpose of imparting "a tone" to parcels of particularly low quality, by mixing in a certain quantity of good gutta; and frequently the 'tone' consists only of a skin of good gutta over a core of bad. Some of these so-called varieties have no right to be called "Gutta Perchas" unless indeed we extend the significance of the term and admit Kowrie Gum, Gambier, Cutch, and other like substances. This mixing to a manufacturer is a serious matter, and it has yet to be disproved that where a "fault" has been found in a cable it has frequently been caused by the fraudulent admixture of some such resinous substance and its subsequent crystallizing out. When it is borne in mind that a small percentage of such an admixture may render a cable utterly useless at a most critical moment, I am sure that I shall not be charged with hypercriticism or of speaking too strongly on the subject. All the varieties are useful, and by all means let it be seen that they are well boiled; but as to the 'mixing,' the manufacturer at home is best able to judge as to what varieties he can best mix to meet the requirements he has in view.

The very best form in which to prepare gutta for the market is in thin, well-pressed, and well dried slabs, certainly not more than three inches thick. These thin slabs would reduce gross adulteration to a minimum; but where great irregular blocks are sent, the manufacturer has to allow a margin for stones as large as one's head, billets of wood, clay, &c, beside another margin for unnecessary wear-and-tear of machinery. Where slabs are not well pressed, a loss of 25 per cent frequently occurs during the voyage, thus paying freight for so much water; and when not well-dried, parcels frequently arrive half rotten, from fermentation having set in.

The many and various purposes to which Gutta Percha is now applied are legion, rendering an enormous and regular supply absolutely necessary. There are many reasons,—so well known indeed that they need not be recapitulated here,—that for our commercial supplies of any staple article, we cannot long depend on the spontaneous products of the forest; a statement indeed that has the force of an axiom, and is beyond all controversy. Special trees are for the most part scattered over a greater or less extent of forest, thus necessitating long and often perilous journeys before any quantity can be collected. Natives, too, on every possible occasion often maliciously destroy or so maim and injure the trees that they soon wither and die. Recourse therefore must be had sooner or later to conservation, cultivation, and acclimation, in order to keep up necessary supplies. Moreover, when the cultivation of economic plants and their acclimation is undertaken, the various conditions, which are so many elements of success, are the more controllable than when in their wild state. With special regard to Gutta Percha yielding trees, the number destroyed is almost incredible. Thus Dr. Oxley calculated that to supply the 6,918 piculs (1 picul = 133⅓lbs.) exported from Singapore from the 1st January 1845 to 1847, the enormous number of 69,180 trees had to be destroyed; and this statement is by no means overdrawn. From the *Sarawak Gazette*, too, we learn that to supply the 90,000 piculs exported from that district alone from 1854 to 1875, over 3,000,000 trees had to be destroyed. And these are only two instances,—the first shewing the trade in its infancy, and the second that of a limited and comparatively small producing locality. In fact the Gutta Percha trees have only been saved from *utter annihilation* because *young* trees do not yield a sufficiency of gutta to repay the trouble and cost of extraction. At the present time there is a great difficulty in obtaining supplies of the best varieties, and manufacturers require them in much larger quantities than are now obtainable; especially is this

the fact with regard to the maintenance of old and the construction of new lines for telegraphic purposes. It must therefore be granted that the necessary supply to meet this constant and increasing demand will not be forthcoming if speedy means be not taken to ensure it; and this can only be done by the conservation, acclimation, and cultivation of the best varieties. In the Straits Settlements, a splendid opportunity now presents itself to take this matter in hand. We are now in the possession of more power and influence in the Malayan States of the Peninsula than ever we had before, and by means of H. M.'s Residents much can be done in taking charge of the forests. This would be far better than leaving such valuable State property to the tender mercies of Rajahs and other native rulers, who for the most part,—for there are one or two honorable exceptions,—look only to immediate returns and lose sight altogether of future benefit to their States. By letting or "farming" out these forests, for the collection of gutta and other forest products, the working expenses of conservancy would be secured and would result in our obtaining higher qualities and larger quantities at as cheap a rate as is now paid for inferior kinds. In such 'farming' contracts a very stringent clause should find a place—that for every tree cut down, 4 to 6 should be planted. Singapore itself, in the face of so many 'direct' shipments, will not, I believe, long retain her position as the great Eastern entrepôt, unless new fields be opened up for commercial enterprise; and this can only be done by utilizing the undeveloped resources of the Malayan Peninsula. Ceylon, some parts of Assam, and possibly the Nicobars, are likely to prove very suitable for the first experiments in cultivation; and as the subject becomes better understood, and the requirements of the plants ascertained, many other localities in India would alike prove suitable.

On the whole question of Gutta Percha there is still much to be learned, not the least of the desiderata being to identify beyond all doubt the various varieties with the plants producing them. But these queries cannot be satisfactorily cleared up save and except by the personal visit of a well-qualified person to the particular localities where these varieties are actually produced.

TOWN SEWAGE.

ABOUT 1835 a Liverpool merchant imported the first ship load of guano into England, and sometime during the same year, one Mr. Smith of Deanstone, Perthshire, N.B., then an official of the Board of Health at Edinburgh, conceived and laid before the public his ideas of utilizing town sewage as a general fertilizer, and one which would supersede every kind of manure then used. Mr. Smith's name had already acquired honorable notoriety in connection with the subject of land drainage; he was an enthusiast in all matters touching on agriculture—nay, he was even regarded a high authority thereon—but in the question of town sewage his enthusiasm outran the bounds of sound judgment. At Edinburgh he had seen very favorable results ensue from the use of this fertilizer. He had seen a truly "Foul Burn,"—which for nearly two hundred years had conveyed all the liquid sewage and filth of the town to certain fields on the sea shore, converting a large area of sea sand into meadows yielding magnificent crops of natural and artificial grasses—let out at an annual rental of £30 per acre. He at once jumped to the conclusion that *these results could be reproduced everywhere*, and that from the utilization of town sewage "there could be an unfailing source of revenue. The whole cost of sewers, conservancy, water-supply, parks, fountains, and public embellishments were to be defrayed therefrom;" in fact a long desired and much needed agricultural reform would be brought about. Mr. Smith was *not* a chemist, and in his estimate of the value of town sewage he made some serious mistakes.

I.—He assumed that, in *manurial value*, town sewage contained *half* the fertilizing elements and ingredients of *guano*.

II.—He forgot that the damp and rainy climate of England was unfavorable to the *universal* application of sewage.

III.—He assumed that the water-supply of a town would not exceed 12 gallons per head per diem

These were the *cardinal errors* of his "theory:" his disciples were legion, and official aid was not wanting to back and assist him in the dissemination of his views. Numerous companies were started, and as many model farms, on the town sewage system. But it was not long before the enthusiasts and rash speculators discovered the errors of their ways: the companies and farms collapsed, financial ruin overtaking almost all of them.

If in large towns the water-supply could be kept down to about 10 or 12 gallons per head, town sewage would be a valuable fertilizer, even in England, on almost every description of soil; but where 30 to 40 gallons of water are supplied per head of population, it must be admitted that the sewage is very dilute, and the fertilizing constituents form a very small percentage of the bulk of the sewage—scarcely calculated to supply the wants of lands on which large and exhausting crops of cereals and leguminous plants are grown. In England the practice of applying sewage to stiff soils and soils badly drained, has almost invariably resulted in failure: it has only been in *porous* and *well-drained* soils where success has been complete, and there only for certain descriptions of crops. In his evidence before a Parliamentary Committee, Mr. Christie Miller, the proprietor of the Craigentemy Meadows, near Edinburgh, said "that while the application of sewage to grass in the hot season gave marvellous results, producing a visible growth in forty-eight hours, he was not satisfied with its application to wheat or turnips under ordinary circumstances, and when forced by jet or machinery, the water washed out and laid bare the roots both of turnips and wheat." Sir Joseph Paxton said, "I consider sewage a rough kind of business; you cannot put it in nice forms and ways; I should like very much to apply small dressings to land by hose and jet, so as to wet the roots of plants, if you can show me how to do it; but I have not the slightest notion that you will get the system ever applied to the extent sufficient to remove the sewage of all London . . . . . According to my calculations, the excreta of two hundred and fifty persons can be applied to an acre of land, so it would take about 30,000 acres of land to extract all the absolute growth out of the sewage of 3,000,000 of people (the population of the metropolis). According to a rough guess, you have something like forty gallons of water per head per diem. Now forty gallons would not be very strongly impregnated with matter which would largely develope plants. . . . . Sandy soil, a soil that will allow a very large quantity to pass through it without artificial drainage, is the best. On sand in hot weather you can hardly apply too much sewage to vegetation; in clay lands it is otherwise, *because it cannot pass off*."

In India the conditions of climate are different to those existing in England and Northern Europe. In England, the cultivator has at times too much water in his soil, and his first thought is—"how can I get rid of it?" In India, the ryot's first thought is water! and—"how can I most easily procure it?" What in England might prove under certain circumstances a positive evil and nuisance, would be looked upon in India as a real blessing. For a complete system of sewage, a *complete* water-supply is essential: one is a *sine quâ non* of the other. Small glazed earthenware pipes are laid underground to each house: these pipes get all the *ordure* filth and refuse water from each house and convey these substances into pipes of larger diameter, laid under the adjacent streets; these again are led into the mains, which in their turn terminate in the sewers or closed egg-shaped masonry channels, which in due time lead into the main sewer eventually terminating in the out-fall. In order to facilitate discharge and ultimate distribution, it is often found requisite to pump up the sewage to a high level, this being effected by means of steam machinery working a large centrifugal pump. The sewage being caught in a huge masonry pit or well in which the pump works—arrangements being made whereby the foul air generated by the sewage is consumed in the engine furnaces, and to prevent the deposition of solid matter, silt, and detritus which from time to time is unavoidably washed into the drains—a pipe conveying compressed air into the bottom of the pump well is generally constructed and attached to the engine or engines. The use of this is to agitate the mass and mix it well up with the liquid fluid.

It must be borne in mind, however, that the removal of storm water is not included in a scheme for the removal of sewage, because it would enhance the cost of a drainage scheme to a fabulous extent, inasmuch as the Engineer would have to provide for a discharge due to a *maximum* rainfall over the area to be drained, which in India has often been known to exceed 18 inches of rain in 24 hours. In order to arrive at some idea as to the average which might be irrigated from town sewage in India, the following is an approximate calculation:—

Assuming the population at 30,000, and daily water-supply at 30 gallons per head, we have daily discharge = 900,000, $\frac{900,000}{6.25} = 144,000$, and $144,000 \times 365 = 52,560,000$ c. ft. $\frac{52,560,000}{65,000} = 800$ nearly; but 65,000 cubic feet of water is only enough to completely irrigate a *rabi* crop. But meadow and pasture lands would in the hot weather months consume and require double this, and in addition to this, during certain parts of the year, the excessive rainfall would render prohibitory the application of sewage, so that we could not reckon on effective irrigation to more than 300 acres of land. Town sewage is a most excellent and valuable addition to solid manure, but in its dilute form of about 30 gallons per head of population it can never supersede solid manure, poudrette, compost, or cattle dung. It undoubtedly contains a considerable quantity of nitrogen, carbonic dioxide, ammonia, sulphuretted hydrogen, and other organic matters which act as solvents of the earthy phosphates, &c., but a husbandman who trusted *solely* to town sewage in its dilute form, as his only manure, would speedily exhaust the soil. Baron Justus von Liebig, in a letter to the Chairman of a Select Committee of the House of Commons, said:—"The natural laws which govern the permanent fertility of soils and the increase of their produce, are, from circumstances which I cannot detail here, very little understood by the British farmer; and hence arises a fear that the use of sewage, which ought to be a lasting benefit to agriculture, may be regarded after a few years as a veritable detriment by the same farmer who in the first year of its application would assuredly give it his full approbation. In what may be termed its natural state, *sewage is not a universal manure*—like stable-dung, which is efficacious at all times and in all localities—but a special manure, the continued and *exclusive* application of which tends to impoverish the land. Stable dung contains all, a special manure only *some*, of the elements which should be returned to the soil in order to render it permanently fertile. Peruvian guano for instance, belongs to this class of special manures, and experience has shown that in certain parts of Germany and Scotland the application of guano on meadow land which produced in the first years enormous crops of hay or grass, had no later effect at all, and that the same man who at first overrated the value of guano, eventually cursed its application. Sewage contains ammonia, potash, phosphoric acid; like guano, but phosphoric acid in a smaller proportion. On a soil rich in its natural state in phosphoric acid, sewage will have an excellent effect. It will produce for instance large crops of grass, turnips, and corn, if the soil supplies the quantity of phosphoric acid wanting in sewage; but as in each successive crop a certain quantity of phosphoric acid is abstracted, the total quantity in the soil is, by continual application of sewage, gradually diminishing every year, and a time must come when the phosphoric

acid is insufficient for further crops, and when sewage ceases to have its former effects. By having the turnips eaten on the fields, the soil (by the liquid and solid excrements) is exactly manured as if irrigated with a number of tons of sewage containing the elements of the voidings of the sheep; and the farmer knows that at the beginning of a new rotation he must manure his field with phosphates in order to get the former crops of turnips, corn, &c., in succession. The same field could not be rendered equally fit to furnish the same quality or quantity of produce in a new rotation if it was manured year after year by the voidings, or its equivalent sewage, which would be the same thing. By the increase of his crops in the first year, by sewage irrigation only, the farmer, ignorant of the natural law, would be led to believe that the *same effect* would *continue*, and that he could dispense with other manures altogether, except perhaps, the stable dung which his farm produces. But he would be mistaken, and on finding his error, as he soon would do, the revulsion of feeling caused by it would be baneful. The agriculturist must be taught and made aware that by the *introduction of sewage, his whole system of farming undergoes a change, and that he has an apprenticeship to learn to apply it rightly and economically*, and in order to *benefit* and not *injure* his fields. If clearly understood, and properly managed, the employment of sewage will prove a blessing to agriculture; and those who by unwearied perseverance, have at last seen the consummation of their labours, may justly be looked upon as the benefactors of their fellow-men. But loud would be the outcry should the agriculturist, either by his own ignorance or the want of foresight in others, find himself misled. Our name would then become a byword, and instead of gratitude, be recollected with a curse. There are two things which must be done; first, it must be made intelligible to all, that sewage in its natural state does not replace stable-dung in its entire efficacy, and that if used exclusively, it will produce abundant crops only for a time; secondly, that for each crop the composition of sewage ought to be corrected according to the nature of the soil, by adding those ingredients which are wanting in sewage and which the plants to be grown require in the largest proportion.

II.

Town sewage is composed of two distinct kinds of substances,—solid matter suspended, and matter in solution. Of the two the most valuable, from an agricultural point of view, are those substances contained in a state of solution. The following table exhibits an analysis of the solid matter contained in one gallon of ordinary sewage—from the London sewers :—

Organic matter and salts of ammonia	301·82
Sand and detritus of granite	20·69
Soluble silica	12·51
Phosphoric acid	10·41
Sulphuric acid	11·73
Carbonic dioxide	15·59
Lime	21·53
Magnesia	2·87
Peroxide of iron	6·20
Potash	11·13
Soda	1·51
Chloride of soda (common salt)	33·24
Total ...	458·26

The chief sources to which town sewage owes its value are the solid and liquid excreta of the inhabitants; and, bearing in mind their constituent matters, it would be as well to inquire what is the money value of town sewage, and whether the fertilizing ingredients it contains are always available and possess the high value, in an agricultural point, ascribed to them by the enthusiasts who insist on the universal application of town sewage.

One authority, in calculating the value of all the available sewage of London, assumed it to be equivalent to the enormous sum of £1,386,510 per annum. It is needless to remark that the factors which gave such fallacious results were in themselves wrong, because to the potash, ammonia, phosphoric acid, magnesia, lime, &c.—present in sewage—the actual commercial value of these substances was assigned. This was a palpable error. Closer reasoning and a more scrupulous adherence to facts showed that the maximum theoretical value of 100 tons of sewage did not exceed £0-14s.-5·92d., "the value being based upon the supposition that the ammonia, phosphoric acid, &c., are as useful as if they were in the form of guano. So they would be, if the sewage in limited quantity and at the proper time were applied to the soil; but town sewage is in most instances collected in a very expensive manner, is distributed over the land during the whole year, and is usually applied in quantities far greater than is necessary for the wants of at least most crops." There are existing in sewage valuable fertilizing materials; but owing to the bulky nature of sewage, or in other words its exceedingly dilute form, it has been found impossible to extract the full value of these fertilizers and to avail ourselves of them in a perfectly convenient form for agricultural purposes. As Dr. Voelcker remarks :—"The value of a manure depends upon other circumstances than its value as shown by analysis. The more bulky a manure is, the less manageable it is, and the less is its practical value; and we cannot calculate the value of any fertilizer by the price of the constituents we put *in* the ground. We ought to calculate the value by what we can get *out*, through the instrumentality of certain manures, and following this plan it will be found that the real fertilizing value of the sewage of towns will not on the average be more than a halfpenny a ton." Numerous experiments have from time to time been carried out with a view to eliminate the fertilizing matters from sewage, but the results obtained scarcely warranted the outlay; and even with the *expensive* precipitants used, the average price realized from the manure therefrom, did not exceed £2 per ton. "Under circumstances where it was found impossible to apply sewage profitably to land, experiments were conducted in order to determine the best means whereby sewage might be deodorized, thereby mitigating the frightful nuisance attending the pollution of rivers and watercourses. The results of three sets of experiments carried on by order of the Metropolitan Board of Works under M. M. Hoffman and Frankland, showed "that 1,000,000 gallons of sewage required respectively—

	£	s.	d.
66 gallons of perchloride of iron, costing ...	1	13	3
400 lbs. of chloride of lime	2	2	10½
132½ bushels of lime	3	6	6

Three equal quantities of sewage were collected and perfectly deodorized, respectively, by perchloride of iron, chloride of lime, and lime. They were allowed to stand. After two days the sewage disinfected by lime was slightly tainted, whilst that disinfected by chloride of lime and perchloride of iron, remained perfectly inodorous. At the end of three days the lime sewage had become decidedly offensive, whilst the other two specimens still remained free from smell. After four days the odour of the lime sewage had become worse, but that treated with chloride of lime likewise began to exhibit an offensive character, whilst the sewage to which perchloride of iron had been added remained perfectly inodorous. Even after the lapse of nine days the condition of the latter had not changed and in other experiments the same relative permanency of effect had been observed."

The difficulties attending the disposition of sewage in England have not been slow in reproducing themselves in India. Sewage is a necessary evil, and it behoves our municipal and cantonment committees to determine how it can be disposed of in the most complete and efficient manner, and in a way which may prove remunerative to the interests they represent and advantageous to the suburban cultivators. There is no dependency of the British Crown in which agricultural reform is more needed than in India; and by the effective disposition of the sewage of our large towns and cantonments we shall confer one great practical benefit on, and shall have advanced one great step in the *practical education* of, the people. We shall have removed from our market gardener the burdens of grinding poverty and want which are only too commonly the lot of the mass of the agricultural community in India.

The following are the results of sewage irrigation on wheat land on the estates of the Earl of Essex :—

2 Lands 2 a. 1 r. 4 p. with 60,000 gallons of sewage.
" 2 a. 1 r. 4 p. without sewage.

Sewaged lands gave 11¼ loads of straw, 124 bushels of wheat.
Unsewaged land 9¾ " " " 103 " " "

	£	s.	d.	£	s.	d.
And per acre sewaged.						
Straw—5 loads @ 30s.	7	10	0			
Wheat—53 bushels @ 6s.	15	18	0			
				23	8	0
Per acre unsewaged						
Straw—4¾ loads @ 30s.	7	2	6			
Wheat—44 bushels @ 6s	13	4	0			
				20	6	6
In favor of sewage				3	1	6
Deduct cost for sewage for 1 acre, *viz.*, 30,000 gallons=134 tons at 1¼d.				0	14	0
Clear gain on sewaged land				2	7	6

There is no reason why similar, if not more favourable, results should not be obtained in India from the use of town sewage: everything—cheap labor, a grateful soil, and cosmic conditions—being in favor of the Indian agriculturist. And in many instances sewage is to be had free, municipalities being only too anxious to get rid of it. With improved implements and methods of tillage, a year's operations should give something close on the following figures :—

I. Wheat—*Rabi* crop.			
Grain—50 bushels or 37·5 mds. @ Re. 1·5 per md.			56·25
Straw—4,600 lbs or 57 mds. " Re ·25 "			14·25
			70·50
II. Tobacco— Yield 800lbs. which after deducting all cost of cultivation would be valued at Rs. 8 per maund			80·00
III. Indian corn—*Kharif* crop,			
Grain 80 bushels or 4,800lbs @ Re. 1 per md.			60·00
Straw—dry fodder, 70 maunds @ Re. ·25 "			17·50
			228·00
Deduct—			
Revenue to Government ...	Rs.	10	
Manure poudrette 20 tons @ Re. 1 per ton		20	
Cost of tillage operations, &c., on *rabi* and *kharif* crops, as well as a sum equal to 5 per cent. on the value of cultivators' cattle, tools, well gearing, &c,		60	
			90
			138·00

or a clear profit of Rs. 138 per annum on each acre of land.

The production of green fodder crops during the hot weather in India is a question of the greatest importance, considering that for three months (from the end of March to the end of June) the ground becomes as hard as baked clay and refuses, save in the vicinity of canals or watercourses, to yield green herbage of any description. It is under these conditions that a plentiful supply of green food for his cattle and live stock becomes a great desideratum to the ryot. Land laid down under lucerne *Medicago Sativa*, or Italian Rye Grass (*Lolium Italicum*) and liberally dosed with sewage during the months of March, April, May, and June, would easily give monthly crops of magnificent fodder, each cutting yielding from 8 to 10 tons per acre. "Charri" (or *Sorghum Vulgare*) if sown at the end of March and treated with sewage, would also give two good cuttings of fodder during the dry months of May and June. In Northern India, however, none of the large cities are as yet provided with regular systems of water-supply and sewage; and until Government by legislative enactments compel the several municipalities—of such towns as Allahabad, Lucknow, Agra, Delhi, Amritsur, Lahore,

and Peshawur—to elaborate and carry out *complete* schemes for providing their citizens with pure drinking water, as well as for the disposal, in a *rational* manner, of their sewage, we are not likely to see any valuable results on a large scale arising from the application of town sewage to agriculture.

EDITORIAL NOTES.

FROM the last Crop Report we learn that "Agricultural prospects on the whole remain generally satisfactory." More rain, however, would be beneficial in parts of the Punjab and Bengal. Where the rice harvest has been completed in Bengal, the district reports tell us that the outturn has been above the average, and prices rule low in most markets. Rain is still wanted for the unirrigated crops in the North-Western Provinces and Oudh; but although it would be of great advantage to the spring crops generally, it would perhaps do some harm to the mustard plant which is just now in flower in the western districts of the N.-W. P. There promises to be an unusually large crop of rape-seed this year, and prices should rule very low, a result which may give the oil-seed trade a chance of a healthy revival, in spite of the growing partiality for mineral oils. We regret to see that cattle disease continues in Kumaon, and has appeared in Agra, though it is decreasing in Jhansi.

FROM a communication in our correspondence column, it will be seen that Mr. Thos. Routledge is still continuing his interesting and valuable experiments with regard to paper stock from Indian fibres. The home official world is not slow to perceive the important bearing on commerce generally of these carefully conducted experiments, and it seems to us that we in India owe even a larger debt of gratitude to Mr. Routledge. Should he ultimately succeed in introducing new fibres to the notice of European paper-makers, none will be benefited so largely as the Indian public, commercial and agricultural. The plants operated on are all very common in this country, and as a rule they can be obtained at a nominal expense. At the same time it must not be forgotten that it is only a very small proportion of these plants that affords any prospect of profitable manufacture under existing conditions. Mr. Routledge speaks hopefully of the improvement effected by using the ordinary native *dhenkee*, especially in its reducing the bulk, and thereby saving freight. There is another advantage which he has not noticed. When expensive machinery is introduced, a large amount of opposition is sure to be offered by the natives, who are exceedingly conservative in such matters. The native *dhenkee* is a very useful implement for such work, as it acts on the fibres by direct concussion, and there is none of the scratching and rubbing which sundry other processes lead to. The fibre, therefore, while reduced in bulk, is unimpaired in quality. In introducing any improvement in Indian modes of manufacture or cultivation, it has always been found the most effectual plan to take the ordinary native implement and improve on it. The introduction of entirely new modes, leads to a deal of friction among all classes of the community. A notable instance of this is in connection with the Beheea Sugarcane Mill, which is an improved *kolhu*, and which has had a remarkable success.

The merchants and intelligent natives of India ought to move in this matter, and assist Mr. Routledge with such information as their experience may have placed within their reach. By so doing they will help on the inquiry in which he is so devoted a worker. Paper and pasteboard, in fact all sorts of stationery manufactured from fibres, are imported from Europe to the value of Rs. 38,03,154 annually, and we believe there exist no reasons—other than the apathy and indifference of the people of India—why the larger portion of this should not be made in India.

AN interesting letter containing details of an experiment made by a native gentleman, in extracting sugar from Sorghum, will be found in our correspondence columns. Hitherto in this country the "Chinese Sugar-cane" *(Sorghum Saccharatum)* and "Planter's Friend" *(S. Kaffrarium*, or South African variety*)* have been grown almost solely for fodder, for which they are most valuable, as results have shewn. The latter will yield from 4,000 to 12,000lbs of straw, besides a crop of grain per acre. *S. Saccharatum*, however, gives a heavier yield of grain than "Planter's Friend." But although both varieties are specially recommended as fodder producers, there is every reason to believe that they would prove very valuable additions to the crops of this country for the production of sugar. The straw of *S. Kaffrarium* is known to be very rich in saccharine matter. Occupying the ground only about 100 days, it will in that time, and without irrigation, yield from 8 to 10 tons of green Sorghum fit for crushing. In America *S. Kaffrarium* is considered by many to be a better sugar-producer than the Chinese sugar-cane, while all agree that the sugar therefrom is much more easy to crystallize. But quite enough has been written and said and done in the way of experiment, to shew that both the "Chinese sugarcane" and "Planter's Friend" are well worth extensive adoption in this country as sugar-yielding crops. We congratulate our correspondent on the success that has attended his endeavours in this direction. Doubtless the inadequate means of crushing the cane, and purifying and evaporating the juice have to some extent militated against the extensive cultivation of these canes as sugar-producers. But now that Messrs Thomson and Mylne have come forward with their patent sugar-cane mill, which is an acknowledged success, the chief of these obstacles has been removed, and we see no reason why Sorghum should not become one of our staple crops for the production of sugar.

A CORRESPONDENT, whose letter appeared in our December number, wrote to us inquiring for some information concerning the "Dschugara" or "Schugara," a forage plant for cattle. We replied that so far as we are aware the plant is not known in this country by that name and that unless he could give us the botanical term it would be impossible for us to recognise it. Since then we have succeeded in tracing it, and the following description of the plant is taken from a recent number of the *Journal of the Society of Arts*:—

A new forage plant is announced form Central Asia, under the name of "Deschugara." It is said to be largely cultivated in Turkestan, as well as in Poland, where it has given most satisfactory results. From 100lbs of seeds sown, 2,800lbs of grain have been harvested, and a large quantity of straw, which is consumed with avidity by cattle and sheep. The plant has a tall-growing, stout stem, which forms a green cattle food. A variety of the plant ripens three months after being sown. In the climate of Odessa it is described as arriving at maturity as soon as it does in its own country. The chemical composition of the plant approaches very nearly to that of the oat and barely, so that it is extremely useful as a cattle food. The seeds, however, reduced to powder, are used as ordinary flour. Some mystery attended the botanical identification of this plant, when its properties were first made known in the pages of a continental journal, some few weeks since. Mr. Christy has, however, succeeded in obtaining some seed from Russia which, together with information he has also obtained, prove the plant to be that of *Sorghum Cernuum*, a grass closely allied to the well-known "Dhurra" of India.

AN esteemed correspondent sends us the following from Bangalore:—

Our half-yearly Horticultural Show of Saturday last proved a creditable exhibition for Bangalore. In the "flower" department, the standard roses exhibited by Colonel Arbuthnot, 11th (King's) Hussars, and which took the prize, were the best I have seen in India. A new feature was introduced into the show this year, two prizes being offered for the best kept flower-gardens. The first was won by Surgeon-Major Pearl, and the second by Mr. Gibson, Municipal Engineer of the town. The idea is a capital one, as it encourages care and taste in garden cultivation. The show of fruit and vegetables was excellent, and contrasted favorably with the miserable display made at the market on Christmas Eve. The peas exhibited by Mr. T. T. Leonard, who owns a thriving little farm a few miles distant from Bangalore, were of such fine quality, that an extra prize was awarded for them. The same gentleman also exhibited a splendid sheaf of oats, something never before seen at a horticultural show in Bangalore. It may not be out of place to mention here that Mr. Leonard is the first European who has satisfactorily demonstrated that English farming, adapted to local circumstances, will pay in Mysore.

SCIENCE in Agriculture would certainly seem to be taking rapid strides when we hear of man controlling the elements and producing or withholding the waters of the firmament at will. A Mr. G. H. Bell of New York, we read, proposes to build towers 1,500 feet high, through the interior of which he would pump air saturated with water into the upper atmosphere, and so cause the precipitation of rain. By reversing the direction of the blower, a current of air would, when necessary, be drawn down the tube and so annihilate the clouds and prevent excessive rain. A scarcely less startling and more positive announcement is that of a Mr. D. Ruggles of Fredericksburg, Virginias, who proposes to make rain fall at will by exploding dynamite in the cloud region of the atmosphere. Mr. Ruggles, we are told, has already gone so far as to patent his process. It would certainly seem a simpler method than that proposed by Mr. Bell for producing the desired result, though it probably lacks the advantage claimed for the latter of regulating the rainfall at pleasure. It may be worth while noting, however, that both these suggestions emanate from the Western Continent.

JOHN JOSEPH MECHI, of whose death we have been informed by Reuter, was in many ways a remarkable man. Born 78 years ago, he was at an early age placed in a business house, and through his own untiring industry, in devoting the time allowed for dinner to the sale of small articles of which he had secured the patent, he was enabled to set up, in a very small way, as a cutler. In this trade he speedily amassed a handsome fortune, principally by the sale of "The magic razor strop." He then, in 1840, turned his attention to English farming. He may be called the pioneer of scientific farming, and, like most exponents of new systems, was heartily laughed at by the farmers of those days, for his schemes of deep drainage, steam-ploughing, artificial manures, and other improvements. During the forty years he gave his attention to agriculture, however, he lived to see his plans and methods more or less generally adopted, and he himself became a recognized authority on agricultural matters. His model farm in Essex is well known, by name at least, to farmers the world over. He was fond of showing the place to visitors, to whom he explained his many useful improvements in the method of farming; while his letters to the *Times*, written at frequent intervals, and his various treatises on drainage and agriculture have been of inestimable value.

RECENT experiences having shown the necessity of a separate Agricultural Department, and at the instance of the several Revenue Commissioners, the Government of India, in a recent despatch, are said to have recommended to the Secretary of State the formation of a distinct and separate agricultural establishment in the Home Office, to be placed under the immediate charge of an Under-Secretary or an Assistant Secretary of the Department.

OUR last issue contained a few remarks on agricultural banks, which a contemporary informed us would probably occupy a prominent place in the commercial and industrial questions to which Lord Ripon hopes to devote his Indian career. We now learn that Mr. W. Wedderburn, the Judge of Ahmednuggur, with the assistance of some of the opulent and influential residents of that place, intends to open an Agricultural Bank there. It is said that the proposed Agricultural Bank will purchase and supply the poverty-stricken ryot with cattle, and all the necessary implements of husbandry; the ryot, on the other hand, paying the cost of these articles at his convenience. Mr. Wedderburn's proposal is, we believe, a move in the right direction, and as such, deserves commendation.

A STEAM-PLOUGH was recently purchased by the Government of the North-West Provinces, and last month some experiments were conducted with it, under the superintendence of Mr. List, C.E., on the black-soil plains of the Banda district. The following account of the trial is from the *Pioneer* :—

The experiment, so far, has been eminently successful. The plough loosens the soil to a depth of 18 inches and tears up the *kans* stems in a way that could not be effected by any amount of animal power; for a large number of animals cannot be made to work steadily together. The effect of the deep ploughing, however, can only be estimated when next year's *rabi* crop has been reaped, that is, after about fifteen months. We shall then know the increase of produce due to the bringing of the sub-soil to the surface, and Government will be able to decide on the financial success of the experiment. It is estimated that 1,500 acres can be ploughed in the year, but further experience is necessary to frame a trustworthy estimate of the cost of working. Land similar to that in which the plough is now working, when worked up with the ordinary country plough, lets at Rs 7 an acre. If deep ploughing doubles the produce, there is no reason why the letting value should not also be doubled.

SURGEON-GENERAL E. BALFOUR has published a memorandum on the subject of Manilla hemp. Mr. Liotard, of the Agricultural Department of the Government of India, has reported on the materials in India suitable for the manufacture of paper. Several of the fibre-yielding plants are mentioned by him and, amongst others, various species of the genus *Musa*, of the plantain or banana tribe, many of which have been grown in the East Indies from the most remote times. He describes the introduction, in February 1858, of the Manilla hemp plant, direct from the Philippines, into the Madras districts, by Colonel (now Sir George) Balfour. Nevertheless, the Import Trade Returns of the United Kingdom show a large and continually increasing delivery of hemp from the Philippine Islands, now averaging yearly about 20,000 tons, valued about half a million sterling. Dr. Balfour says:—

"I have ascertained from the London Produce Brokers, through Dr. Birdwood of the India Office, that this imported article is the true Manilla hemp from the *Musa textilis*, that the bulk of it is delivered in London where it is made up into cordage and ropes for ships, especially for yachts' running rigging, being very light, strong, and clean, and also for clothes' line. But there is no doubt that the Manilla hemp plant, *musa textilis*, grows as well in British India as other species of the plantain or banana genus, and that British India could in a couple of years, supply the London market with all that it could take of Manilla hemp fibre. The prospect of benefiting British India by creating an export trade from it of the extent and value above indicated might well incite to considerable efforts to attain success. In 1861 to 1863 the Madras Revenue Board made continuous efforts to secure the naturalisation of the plants which Colonel Balfour had introduced; but their efforts seem to have been effectual only in the Wynaad from which, by 1877, the Conservator of Forests replied that the Philippine variety had been introduced on several of the coffee estates, where it grows remarkably well, and no doubt is felt there as to the value of its fibre. The attention of the Boards and Commissioners of Revenue, and of the Agri-Horticultural Societies might be re-directed to this plant."

VANILLA has often been recommended as a suitable production for cultivation in Southern India. But the plant is delicate, is somewhat whimsical in its likes and dislikes of situation, and is exposed to obnoxious attacks of various pitiless enemies. A citizen of Bombay has, the *Bombay Review* tells us, during the last two or three years, been trying to cultivate it in the Goa territory—we presume on some of the uplands—and is now able to announce that his experiment is successful. It appears that one essential part of the process is the due fertilisation of the flowers. This has been effected. Not only so, but there are already many fine large pods from which, or from the seeds, the precious extract is taken. These pods bid fair to ripen in due course; and this will complete the success of the somewhat delicate experiment. The gentleman in question has already resolved to extend his nurseries of Vanilla. He thinks that croton oil plant also will succeed in some parts of the Goa territory.

THE following remarks on the "Mahwah" tree (*Bassia Latifolia*), grown in India for food purposes, and highly esteemed, are from the *Chilian Times* :—

The fruit is really a staple crop. It is eaten greedily by all kinds of birds, and by animals, from the goat to the tiger. All the information procurable about this tree confirms the belief that it would prove an acquisition to Chili, and it is to be hoped that some of our farmers will test it here. Its fruit is large, contains 50 per cent of sugar, is eminently fattening in its qualities, and is said to improve the flavour of the flesh of animals to which it has been fed. Another interesting fact is that the flowers, of which a single tree will often produce 400 pounds, are also a favourite article of diet, and are distilled into a spirituous liquor. Sugar is also made from these flowers. Besides the *Bassia Latifolia*, there are other allied species of value, *B. Buttyracea*, a native of Nepaul, has an oily fruit, of which a sort of butter is made; *B Longifolia* gives oil for lamps; and another species, found in Abyssinia, produces the shea, or Galum butter. The height of most of the *Bassia* average forty feet. The trees are highly ornamental, and if introduced here might in time be of great commercial importance.

MESSRS. THOMAS & Co., of Calcutta in a recent report say :—"With reference to a telegram from Munich through Reuter's Agency, lately published in the newspapers, that an artificial indigo, equal to Indian, has been discovered there by a scientific man, we may remark that as far we can ascertain, this intelligence points to no new discovery. It is a fact that artificial indigo can be, and is made, and this has been known for some time past. It cannot, however, at present be made at a price to compete with Indian indigo, and, having carefully inquired into the matter, we believe we are correct in stating that thus far the price of the artificial indigo is nearly three times that of the real article, while it can only be employed by the manufacturers of printed goods."

FROM the Administration Report of the Bombay Presidency for the year 1879-80, we learn as regards the production of cotton throughout the presidency, including the tributary States, that the area of land under cotton was increased by no less than 777,323 acres, the total acreage under cultivation in 1879-80 being 3,758,195, and in 1878-79, 2,980,872. This, be it observed, is an increase in the areas under cotton of only twenty-six per cent; but the outturn of cleaned cotton obtained from the areas sown during that season has increased by one hundred and seven per cent over the preceding year! This is a most encouraging fact, and shows that there are other ways than extending the area under cultivation by which the cotton yield, as well as the yield of other produce, can be increased; for in this instance the result of the year's cultivation on cotton lands shows a better yield on an equal area by eighty-one per cent. The comparative outturn has been better everywhere, varying from 155 per cent in the northern division, to 11 per cent in the Native States situate in the southern

division of the presidency. As regards crops generally, the whole of the season of 1879-80 was unusually favourable, although not equally so in every part of the presidency, the rainfall showing a general average, but not falling timely in many parts.

THE Lucknow paper writing of the imports of Indian wheat into England says :—

This is a branch of Indian commerce which is likely to be largely developed, but we are afraid that unless great care is exercised by shippers to see that the wheat is clean and as free from admixture as possible, there will be considerable disappointment in store for those on this side who engage in the trade. Especial care is necessary with such a large competitor as America in the field. In the States, every appliance is available for the shipment of wheat in the best possible condition, and unless shippers in Indian ports are very vigilant they will assuredly consign their grain to a bad market when sending parcels of wheat to London and Liverpool. Some years ago,—in the infancy of the Department of Agriculture and Commerce,—some very useful hints to wheat cultivators were promulgated ; we are afraid, though, that very few of the circulars reached actual wheat-growers. It would be a step in the right direction to have those republished in the various vernaculars, and widely circulated in the wheat-producing districts.

FROM the last Administration Report of British Burmah, it appears that little more than 5 per cent of the total area of the province is under cultivation. There is vast room, therefore, for the development of this, the most prosperous of the provinces under the Government of India. The cultivation consists almost wholly of rice, over 88 per cent of the cultivated land being under that crop. The rice cultivation increased, in the year dealt with in the report, by 160,574 acres, which, it is reckoned, means an increased yield of 120,000 tons of rice. Indeed, the only limit to the extension of rice cultivation in Burmah appears to consist in scarcity of labour obtainable for that purpose. The total land under rice is given for the year at 2,868,329 acres, out of a total cultivated area of 3,257,903 for the whole province.

ACCORDING to recent reports, the present paddy crop all over British Burmah will probably show a deficiency of from 10 to 15 per cent all round, which may make prices somewhat dearer in Rangoon for exportation, but will hardly affect food prices in the districts, for the mass of the people. Work at the rice mills seems yearly increasing. Some ten years ago the milling and shipping used generally to be completed by the middle of April. Gradually steamers were loaded at the commencement of the rains, and the Bengal famine showed that even in a Burmah monsoon it was possible for cargoes of rice to be sent from Rangoon safely, all through the rains. Since then the shipping season has been gradually extending, and with a constant fleet of steamers trading between Rangoon and Penang and Sigapore, the rice mills are working now about 9 or 10 months out of the 12. As in the fine weather or busy season many of them work night and day, during which time 1,000 bags of cleaned white rice can be milled, the amount of work got through in the course of a year at a Rangoon rice mill is very considerable.

A CORRESPONDENT writes to us from Rangoon with reference to Government leases of land in Burmah :—

It is to be hoped the visit of the Chief Commissioner to the Tonghoo hill tracts, in which he purports staying a week, will make Mr Bernard propose to the Government of India some more liberal system of giving grants of land than at present exist here. It has been conclusively proved that tea and coffee flourish on those high lands. Potatoes and cinchona have also been grown there, and the climate is said to be cooler in the hot weather than at any of the towns in Burmah. If land were made easy of acquisition, no doubt the Tonghoo hill tracts might in a very few years become a most valuable part of the province, and even be settled by European and Eurasian colonists. The tea, which for the first time has been sold in Rangoon, is equal to all but the best kinds of Assam and doubtless after a little more experience the enterprising pioneer of this cultivation will be able to produce a still better flavoured article. But how can people be expected to go in for plantations, importing expensive machinery and foreign labour, if, under the Burmah Land Revenue Act, they are liable to be turned out of their holding by Deputy Commissioners whom they offend? Leases at the good will and pleasure of revenue officials are not sufficiently attractive to draw to Burmah the capital the expenditure of which our waste lands so much require, and I trust Mr. Bernard's tour to Tonghoo will have the effect of opening his eyes to the mischief likely to be worked in this province unless we get an improved land law, enabling the Chief Commissioner, in such cases as he thinks fit, to grant the freehold of the land which is now lying waste, and which only some such liberal law can bring under cultivation. People will not cultivate or expend money largely on leases, and the enormous power given to Government officials in the districts makes Englishmen view them with suspicion, and everyone is chary of expending much money outside of the chief towns.

THE enterprising gentlemen who are so successfully working the Arakan earth-oil wells have, we are told, recently purchased a piece of ground near Kemindine, Rangoon, where they intend erecting machinery to refine the oil. If successful in producing an article to compete with Devoe's American oil, which is now selling there at Rs. 2-8 per five-gallon tin, Burmah should soon become independent of importation from New York, and possibly be able to supply India to a certain extent.

WE hear with pleasure that the local Government has caused our article on "Rice Mills in Burmah," published in the *Indian Agriculturist* for December, to be printed in the *Official Gazette*, for general information. This will probably give the article a wider local circulation than if it only appeared in the agricultural organ, and speaks well for the administration in trying to draw public attention to this important trade of Burmah.

THAT Japan can afford to compete with any rice-growing country in the world, all other conditions being equal, would seem to be evidenced by the statement of cost of rice production furnished by the Tokio Chamber of Commerce. A recent issue of the *Japan Gazette* tells us :—

The average cost appears to be yen 2·45 per koku, and the average selling price, yen 4·45, so that the producers' first profit is considerable. We of course, deal with these prices as silver, not paper rates, and proceed upon the assumption that if rice has appreciated in relation to currency, silver has increased in value in the same proportion. Further, that in view of the satisfactory harvest and large surpluses, the value of rice for silver is unchanged. Under these conditions there is no reason why Japan should not be a formidable competitor to Saigon, Rangoon, and the other eastern rice ports ; nor why large sums of specie should not annually flow into this country to encourage increased production and activity. Ordinary Japan rice at $5 silver per koku would command a large sale.

THE Japanese Government have established an agency in London for the sale of paper of various kinds manufactured at the Tokio mills. The quality of this paper is pronounced to be all that can be desired, but the price is practically prohibitory. If they were to turn their attention to supplying the manufacturers at home with the raw material, there would be more likelihood of finding a profitable market.

WE see that the Rajah of Sarawak has issued a proclamation inviting Chinese to settle with their families on the Rajang river in that province, and offers them very tempting terms. The island of Borneo offers a vast field for enterprise, being almost wholly undeveloped, but it is so rich in natural resources, possesses so fertile a soil, and enjoys so excellent a climate for the tropics, that it cannot fail ultimately to attract the attention of capitalists and planters. At no very distant date, doubtless we shall see Labuan and the Borneo Settlements in direct and regular steam communication with Hong-Kong. Mr. Lees, the Governor of Labuan has been instructed to assist in opening trade with Borneo, and to adopt such measures as are, in his opinion, best calculated to develope commercial relations with that country. This is an acknowledgment, at all events, of the importance of cultivating a promising field for the extension of trade, and may perhaps be regarded as a sort of preliminary step to recognising the cession recently made to the Dent Overbeck Company.

TRUSTWORTHY information, the Press Commissioner tells us, has been received regarding the attempts to introduce the cultivation of the opium poppy in the Portuguese territories of Mozambique, which shows that the results are more unfavourable to the success of the experiment than they were at first supposed to be. The yield of opium is found to be not more than one quarter that in Malwa, the plants give only one-third the number of capsules, and the African drug is considered inferior in quality. Out of forty-two Indian cultivators who had been imported to introduce the Indian system of cultivation, seven had died ; whilst the Parsee engineer who had been employed to attend to the irrigation works, had left the country.

MISCELLANEOUS ITEMS.

OUR acknowledgments are due to Major Nutt, the President, for a copy of the prospectus of the Wadhwan Agricultural Show, to be held on the 10th, 11th, and 12th instant. Prizes we see will be awarded for horses, ponies, cattle, sheep and goats, camels, asses and mules, poultry, fresh fruits, vegetables, grains and seeds, oil-seeds, fibres, cotton, Indian tobacco, dyes, forage plants, manures, and agricultural implements.

THE annual Show of the Agri-Horticultural Society will be held in their garden at Allpore on the 3rd instant. We are given to understand that their Excellencies the Viceroy and Marchioness of Ripon and the Hon'ble Sir Ashley Eden intend honoring the show with their presence.

AN agricultural exhibition of animals and agricultural products, combined with trials of agricultural machinery, ploughing matches, wrestling, and fire works, is to be held on a large scale at Lucknow on the 8th, 9th, and 10th of March next.

A HORTICULTURAL exhibition is to be held at Mahableshwar on or about the 25th April. There are to be three classes: flowers, fruits, and vegetables; and about one hundred prizes, varying from Rs. 20 to Rs 2.

WE find from a report (a fortnight ago) in the local *Gazette* that the outturn of the crops in Assam is expected to be a bumper one, one-half having been already gathered in. The weather is reported as "seasonable."

IN the Nepal Terai the rice crop is not likely to exceed an eight-anna outturn.

THE French Government in Saigon have increased the export duty on rice, from the 1st January, from 10 cents to 15 cents per picul, but French Colonies and French ships are to be exempt.

THE failure of the crops in the Southern and South-Eastern Provinces of Russia is reported to be so great that when spring arrives, nearly two million people will be without food.

MESSRS. HIGGINBOTHAM & Co., Madras, have brought out a very valuable publication printed in English and Tamil, under the title of "Extracts from manuals of the more deadly forms of cattle diseases in India," by Messrs Thacker and Hallen, Veterinary Surgeons of well-known repute.

HIS Highness the Maharajah of Cashmere has applied for permission to engage the services of three Frenchmen for working the liquor distillery which has just been established at Srinuggur, and for generally supervising the vineyards and other industries in his State.

WE observe that Mr. James Mylne of Beheea in Shahabad, Bengal, Zemindar and Indigo Planter, has taken out a patent for improved spindles for rollers used in Thomson and Mylne's patent sugar-cane crushing mills

CALCUTTA absorbs 44·04 per cent. of the whole trade of India; Bombay, 37·22; Rangoon, 5·76; Madras, 4·55; Kurrachee, 1·42. The trade at any one of the other Indian ports does not reach 1 per cent of the total trade of the country.

THE Ivory supply of the world causes the destruction of 100,000 elephants annually.

THE quantity of salt made and imported on which duty is paid in India is about 25½ million maunds, and the duty received £6,528,681; the charges to be deducted are about £260,000

THE importance of the hide and skin trade of India is shown by the fact that it stands seventh in the list, and that it has attained to the yearly value of £3,750,000. The total quantity of raw and dressed hides and skins now exported from India annually is but little short of 1,000,000 cwt.

THE Upper Provinces are promised a new and picturesque industry in the shape of an experimental Ostrich Farm, the material for which is to be brought from the Cape. Moreover, the scheme is fathered by a very practical man.

THE paper railway wheels which have been tried in America are said to be a success. One carriage having these wheels has run 100,000 miles with very little wear.

ABOUT 75,000 miles of hoop iron—enough for a threefold girdle round the earth—will be needed to bind the forthcoming American cotton crop, if it reaches the amount of bales predicted by statisticians, or 6,000,000 bales.

THE Grand Opera at Paris has just been lit with cork-gas. The manufacture of cork-gas is likely to extend, as the cork-oak (*Quercus suber*) grows in vast quantities in Southern Europe and Northern Africa In fact, Spain and Portugal supply almost all the cork used in the world. The tree is very thriving, and produces its deep layers of bark for one hundred and fifty years.

THE culture of jute has, as stated in our last issue, been commenced in Egypt. Hitherto Bengal has been the great centre of production, although attempts to grow it have been made in parts of America and Australia. Egypt possesses the requisite soil and climate for its culture. As it yields a crop of about a ton an acre, worth at least £14 to £20, the culture of jute may come to be a rival of cotton in Egypt.

IN 1829 the export of jute from Calcutta was twenty tons only, worth about twenty pounds. Now the quantity exported annually is 350,000 tons—nearly two million bales—valued at about six million pounds sterling. This large quantity does not include the enormous supplies retained in India.

RECENT reports state that Chinese in the interior of China are loudly complaining of the want of rain. In some places around Soochow and Nanking they have had none for five and six weeks, while at Chinkiang it has not rained for nine weeks.

A CHINA paper writes as follows:—"A telegram was received in Yokohama lately, stating that the sugar crop in Formosa is very bad this year, and will be 400,000 bags less than the usual outturn. We cannot guarantee the exact number of bags as above-mentioned, but it is certain that the sugar crop is very poor."

THE opium plantation on the Zambesi river is, we observe, said to have a hundred and seventy acres of land under poppy this season. This is a small beginning, but the venture has been so far successful as to induce its conductors to indent on this country for a second instalment of Malwa cultivators.

OFFICIAL PAPER.

ON THE CULTIVATION OF JALAP.

FROM A. Jamieson, Esq., Superintendent, Government Botanical Gardens, to N. A. Roupell, Esq., Acting Commissioner of Nilgiris, dated Ootacamund, 9th July 1880, No. 115.

With reference to your docket No. 293, of the 2nd instant, and Official Memorandum, Revenue Department, No. 191, dated 1st instant, I have the honor to submit the following report on the cultivation of jalap.

Area under Cultivation.—The propagation of jalap was commenced in the Ootacamund gardens in 1877. Our stock then consisted of 100 plants that had been grown in the gardens for ornament. Although the tubers increase to a large size, and the stems grow luxuriantly and flower profusely, the flowers do not fertilize freely and produce but few seeds in the climate of Ootacamund; consequently, the increase of the plant has been confined almost entirely to propagation from root and stem cuttings. This work has been carried on steadily until there are now upwards of 25,000 plants and root cuttings permanently planted out. The tubers were at first planted 4 × 4 feet apart, but it was found that they did not exhaust the land, and throve equally well when planted closer. They are therefore now planted in rows three feet apart and the distance between each plant in the row does not exceed two feet, so that 25,000 plants give a total area planted of 5 acres. The cost of cultivation, weeding, &c., is also much reduced by close planting.

Method of Cultivation.—Having no data to guide me regarding the climate and soil which are natural to the jalap plant, I tried it in a variety of situations, and now find that it thrives best in a tolerably rich, dry and friable loamy soil,—in fact, conditions of soil that are indispensable to the production of good potatoes seem equally necessary to the growth of jalap. Good grass land is preferable to open rich forest land; when planted in the latter, it has a greater tendency to produce a mass of succulent roots than to form tubers. In opening land for the cultivation of jalap, several acres of well-drained grass land sheltered from the south-west winds, and with a stream of water on or near it, should be selected. If the land be very steep, it should be laid out in terraces 10 feet wide. The terracing should be completed by the end of January, and the ground dug over to the depth of two feet and left exposed to the action of the sun until the beginning of April, when it should be drilled, manured, and planted with potatoes (an early ripening variety of kidney would be the best variety to plant). The potatoes should be lifted in June, the land cleared of weeds and forked over in order that the manure (not taken up by the potatoes) may be incorporated with the soil. The ground is now ready to receive the jalap plants, which should be planted when the tubers are about the size of pigeon eggs in rows (across the terraces) on ridges a few inches higher than the general level of the ground, in order that they may be raised sufficiently high to prevent water from lodging immediately around them. If the weather be dry, the plants should be watered occasionally until they have begun to grow; when once established, ordinary garden culture, as to weeding, &c., is all that is necessary.

Jalap is an herbaceous plant throwing out twining stems, which should be supported by stakes or wire trellaces in the same manner as ordinary garden peas are. The stems die down annually, and the tubers remain dormant for two or three months. In addition to the aërial stems, jalap throws out a mass of under-ground shoots which emit roots and form tubers at intervals of from 6 to 9 inches. It is from these under-ground shoots that the greater proportion of our plants have been raised. When cut about three inches long and planted, they root freely and gradually enlarge into tubers; by this means the plants can be multiplied to any extent.

In the year 1879-80, 178 lbs. of dry jalap tuber was supplied to the Medical Department which was valued at Rs 2-4-5 per lb. = Rs. 393-12-1. The crop for the current year to be delivered in February or March next is estimated at 400lbs. and that for 1881-82 at 800lbs. and from February 1883, 1,200 or 1,500lbs. or more annually according to the area brought under cultivation. One acre of land planted as I have described should at the end of three years produce 5,000lbs. of green tuber, which will yield when thoroughly dried 1,000lbs. of jalap powder. The cost of cultivation, collection, and drying of the root for the same period will not exceed Rs 300. I therefore estimate that dried jalap tuber can be produced in Ootacamund at a cost of four annas and ten pies per lb.

No regular season has yet been observed for collecting the tubers or method adopted for preparing the drug for use, but I have no doubt it will be found most advantageous to dig them up when the herbaceous stems have died down and the tubers are dormant, which on the Nilgiris will be during the months of January and February.

The propagation and growth of the jalap in the Ootacamund gardens has so far been very successful, so much so that I consider it highly desirable that the area should be extended until there are at least 10 acres put under cultivation. From the Chemist's analysis and valuation published in G. O. No. 1027, dated 1st July 1878, there can be no doubt entertained as regards the commercial value of Ootacamund-grown jalap.

SELECTIONS.

SORGHUM CULTIVATION IN MADRAS.

A correspondent writes to the *Madras Mail*, as follows :—

In your issue of 4th December, you publish some remarks on experiments which *Sorghum Saccharatum* conducted in the Coimbatore district.* I am unable to lay my hands upon the exact data I collected regarding *Sorghum*, but may briefly state the following facts to show what has been, and can be, done in Madras :—

I selected a piece of clay land in Kilpauk, irrigated it slightly, so as to allow a country plough to penetrate the surface, and after ploughing, broke up the clods with small crowbars, and removed the bulbs of the coarse grass, its only produce. The ground was so hard that I had great difficulty in digging in with crowbars a dressing of stable manure. I then planted *Sorghum* in drills, about 9 inches apart, and irrigated with Red Hills water, but the crop failed, after coming up a few inches. Having again drilled the ground I planted *Sorghum Saccharatum*, and when the young plants had grown about 4 inches, I gave a top dressing of poudrette, manufactured on a new plan, whereby valuable chemical products, hitherto generally wasted, are saved and utilised ; this was then worked below the surface. I continued irrigation twice weekly and commenced cutting the crop as green fodder, whilst the seed was still unripe, a small patch daily, taking care to leave about 6 inches of the stalk, which immediately sprouts afresh. From this plot I gathered three complete cuttings, equal to twenty-five tons per acre, in less than five months. After each cutting the crop became thinner, owing to many roots dying ; but some of the plants seemed to gather strength, and produced several stalks apiece. From another plot, of slightly better ground, that I had prepared for other crops, and manured with poudrette, I gathered green fodder equal to 35 tons per acre in the same time. I am aware that I exercised more care and spent more time, manure and water than would ordinarily be practicable ; but, on the other hand, the soil was exceedingly poor, and the heavy outturn is mainly attributable to the fertilizing influence of the poudrette which was brought into immediate contact with the surface-feeding roots of the *Sorghum*. This crop is, however, so valuable for fodder that it should pay well for attention. In its green state *Sorghum Saccharatum* contains over 10 per cent of sugar starch and other carbo-hydrates, and I may mention that my horses at all times preferred it to their grain. I was not very successful in securing seed as the parrots and squirrels destroyed the heads before they had matured.

CAROLINA PADDY.

LAST November Mr. C. Benson, the Acting Superintendent, Government Farms, Madras, forwarded to the Board of Revenue samples of the paddy received from the Government of India together with a sample of genuine Carolina paddy, and said :—"The samples do not appear to me to be other than specimens of common paddy, known as *kar* in this neighbourhood. The husk is of a dark dirty colour, and the rice is, throughout, more or less red ; whereas Carolina paddy is characterized by the bright golden color of the husk and the fine white rice it yields. I observe that Mr. Dickson acknowledges that the paddy has lost the color of its husk, but I am extremely doubtful whether that ever takes place, for we have never found it to occur, and probably the true Carolina paddy has been lost in Ceylon. We have frequently observed this in the case of samples raised in this presidency. It is probably due to the sprouting of shed seed from former crops of native paddy on land where Carolina paddy has been grown, and as the latter variety does not flourish under the usual native system of management, the former has suppressed it. The chief recommendation of Carolina paddy lies in the whiteness of the rice it produces, and if it should be the case that in Ceylon this character really undergoes a change, its value is lost, for that variety undoubtedly requires greater care in its cultivation than native varieties."

"The Board remark that the Ceylon samples forwarded by Mr. Benson are so unlike the genuine Carolina rice, that the Board are inclined to think that it may not be Carolina rice at all. But if it be, it has evidently deteriorated so seriously as to render any further experiment upon its cultivation undesirable, as it has lost the principal characteristics which render it valuable.

THE CRUSHING AND CLEANING OF COTTON SEED.

IT has been said that cotton seed cannot be crushed in this country with a reasonable prospect of realising as much by the oil produced as the cost of the crushing amounts to. This too, it has been said, is owing to the quantity of fluff that adheres to the seed ; which means in other words, the bad or imperfect cleaning of the cotton. Now the crushing of cotton seed has become a very important industry both in England and America. Indian cotton, it is perfectly well known, produces, after cleaning, less of the staple and more weight of seed than any produced elsewhere. Here are two shapes in which the Indian cultivator may gather to himself the profits of his labour ; first the cotton, and next the seed. From these two sources, it is questionable whether the oil might not yield the *larger* amount of profit. While New Orleans cotton in cleaning, loses one-third or thereabouts, Indian cotton under the same process, loses two-thirds, and the two-thirds loss must of course be mainly in seed. What becomes of this immense amount of seed ? Throughout the United States, there are at this moment more than forty cotton-seed-oil mills in full operation. The annual quantity of seed converted into oil amounts, even now to, 410,000 tons. The average yield of American seed is about thirty five gallons of oil to the ton, and even then there remains a "by product" of 750 lbs. of oil-cake, far better fitted for the food of cattle than the seed itself England, where the enterprise was first carried out—was, up to recently mainly supplied with seed from Egypt. Although the export of seed from Egypt to England in 1860 was only 1,000 cwts. has by this time risen to about 5,000,000 cwts. More than *ten crores of rupees* are annually being paid by England for cotton seed ; and is India to have no share in this great harvest ? What folly to talk of the cotton that adheres to the seed rendering it useless for the purpose of crushing. Why not, before submitting the seed into the crushing mill, pass it gently through a well constructed furnace, and singe from it the adherent cotton, as our cooks at home singe their geese before cooking them ? That is one way ; another would be to brush off the fluff by a properly constructed winnowing machine.

* See our last issue p. 12.—Ed., *I. A.*

FAMINES AND CANAL IRRIGATION.

IN the event of a total failure of the rain required to prepare the soil for the *rabi* sowings,—and for a large portion of these provinces this calamity has been but just missed this year—it becomes an interesting problem to calculate what would have been the actual value of a canal running through the distressed parts. We may take it for granted that under the circumstances supposed, no crops whatever could be grown without artificial irrigation, either by canal or well, and for the purposes of our problem may work out the actual value of the crops grown, and compare it with the cost of constructing the canal. In 1878-79, a year of famine, it was computed in the Irrigation Revenue Report of that year that the Ganges Canal, with a length of 593 miles of main channel, produced crops worth Rs. 4,11,02,350, or Rs. 66,300 per mile, the capital cost of the canal being Rs. 51,500 per mile. Thus supposing a season in which the *kharif* crop failed entirely, and there were no rains to enable the *rabi* to be sown, it may be said that the canal would more than cover its original cost by the value of the produce, which could not have been bought to maturity without it. Again, if we take out the value of the canal in the same way based on the *rabi* crops only, which we will assume, could not be given at all without its aid, we shall find the value of crops raised to be about 29,500 per mile of canal, or 57 per cent of the cost of its construction. On the supposition, therefore, that a draught occurs once in 10 years only, it would appear that a canal which would hardly pay its expenses in an ordinary season would be worth constructing as a protection against total failure. The above figures deserve consideration in calculating whether it is worth while to construct such a work as the Sardah Canal, which, we believe, is now to be started as a relief work in the distressed districts of Oudh. It seems clear that in a season like the present, when *kharif* has produced no more than a four-anna crop, and when the *rabi* cannot be sown, the canal, had it been in existence, would have saved its own value in crops. Turning again to the canal returns for 1877-78, we learn that an area of 1,037,000 acres was cultivated by a canal 593 miles long, which cost Rs. 51,500 a mile. These figures will enable those who are skilled in the average cost of sinking wells in such a season, and who know the area such wells will protect, to calculate whether the wells or canal would be the cheaper.—*Pioneer.*

SAWDUST FOR BEDDING AND MANURE.

ONE of our most valuable correspondents writes :—We have tried for two years dry sawdust in the cows' stable, and on the whole like it better than any bedding we ever tried. It makes a more comfortable bed, completely absorbs the urine, and the cow is kept clean with less labor than when any other is used. The objection to salt marsh sods, dried, or to headlands, and dry muck, is, that they soil the cow, and make it necessary to wash the bag before milking. Straw of all sorts soon becomes foul, and without more care than the ordinary hired man is likely to bestow, soils the cow's bag also. Dry sawdust is clean, and makes a soft spongy bed, and is an excellent absorbent. The bag is kept clean with the aid of a coarse brush without washing. A change of 15 bushels in a common box stall, or cow-stable, will last a month, if the manure, dropped upon the surface, is removed daily. The porous nature of the material admits of perfect drainage, and of rapid evaporation of the liquid part of the manure. The sawdust is not so perfect an absorbent of ammonia as muck, but it is a much better one than straw, that needs to be dried daily, in the sun and wind, to keep it in comfortable condition for the animals. In the vicinity of saw and shingle mills, and of ship yards, the sawdust accumulates rapidly, and is a troublesome waste that mill-owners are glad to be rid of. It can be had for the carting. But even where it is sold at one or two cents a bushel, a common price, it makes a very cheap and substantial bedding. The saturated sawdust makes an excellent manure, and is so fine that it can be used to advantage in drills. It is vauable to loosen compact clay soils, and will help to retain moisture on thin sandy and gravelly soils. There is a choice in the varieties of sawdust for manure, but not much for bedding. The hard woods make a much better fertiliser than the resinous timber. To keep a milch cow in clean, comfortable condition, we have not found its equal.—*American Agriculturist.*

ON SOOT AS A GARDEN MANURE.

THE value of soot as a manure appears to be slowly but surely impressing itself on all classes of cultivators. That it is a powerful fertiliser, requires but little in the way of experiment to prove. The rich verdure it imparts to any plant to which it may be applied, either as a soil-dressing or as a liquid manure, is powerfully demonstrative of its manurial qualities. We apply it to everything : to kitchen garden crops, to fruit trees, and to pot plants, both foliage and flowering, with the most satisfactory results. It is applied broadcast to the open quarters of the kitchen garden, and dug in with any other manure that may be used along with it ; it is mixed with potting soil, either by itself or along with any other fertiliser that it may be desirable to add to any compost ; and it is mixed with our cow urine, or with any artificial manure that we may desire to use as a liquid manure, and in every case with the best results. It is especially valuable as an application to all plants that are liable to attacks of insects or worms at the roots. Carrots, parsley, and parsnips, which are subject to fatal, or at least damaging, attacks of wire-worm, may be so invigorated by constant and regular applications of soot-water, that they will resist the attacks

of these earth posts, and these themselves appear to be destroyed by the qualities of the manure. We make it a rule to save every particle of soot that is deposited in our chimneys and flues, and obtain a good supply in addition, as occasion requires, from the nearest chimney-sweep, and would advise our readers to do the same.—*N. B. Agriculturist*.

THE USES OF STRAW.

IN travelling through the country we see, in every direction, great heaps of straw (and sometimes hay), which are not in a condition to be more profitably utilized. First these materials are most valuable for food for stock. Too frequently, we are satisfied, farmers in the West lose by growing more of some food crops than they keep stock to consume it. The result is loss upon hay, straw, and especially corn-fodder, which becomes comparatively of little value when not utilized for stock food. There are, however, other uses than food for these products. Their next most profitable employment would be in the construction of temporary shelters for stock from the storms and cold of winter, on farms in which permanent buildings have not been erected. By all means, then, let the materials, now apparently going to waste, be appropriately applied in this direction. Their being so utilized may save many a bushel of grain or ton of hay used as actual food, for it is as well ascertained that stock, exposed to storms and cold, require more food to keep life and health in them, as that it requires more fuel to keep a rickety open house warm, than it does to keep comfortable the better constructed. Besides, if this extra food is not given, unsheltered stock comes out of the winter poor (if not diseased) and half the following pasture season is over before the stock has attained the condition of flesh it had the previous fall. Such stock if in condition to be well-fatted at all in one season can only become fat late in the season when prices are usually at their lowest. Hence the necessity for good shelters and good feeding during winter to enable early fatting in the summer. But if more straw corn-fodder &c., are on a farm than is needed for food and shelter, it should be used for bedding stock which adds to the comfort and hence thrift of farm animals. If, however, these materials are not actually needed for food, shelter, nor bedding for stock, there is still another use to which they may be profitably appropriated. For example: Every farmer knows, or ought to know, if he does not, that the winter grains and grasses, fruit trees, shrubbery, &c., need shelter as well as does stock, and for a similar purpose—to protect them from the cold of winter and enable them to make an early, vigorous growth in spring and early summer, the natural growing season of plants carried through the winter in a growing condition. Perhaps as profitable use as can be made of surplus straw, damaged hay, &c., is to spread them evenly over wheat and grass fields. This prevents the winds from blowing the soil away from the roots of wheat plants, and enables them to grow during the winter as does a light covering of snow. This again gives an early start in spring, and hence early maturity and perhaps escape from rust, injury from insects, &c. The same is true in the application of straw as a covering or mulch for grass during the winter. This has been frequently tried with eminently satisfactory results on both sides of the Atlantic. In a valuable work on "Farming with Green Manures" by Dr. Harlan of Wilmington Delaware now before us, we find the result of covering grass land with straw made by the celebrated English agriculturist Gurney. In one instance grass covered with straw gave him in one month 5,870 pounds per acre; the same kind of grass uncovered, 2,207 pounds. No rains fell during this experiment. Another covered plat in one month gave 3,460 pounds per acre, while a similar lot not covered gave but 970 pounds. In another experiment, clover covered grew six inches, while that uncovered grew but one and-a-half inches. These experiments may, and perhaps do, illustrate unusual advantages derived from top dressing with straw. But there can be no doubt of the general advantage. The effect of top dressing grain or grass with straw is, first; protection from the influences of dry, freezing, driving winds &c., secondly; as a preventive against the evaporation of moisture, often highly injurious to grain and grass in spring or early summer, in our latitude, and thirdly; the actual manurial advantages to crops as decomposition advances. By all means, therefore, our farmers should spread their surplus straw upon their wheat and grass fields, as early as practicable, instead of wastefully allowing it to rot in heaps and pass off into the atmosphere in the form of gases during decomposition, or the more wasteful practice of burning their straw. In spreading straw on grass and grain, care should be taken to have the material spread evenly over the ground, and not in bunches to smother out the growing plants. With the prevalent mode of securing hay with us, straw perhaps may not be spread on meadows with quite so good results, as our horse rakes would be likely to take up that remaining unrotted and mingle it with the hay to its damage, especially to hay shipped to market. But on pastures, there can be no doubt that straw and corn stalks may be beneficially applied at anytime.—*Journal of Agriculture.*

PEPPER IN CEYLON.

THERE is a cultivation now in its infancy in Ceylon which should develope a very considerable trade, and that is pepper. Many years ago when first introduced into India by the old East India Company, it was declared a failure, "although they admitted that the hermaphrodite plant had been withheld from them by the natives, and consequently the plant had been starved into celibacy." Notwithstanding their first failures, pepper ultimately became the most important article of their exports however. To-day the Malabar pepper is the kind most sought after, and the production is annually over 6,000,000 lbs. But to appreciate the enormous trade done in pepper, take the Sumatra export which is over 30,000,000 lbs yearly. Now, as the cultivation takes a good deal out of the soil, and is said not to be worth growing after say, the tenth year, it is evident that there is always room for its extension in Ceylon and elsewhere. Regarding its cultivation, the writer has had some experience with this product, and can affirm that it grows better in the *open* than in *shade*. The native method of growing it is to plant five feet apart, and support it on a fence of sticks; the pepper grows luxuriantly where it has much moisture, and hence valleys are the most favorable situations for its growth. After the first planting the vine requires but little attention, being left to its fate for twelve or eighteen months, when whole, the plant, with all its branches, is buried in such a way "that only a small arch of the stem remains above ground. From this arch new shoots soon sprout out, three or four of which are allowed to climb up the props, and are able to produce flowers and fruit in a year after this operation, by which practice the strength and vigour of the plant—by the multiplication of its organs of nourishment, the roots—are increased, and it cannot fail to produce large crops of flowers, and bring its fruit to its greatest perfection.

CASSAVA ROOT.

RICE has for so many centuries been the staple article of food in large tracts of this country, that if roast beef and plum-pudding were the offered famine diet, they would in all probability be rejected. Cassava root, however, is in every respect superior as an article of food to rice, and may be obtained at infinitely less cost. Throughout Eastern Africa this takes the place of rice, and is largely consumed both by European and natives. India alone, until every recently, has stood apart from the cultivation of this most nutrient vegetable. It is satisfactory, however, to see that the cultivation of this root is now being prosecuted to a considerable extent in Jaffna and also in Ceylon. Irrespective of its value as a cheap and wholesome food, it is of good commercial repute for the manufacture of glucose and suger, for which purposes it has already been rather extensively shipped to England from the east African coast. Owing to the abundant rain on that coast, three crops of cassava may be obtained in the course of the year. It may be doubted if more than two crops could be obtained on this side of India; but even this, with the small amount of labour required, would unquestionably be found more profitable than the cultivation of rice. The Ceylon planters, always wide awake to every new move, have made a beginning at the growth of cassava, and we shall probably next hear that they are largely exporting it. The *Ceylon Observer* gives the following as the rule for planting, which differs but slightly from that followed in East Africa:—

After preparing the ground in beds, the stalk (cassava) is cut up in pieces of nine inches, in length and planted two inches in the ground, and watered daily for the first two weeks; and subsequently once in three days. After six or seven months, according to the nature of the ground, the root is dug out. The largest root measures three feet in length and six inches in diameter. Immediately it is dug up, the outside bark is carefully pealed off and the root cut up in thin slices and dried up for powdering: the flower thus made is used for baking hoppers, *puttu*, and other native cakes. It is also used for adulterating wheat flower.—*Bombay Review.*

JUTE IN EGYPT.

WE see that two samples of Egyptian jute sent to Dundee for examination and report by practical spinners have been valued, one at £15, the other at £17 per ton of 20 cwt., and these prices are rather higher than the finest qualities of Bengal jute command. Presently an opportunity will be given to compare larger samples, as the administration of the Daira Sanieh are about to make a shipment of a few bales, the produce of experiments on their lands, and another proprietor, an Englishman at Mansoorah, who has taken a warm interest in the matter, is about to send to Dundee a bale. It appears that one obstacle to the success of jute culture as yet, has been the ignorance and prejudices of the fellahs, who thought it no better than a weed; but curiously enough they soon found out the value of the fibre as applicable to rope-making, and it is added that the mysterious disappearance of much of this season's produce may be accounted for by this discovery. Notwithstanding all adverse influences, however, a firm belief in the new culture seems to be growing up, and as private arrangements have been made by the administrations of the Daira and the State. Domain lands to procure a supply of fresh sound seed from India, a material extension of cultivation may be looked for next season under favourable conditions, as the Bengallee coolies lately introduced have been retained to supervise operations. Practical experiment has conclusively demonstrated that on suitable soil and with the same care that is bestowed on the cultivation of cotton, jute can be grown successfully in Egypt, some of the plants on the State Domain lands being superior o anything produced in Bengal. The Egyptian papers publish elaborate calculations as to the profit certain to attend the enterprise, and these seem wholly free from exaggeration. It will of course be a work of time, as was the introduction of the cotton culture, but too many powerful interests are in favour of the jute experiment to let it result in failure from any want of fair play in giving it a trial. European capital is pouring into Egypt still it must be remembered, and so long as that goes on the peasantry will have a powerful stimulus to improve.

JUTE CULTURE IN AMERICA.

LETTER FROM PROF. WATERHOUSE TO THE MERCHANTS' EXCHANGE.

THE Directors of the Merchants' Exchange in their meeting October 23, received a letter from Prof. S. Waterhouse in relation to the proposed culture of jute in the Southern States, as follows:—

WASHINGTON UNIVERSITY,
ST. LOUIS, OCT. 23, 1880.

ALEX. H. SMITH, President Merchants' Exchange.

DEAR SIR,—That the specimen of jute which was sent you, attracted so much attention on 'Change is a very gratifying fact. Ever since my visit

to India in 1872, the culture of jute in the United States has seemed to me to be a practicable undertaking. The possibility of introducing an industry whose annual product would stand next to cotton in fibrous importance is an agricultural problem of the highest moment. The observed conditions of growth in India are almost identical with those that exist in our Southern States. It is probable that Texas alone contains a larger area suitable for the cultivation of jute than that which in India is now yielding, annually, one hundred million dollars' worth of jute. The fibre has a high textile value. Its range of uses is almost illimitable. It enters into a vast variety of fabrics, from the coarsest cotton baling and gunny bags to the finest broadcloth and satin. Last spring Mr. Le Duc. United States Commissioner of Agriculture, kindly sent me several packages of jute seed. Some of it was distributed in the South and some was sent to friends in the city and neighbourhood of St. Louis. The seed given to Mr. Henry Shaw received no special care. It was entrusted wholly to the custody of Nature. The plants were not even watered, but they grew to a height of several feet and bore seed. The specimen of jute which was exhibited on 'Change the day before yesterday was raised by Prof. Jenks of Washington University. The following note explains its growth.

OCTOBER 22, 1880.

"The jute seed which you gave me was sown about the 20th of May in a compost of earth, coal-ashes, and horse manure, in a corner of my back yard which was shaded by a high fence nearly half of the day, conditions certainly not favourable to the fullest development of the plant. The ground was kept well watered. This specimen had attained a height of six feet three inches before the first of October.

"JNO. H. JENKS, 1418 O'Fallon-Street."

Nothing but failure was anticipated from the trials in this latitude. The climate of St. Louis is too cold for jute. The experiments were tried with the hopeless motive of testing the hardiness of the plant. The result is an agreeable surprise. Its vigorous growth under circumstances so different from the conditions of its nativity, is a very favourable augury for the successful culture of jute in the Gulf States. A southern correspondent assures me that he can raise jute on his plantation just as easily as he can raise corn. The recent experiments being successful, the possibility of naturalizing this plant in the United States is now affirmatively settled. But American hands cannot complete with the cheap manual labor of India. In order to derive from this new industry a yearly return of scores of millions, the inventive genius of our countrymen must devise some cheap mechanical or chemical means of disintegrating the fibre.

Respectfully yours.
S. WATERHOUSE.

The Merchants' Exchange Directors, after considering the subject, adopted a resolution reciting that they had noticed with great satisfaction the experiment of Prof. Waterhouse in introducing the culture of jute in this country, and that from the results obtained it is evident that jute can be successfully raised in the Gulf States, and the board recommended the letter of Prof. Waterhouse to the careful consideration of planters and farmers in the South."

INDIAN EXHIBITS AT THE SYDNEY EXHIBITION.

THE following are extracts from Major Clementi's report .—

COCOANUT OIL.—Ceylon and Fiji showed far superior cocoanut-oil, which is a staple production now in the latter colony ; copra also is largely exported from the Fijis. The cocoanut tree takes from five to seven years to mature in Fiji ; about 60 trees are planted to the acre, producing about one ton of copra, worth on the plantation of £12-10. The export value in 1878 was £122,194.

INDIGO.—The judges had no technical acquaintance with this manufacture. Mr. James Inglis, who has the experience of an indigo planter, happening to be present when the judges came round, was able to explain to them the characteristics of good indigo. The result was a second award. I find that there are three dye establishments in this colony, but indigo finds no place in the list of colonial imports. Small quantities, of "indigo paste" are imported from England for the use of the dyers.

MATS.—These were very generally admired, and most of them sold. Nine were bought by gentlemen connected with the Belgian Commission, one by the Japanese Commissioner, and two by a Sydney resident. The rattan and grass mats received each a second award. Many persons thought that *khas-khas* screens would find a market here and in Queensland for use during the hot season. A living specimen, brought from Queensland of the *khas (Andropogon muricatus)* was exhibited in the agricultural hall.

PITH HAT AND BOTTLE-COVER AND RAW-PITH.—Pith helmets and hats are very generally worn in this colony and in Queensland during the summer. The use of pith for bottle-covers was regarded as a novelty. The sample of raw-pith was much sought after by botanists many of whom specimens were given. Queensland exhibited a living, but, to very poor specimen of the plant *(Aschynomyne aspera)*.

CINCHONA.—There was nothing exhibited elsewhere at all equal to these specimens, which were considered remarkably fine and very interesting. The collection received a first award.

RED-WOOD AND CHAY-ROOT.—These exhibits were unnoticed excepting by collectors of botanical specimens. They evidently would find no market here

GROUND-NUTS.—These were so very inferior in quality as not to have been noticed. Fiji exhibited a variety of kinds, one sample being particularly fine. These, the Fiji nuts, fetch from £14 to £18 a ton. in bags, at Sydney. In 1878 about 444lbs. seem to have come to Sydney from Fiji for transhipment. The duty on all nuts is 1*d*. a pound.

RICE AND PADDY.—Long before the judging commenced, the raw rice and paddy were alive with insects. The rice trade is said to be falling off ; the colonists are not rice-eaters. The following decennial statement may be given : In 1869, the imports were 2,621 tons ; in 1870, 2,875 tons ; in 1871, 3,561 tons ; in 1872, 3,224 tons ; in 1873, 4,982 tons ; in 1874, 4,879 tons in 1875, 3,714 tons ; in 1876, 2,078 tons ; in 1877, 3,676 tons ; in 1878, 6,080 tons ; in the latter year the quantity of rice exported from Sydney was 1,866 tons, of which 15,568 cwt. went to Victoria, 2,881 cwt. to New Zealand, 8,245 cwt. to Queensland, and 8,953 cwt. to New Caledonia. No rice is returned as imported direct from India, but in 1878 1,515 tons came from Victoria, 2,002 tons from Hong-Kong, and 2,141 from Japan. The Patna rice seems to be best liked in this colony ; the greater quantity of rice by far is imported for the Chinese colonists, who are increasing in numbers. Since the opening up of the Torres Straits route, the Chinese dealers have imported China-grown rice which is cheaper than the Patna, though it seems that the Chinese would prefer using the latter kind if they could be supplied with it by the Sydney-Chinese importers. The duty on rice imported into Sydney is 60s. a ton. In the Queensland Court Mr. A. Macpherson exhibited samples of various kinds of rice grown by himself in Brisbane, and gave me some of each kind to try. The grain was small and badly dressed, but, when cooked, some of the samples proved to be of very good quality. Mr Macpherson informed me that he found the rice he sowed on dry land produced as much straw and grain as that sown on swampy ground ; but in Queensland there are heavy dews and occasional rain. The produce of one-eighth of an acre Mr. Macpherson found to be £428 or 68 bushels, or £50 to the acre. His interesting pamphlet, giving the results of his experiments, will be found among the publications accompanying this report.

MADRAS GRAM.—This description of grain is not known here. Like the other grain exhibits it was full of weavil by the time it was looked at by the judges in class 623, and they passed it without a word. It happened, however, that this grain was also judged in class 627 (seeds and seed-vessels), the judge being Mr. J. Inglis, late of India, and he reported it as being an exhibit of "very fine gram-seeds." On my bringing this to notice, the Committee of Judging and Awards decided that the exhibit should be placed in the third degree of merit.

TOBACCO LEAF.—These exhibits, as compared with the samples from elsewhere were considered to be of not much merit. With some hesitation the judges awarded the Madras exhibits a fourth place in the order of merit.

CIGARS.—There were a few inquiries for these, and I gave samples to those wishing to try them ; but they were not as a rule approved of. The judges took away samples of each sort, and in the end declined placing them in any order of merit. Owing to the imperfect protection afforded by the show-cases, by far the greater part of these exhibits were pilfered It is thought here that Indian tobacco will not find a market in his colony.

TEA.—Very great interest was taken in those exhibits. Japan exhibited some very good samples of Pekoe Souchong and Congou of which I have kept samples ; and Ceylon exhibited a large number and variety of very excellent teas ; China did not exhibit. The judgment was by courts and not general as it ought to have been. The results of the judging cannot be considered to be satisfactory all my endeavours to obtain a fair and intelligent judgment having been thwarted. Mr. Poader was really the only one of the judges that had a technical knowledge of tea, and he was appointed on my nomination, as I could not find any one else not exhibiting who had the experience of a professional tea-taster. But as he was engaged at the time in the business of a Sydney merchant, the agent for three exhibitors who were the Calcutta agents for a number of tea concerns I considered that great caution was necessary, so that the judges should not know the names of the exhibitors of tea concerns until after they had given their judgment on the merits of all the teas, variety by variety. The Government of Madras exhibited 24 samples including nine varieties, and received a third award. These teas were exhibited in shallow boxes, divided into 12 partitions each, with small pieces of glass, one for each partition, slipped in one over the other. This was by no means a good plan, as the least vibration caused the glasses to slide, and, even when properly adjusted, the teas were exposed to dust and air, as there were open spaces where the glasses overlapped. Mr. W. Lee Kirby, Brooklands Estate, Nilgiri Hills, received a second award for the six varieties exhibited by him. Messrs. Begg, Dunlop & Co., exhibited 18 samples, which included seven varieties of tea, and received a first award for the collection ; the teas were well shown in large glass bottles arranged on a stand—in my opinion not only the most convenient, but the best way of exhibiting teas. The two varieties exhibited by the Commissioner of Arakan received no award, though they were surely samples of no common merit. The Singbulli and Murmah Company exhibited three varieties and four samples of Pekoes, receiving a first award. For the collection of 35 samples, which included 11 varieties of tea, a first award was adjudged to Messrs. Williamson, Magor & Co., whose teas were well shown in large glass bottles. The Kousanie Tea Co.'s exhibit included eight varieties of very high class teas, possibly equal to any shown, but they only received a third award. The six varieties shown by the Muka Ruttyoor Tea Concern were unsurpassed by any other exhibits, yet they were adjudged only a fourth award. Messrs. O. Steel & Co. sent down three varieties of teas in 14 varnished teak-wood chests, of which a trophy was made in the Indian Court, glass being let into the front of one chest of each variety. The Company received a fourth award. The teas of Messrs. Balmer, Lawrie & Co., were well exhibited by their Sydney Agents, Messrs. Clifford, Love & Co., in a handsome show case. There were nine varities of as good tea as any shown, but they received only a second award.

COFFEE.—The judging here was as unsatisfactory as it was in the teas. In sending down samples to the judges' room, I followed the same plan adopted in the case of the teas. The awards were, however, given for no less tions, and not for the best of each specific variety. The judging was general and not, as in the case of the teas by countries or courts. Thus an exhibitor from New Caledonia received the only first award for coffee beans as being the best in the exhibition, and for the same reason a Fiji exhibitor was adjudged, the only first award given for parchment. The award to New Caledonia was so manifestly unfair that the Commissioners for Ceylon and Fiji joined with me in appealing against it. I have kept a sample of the coffee, which is unsized and of every variety of colour. The Committee of Judging and Awards declined to alter the award. The awards are as follow : To Messrs. Parry & Co., a fourth award for coffee beans, to Fairlands Estate, a third award for parchment and coffee beans ; to Messrs. Staues & Co., a second award for the Hullacary Estate coffee beans, and a third award for coffee beans from the Colacumbay Estate ; and to Mr. J. Lechler a fourth award for coffee beans. The coffee-planting in Fiji promises well ; some really excellent samples were shown. The first crop, at two years yielded about 400 lbs. The acre ; last year over 1,000 acres were under crop. The coffee grown in New Caledonia is nearly all consumed there, and she imports a good deal. In 1878, for instance she imported from Sydney 22,507 lbs. Her coffee is said to be, as a rule poor and weak, and of bad colour, though some is reported to be of very, good flavour. The Adulteration Act is not put in force in Sydney, so there is considerable adulteration practised. The grocers buy the coffee sometimes raw, but more generally roasted, from the importer, and adulterated it with chicory before retailing it, more or less as the wholesale price rises or falls. Ceylon plantation No. 1 is the kind of coffee in principal demand. In 1878 the amount of coffee on which duty was paid for home consumption was 443,858 lbs ; whilst of chicory the amount was 304,546lbs. The duty on both articles is the same—3d. a pound. In bond

the price of Ceylon plantation coffee is from 11½d. to 1s. a pound, and its wholesale price when roasted is from 1s. 6d to 1s. 7d. a pound. The grocers keep two qualities as a rule, which they sell, according to the amount of adulteration, from 1s. to 2s. a pound.

SPICES.—These exhibits did not attract much attention and received no award. Chillies are largely grown in these colonies.

CONDIMENTS, PRESERVES, &C.—Many of these exhibits were favourably regarded. Those of Nujeeb Khan & Co. Sydney Agents, Messrs. Clifford, Love & Co., were exceedingly well got up and well displayed; they were adjudged two first awards and one second award. The exhibits of Vencata Chellum, Sydney Agents, Messrs. Lorimer, Rome & Co., were large and various; they received one first, two second, one third, and one fourth award. This class of comestibles does not find any large sale here, being possibly too expensive for the general run of colonists; a better sale is found in Queensland.

COIR YARN.—The coir from Fiji was thought by the judges to be finer than that from Madras. In 1879 New South Wales imported 6,152 bales of fibre from Fiji, and 6,572, bales in all. There is no duty. I understand that cocoanut trees are now being extensively planted in N. Queensland. The Madras aloe fibre and *sun* hemp were considered good in quality, and were adjudged each a second award.

AGRI-HORTICULTURAL SOCIETY OF INDIA.

The Annual General Meeting was held on Thursday, the 13th January 1881.

W. H. COGSWELL, ESQ., *Vice-President, in the Chair.*

THE proceedings of the last meeting were read and confirmed.

The Report from the Council was submitted and adopted. The Report enters first into the internal economy of the Society, shewing that after deducting deaths, resignations, and departures from the country, and allowing for elections during 1880; the total real number of paying members on the books is 471 or 14 less than last year. The report adds that the financial position is much the same as last year; although there has been a decrease of expenditure in some items, there for has been an increase in others, which nearly equalizes the account.

The report then proceeds as follows:—

"It will be observed that among those who have been removed by death is Mr. John Scott, Curator of the Royal Botanic Garden, Calcutta. M Scott, was the contributor of several valuable papers to the Journal, among them "Notes on Horticulture in Bengal" and "a list of the higher Cryptogams cultivated in the Royal Botanic Garden, Calcutta," and several other minor papers. Mr. Scott was always ready to assist the Society on all subjects referred for his consideration. With an observant and original mind in him was united great modesty and unobtrusiveness of character. He was elected an Honorary Member in 1871. His death in the prime of life is not only a great loss to the Society, but also to Vegetable Physiology, of which he was an ardent and able votary.

The Council have also to allude to the loss sustained by his departure from India during the year of Sir Louis Jackson, C.I.E., late President of the Society. In the Proceedings of the General Meeting in May, in which Sir Louis' letter of resignation was submitted, will be found the resolution of the Society expressive of their "warm appreciation of the interest he has taken, and the valuable services he has rendered, in dealing with the various subjects that have been under consideration during his four years' tenure of office." Sir Louis Jackson was, at the same time, unanimously elected an Honorary Member.

The annual shows of vegetables, fruits, and flowers were held as usual in the early part of the year,—that for the former in the Town Hall on 29th January, and the latter (flowers) in the garden on the 16th February. The vegetable show was an excellent one, perhaps, the largest, or one of the largest, held during the last forty years. The flower show was also about equal to those of former years, and the attendance was large. It was found necessary, in the interest of the market gardeners, to hold the show of vegetables and fruits separately instead of, at one time, as heretofore; and in the forenoon, instead of the afternoon, to allow of their selling the produce immediately after the closing of the exhibition.

Vegetable and flower seeds were imported as usual, and widely distributed. There have been many complaints in respect to the flower seeds which may be mainly attributable to the adverse season in England of 1879 for ripening seeds. It is proposed in future to order a more select assortment of flower seeds, consisting of those that are known to succeed well in Bengal and Upper India, and to increase the quantity of such. It is hoped this will afford satisfaction to the majority of Members.

In respect to the Garden, it may be noted, that the distribution of plants is gradually increasing, as their privilege of indenting on it annually is becoming better known to Members. Applications (250) for delivery orders have been duly met; besides many (80) supplementary orders. Of ornamental plants, 9,350 have been distributed to Members, besides a quantity of economic plants and cuttings. In addition thereto, there have been sales to Members and the outside public, of 1,440 fruit grafts, and 1,212 ornamental plants. To increase the stock of roses, for which the demand continues greater than for any other class of plants, supplies have been received, by exchange, from the public gardens of Allahabad, Agra, and Lahore. A consignment from Mr. Bull of Chelsea, arrived in the early part of the year unfortunately in a totally unserviceable condition, scarcely one alive. A subsequent consignment in November reached in excellent condition. The demand for economic plants, Mahogany, Coffee (Arabian and Liberian) Pithecolobium saman, and certain timber trees, has been constant. The supply of these is still great, while of ornamental plants the stock is also large, notably of Crotons, Palms, Dracænas, and a few other kinds of variegated foliage. The collection of fruit grafts, especially of Mangoes of many kinds and of Lychees, is now sufficient to meet a fair demand.

The contributions to the Garden have been as great as last year. The Society is especially indebted to the Queensland Acclimatisation Society, Mauritius Botanic Garden, Calcutta Botanic Garden, the Baron F. Von Müller, Messrs. C. Ady and Rowett of Rangoon, C. K. Hudson, C. Nickels, E. H. Man, Dr. R. Beaumont, Col. W. M. Lees, and Capt. J. F. Pogson.

The attention of the Society was called by the Government of Bengal in the early part of the year, to the desirability of trials with certain kinds of manures on certain crops in connection with some recent experiments at the Bangalore Farm. The Garden Committee took initiatory steps towards meeting the wishes of Government, but being unable to undertake the trials in the manner suggested, have deferred doing so for another season, when they hope to carry them out as fully as the means at their command will admit.

Trials were also made at the commencement of the rainy season with several newly manufactured ploughs submitted for competition. The report of the Committee will be found in the Proceedings for July.

There has been a fair demand throughout the year for seeds of useful kinds, other than vegetable and flower, and many applications for information on various subjects; all which have been complied with. Notices of some of these are recorded in the monthly Proceedings. In addition to these, certain papers of interest have been submitted regarding cotton and cotton seed oil, tobacco, fibres of sorts, &c., which have been discussed and reported on.

The Council cannot close this brief summary without reiterating what has been more than once urged in previous annual reports, that unless they have a more hearty co-operation from Members generally, resident and non-resident, they cannot expect the operations of the Society to be conducted with that success which characterized it, proceedings in former years. It was by the united efforts of public-spirited men that the Society was founded, it is mainly by a continuance of such efforts that its influence and prosperity can be maintained. It is true that times have changed,—that European Society in India is becoming annually more fluctuating, many considering themselves merely birds of passage. It is, moreover, the fact that competition in all branches of life—public and private—has become greater; that Europeans have not the same amount of leisure that was possessed by their predecessors to render such assistance as could be desired to public institutions. Still, notwithstanding these drawbacks that may be existing, if those who are interested in the Society's work (and it is but reasonable to suppose that some really are) would annually induce one or two friends to join it, the number of subscribers would soon be considerably increased. With such increased numbers would come increased influence and increased power for useful work, of which it may be added there is much before us, if we possessed the necessary means of application.

The Council regret also to observe that while the spread of education is rapidly increasing in this country, the landed proprietors and other intelligent natives, Hindu, and Mahomedan, have not as yet, with few exceptions, shewn that interest in the Proceedings of the Society which might naturally be expected from a class who would derive most benefit. Such was not the case in former days when the leading members of the native community, not only took an active part in our proceedings, but contributed to its transactions. They do not now number even one-sixth of the entire list.

Since the issue of the last Report only one number of the journal has been published, Vol, VI, Part 2. Another is now in the press, and will be distributed in the early part of this year. The Council would also request more assistance in this department. We have, indeed, competition here again, where formerly we had the field almost entirely to ourselves. Nevertheless more might be done than has been recently effected. We should ask not only Members, but the public in general, (Zemindars and other Agriculturists) who are favourably situated, to co-operate in this line. Let each contribute his item, however apparently unimportant it may appear to be, of sound practical information, founded on facts, the result of his own experience, and we shall be enabled to publish annually a much larger number of useful papers, and be in a position to disseminate them more frequently for general information, and thus confirm the words of the founder of the Society, in his opening address, some 60 years ago—that "a body of men engaged in the same pursuit from a joint stock of their information, and thereby put every "individual in possession of the sum total acquired by them all."

The election of Officers and Council was next entered on with the following result:—

President.—Mr. W. H. Cogswell.

Vice-Presidents.—Baboo Peary Chand Mittra, Mr. S. H. Robinson, Mr. G. L Kemp, and Baboo Joykissen Mookerjee.

Secretary—Mr. A H. Blechynden.

Council:—Mr. J. E. MacLachlan, Mr. R. Blechynden, Dr. G. King. Mr. H. J. Leitch, Dr. S. Lynch, Baboo Protapa Chundra Ghosa, Mr. W. Stalkartt, Rajah Suttyanund Ghosal Bahadoor, Mr. J. G. Meugens, Mr, A Wilson, Mr. W. Pigott, and Mr. H. A. Firth.

The names of Mr. Cogswell, and Baboo Bholanath Dhur were added to the Sugar Committee, and Mr. J. G Meugens, to the Tea Committee.

The names of the following gentlemen were submitted for Membership.

C. Duke, Esq., Assistant Commissioner, Engatein, Rangoon,—proposed by the Secretary, seconded by Baboo P. C. Ghosa.

Bhupendra Bahadoor Sing, Rajah of Kuntil,—proposed by Mr. W. G Jackson, C.S, seconded by the Secretary.

W. Martin, Esq, Indigo Planter, Myupoory,—proposed by Mr. J. Thomas, seconded by Mr. R. Blechynden.

T. J. Kallonas, Esq., Indigo Planter, Mymensing.—proposed by the Secretary, seconded by Mr, J. E. MacLachlan.

Rejoined.—T. Allen Brown, Esq., Deputy Magistrate, Agra.

The following gentleman was proposed, on the recommendation of the Council, as an Honorary Member:—

T. Lewis Bernays, Esq., Vice-President Queensland Acclimatization Society.

MINERALOGY.

MR. WYLD, (Geographer to the Queen) of Charing-cross, will shortly publish an elaborate map of the Gold Fields and Gold Reefs of Southern India.

A COAL mine is reported by the Peshawur correspondent of the Lahore paper to have been discovered at Churi, near Campbellpore.

AN extensive coal-bed, estimated as capable of yielding 3,000,000 lbs daily for a century, is now being worked near Kisgashe, on the Kiou Kads, Japan.

THE Japanese Government, it is said, is going to develop the gold mines in the Island of Sado, which have as yet been worked very little. A large consignment of mining machinery, made in San Francisco, has lately been sent to Japan; and the Government hopes that systematic working will make the mines a success.

A SIAMESE paper says that there are rumours in circulation that gold has been discovered in one of the northern provinces of Siam, and that a rich specimen was recently brought to Bangkok.

A GOLD FIELD has been discovered at Temora, New Zealand, and the local Government have awarded the party of discovery £400 as compensation for their trouble, and as an encouragement to others to prospect the country.

THE Melbourne papers just received state that a nugget weighing 201 ounces, and worth £800, has been found in some alluvial gold workings near Inglewood in Victoria.

ITALY has struck oil. Petroleum has been pumped in the Abbruzzi and in Piedmont; companies are being formed to sink and work more wells, and experts from Canada have been sent for to supervise the extraction and refining of the oil.

THE Society of Arts is showing some interest in Indian gold-mining. During the session which has just commenced Mr. Hyde Clarke will read a paper on "The Gold Fields of India," and Mr. A. G. Lock one on the "Causes of Success and Failure in modern Gold Mining." Both lectures, from the ability and reputation of the lecturers, will be read with interest.

THE *Ceylon Times* lately asserted that gold had of a certainty been discovered in Ceylon, the Editor of that journal stating that he had seen a small nugget. "Raglan" writes to the paper, asking for further informatoin, and the editor replies:—

That there is gold in Ceylon, there can be no doubt: this as we stated, was proved to us. We are not at liberty to state where this gold was found, but we can say, and on the best authority, that on investigation it is found that it is in such very small and unappreciable quantity as to preclude any hope of profitable collection.

We learn that the locality in which the nugget was found, has not rewarded further search save in demonstrating that the place is rich in precious stones of good quality: two rubies have been found equal in richness of color to any stones from Burmah.

SOME 50,000 tons of Australian copper were shipped to Calcutta last year, *via* England, instead of direct. An explanation is found for this in the difficulty of making satisfactory financial arrangements between India and Australia. The Lieutenant-Governor of Bengal hopes that the growth of a direct trade with Australia in tea, jute, seeds, and other Indian produce, will in time correct the anomaly. It is a hopeful sign that India sent over twelve million gunny bags to Australia last year. The total value of the trade between the two countries was something over 70 lakhs, the value of Indian export being about 45½ lakhs, and the value of India's imports from Australia 24½ lakhs. An attempt to raise in Australia some of our next loan might produce good results.

GOLD IN BURMAH.

WITH the recent development of gold mining enterprise in Mysore and the Wynaad, would it not be as well if some attention were given to the gold washings in Burmah? At Shuaygyeen, the name of which signifies "gold washing," gold is even now found, and has been for years past, although not in very remunerative quantities. Mr. Theobald, of the Geological Survey, calculated some years ago that an industrious gold-washer at Shuaygyeen could calculate on making daily about five annas. A party of Chinamen tried their hands at gold seeking in Burmah about ten years ago, but the result was not remunerative, and, some of their number suffering from fever, they discontinued working. The time would seem to have come when further attempts should be made, and as gold undoubtedly exists in the sands of the Shuaygyeen river, the State might send a competent authority to this district to endeavour to ascertain where it is washed from. Besides gold it is known that lead, tin, copper, and galena exist in this district, and the services of a mining geologist might be spared for a few months in the year to ascertain if these mines might not be remuneratively worked. The last went there who came here in this capacity, Mr. Mark Fryer, was such an invalid that it was impossible for him to do justice to the work, which is arduous and has to be carried on under considerable privations. It is to be hoped, then, that the Government of India, if they send a mining geologist, will send a young man in good health, when there is, we think, little doubt that discoveries of considerable value would be made in the vicinity of Shuaygyeen.

FORESTRY.

WE see that Sir Richard Temple was to lecture before the Society of Arts last month on "Forest Conservancy in India."

KEROSINE oil has been put to a variety of uses. In Germany it is utilized for preserving timber with much success.

AN American agricultural professor recommends a paint of skimmed milk and brine (water) to render wood non-inflammable. It has the advantage of being cheap and durable, and is impervious to water.

RUSSIAN forests bordering on the river Dnieper have been destroyed so recklessly of late years that the neighbouring districts have become arid steppes, many of the most important feeders of the river having dried up. The amount of water in the river has largely diminished; rocks and sandbanks in its bed have been laid bare by the lowering of the waters, and the navigation is already interrupted. This is a serious disaster, as the river passes through nine districts and affects the prosperity of those provinces.

MESSRS. SHAW FINLAYSON & CO., of Calcutta are desirous of starting a saw-mill in the Upper Dehing Forest, and the Planters' Stores Company are going to establish one also in the same locality. Sir Steuart Bayley says of these:—

"The establishment of saw-mills, two of which it is hoped will very shortly be opened in Upper Assam, should create a demand for timber suitable for tea-boxes, and thus replace with indigenous produce, to the profit of the province, the present expensive and circuitous method of importing teak planks for the purpose from Burmah. Scarcity of local labour—not want of good wood for tea-boxes—is the sole explanation of the latter, and the mills, if judiciously worked, should do a good business.

IN his Burmah Forest Bill, Mr. Aitchison is resolved to take time by the forelock. Rangoon and Moulmein are the two principal ports of teak supply for India and the world. The chief sources of production are Upper Burmah, Siam, the Karennee country, and British Burmah. But it need hardly be said that there is no such thing as conservation in the trans-frontier territories; and the probability—perhaps Mr. Aitchison might have said the certainty—is that those foreign sources will in time be exhausted. In that case, and because the yield from the South Indian, Javan, and other forests, is insignificant, British Burmah will become the chief exporter, in which case the country's capability to supply the demand will depend on conservation. Hence the present necessity for a Bill such as Mr. Aitchison has introduced for consolidating, amending, and amplifying past regulations on the subject of the British Burmah forests. It is worth remarking the extent to which the export trade in teak has advanced since the annexation of Pegu. In eight years after the annexation, the exports were below seventy-seven thousand tons. For the five years ending 1879, the exports were upwards of one hundred and thirty-four thousand tons.

WE have repeatedly and at length called the attention of the Bureau of Forestry to the advantages likely to accrue from the results of afforestation in this country. We read in a foreign exchange an interesting account of the advance of that science in France:—"French forestry has accomplished wonders in France of late years. Wind-blown hill-tops have been covered with shrubs and trees, by building weirs in the mountain gorges and gradually cultivating vegetation upwards. The Torrent du Bourget is one of the best examples of this reforestation. In 1868 it was only a bare ravine of rocks. The torrent is now quieter, and has never since devastated the valley below with periodical inundations, as was formerly the case. From 1861 to to 1877, 68,000 acres were planted with trees, and 6,700 trees tufted, at an expense of 1,725,000 francs. The reclamation of sand dunes is accomplished by building strong fences and planting meadow grass, sedges, broom, or espartero grass in the lee of the masses formed by the shifting sands against the fences. The blue gum tree has been planted extensively in the South of France, and the marshes at the mouth of the Var have been drained, and the fevers that used to prevail there have been ended. In poorer soil the American oak has been planted.' If France can do so much in this direction, what might not we do if those interested were properly encouraged.

TREES IN TOWNS.

BEARING on the question of trees in towns, Dr Phené remarked as follows at the Social Science Congress:—"To the occupants of houses in streets having a northern aspect, the glare of reflected light is injurious but the effect would be much modified by the coolness to the eye produced by the green of trees. In ancient surgery, persons having weak or declining sight were advised to look at the emerald. In the old style of building, the streets being narrow, were both cooler, from the sun not being able to penetrate them with direct rays, and less subject to noxious exhalations from the scouring and purifying effects of the searching air to which narrow streets were subject, so that while there was no space for trees,

there was also less necessity. Wide streets on the contrary are hotter, and require the shade of trees to cool them, and as in the case of London, which has so far done without trees in its sreets, not only are modern streets compulsorily wide, but the enormous increase in metropolitan buildings renders every sanitary question one of importance; and the chemical properties of trees as shown by experiment, gives them an important standing on that ground, irrespective of ornament or the pleasure they produce. But that which is important in such localities is more imperatively demanded in poorer districts, on the score of health, as during the last year lone, 21,000 new houses were erected in London, producing four hundred streets with seventy-one miles and four hundred and sixty-eight yards of promenade."

ARBORICULTURE IN THE N.-W. P.

THE recent Report in the Arboricultural Operations in the N.-W. Provinces, though dealing almost exclusively with a comparatively small portion of the subject, the planting and maintenance of road avenues, marks a substantial step in advance. Arboricultural operations had previously been under the care of the P. W. D. Besides being necessarily limited to the planting and tending of road-side trees, the work had from various causes been hardly as successful as might have been hoped. It was in 1877 that Mr. Buck, recognising that arboriculture being one of the most important elements in the Agricultural stability of the country, was intimately connected with the agricultural Department, asked Government to allow him to undertake the control of district arboriculture. The arrangement was eventually sanctioned, but the year just finished was the first of real work. There are now, we find from the report, more than a hundred nurseries, with over a quarter of a million seedlings of selected species of trees, from among which some thirty thousand were planted out during the year, the operations being distributed over fourteen hundred miles of road. Care appears now to be taken that trees once planted shall not perish for want of subsequent attention; and excellent results have been obtained from a novel system of watering by means of the percolation of water from a common *ghurra* sunk level with the ground close to the roots of the tree. By this means the water is supplied directly to the root, while the soil surface continues loose and open, without the formation of that hard crust which is so prejudicial to the growth of young plants. The *ghurra* once filled, lasts three or four days, and no surface irrigation is required. The report contains an appendix which supplies in a few pages a series of clear and concise directions for raising, planting out, protecting, irrigating, and pruning young trees, with useful estimates as to the probable cost of these operations. Further, there is a list of all the more valuable trees, with notes on their *habitat*, modes of propagation, and the best methods to be pursued in their cultivation.

MR. BUCK ON TREES.

IT was in 1877 that Mr. Buck, Director of Agriculture and Commerce in the North-Western Provinces and Oudh, first offered to undertake the administrative control of district arboriculture. Up to that time the supervision had been entrusted to the Public Works Department. Mr. Buck made his proposals for the following reasons :—

"1. The nurseries at the different gardens were under his control, from which supplies of seeds and plants could be arranged and new and useful trees introduced.

2. He could superintend the system of thinning out of roadside trees, by which a fund could be created to meet a considerable portion of the expenditure.

3. He could exercise continuous supervision, so that the work of one officer who might take an interest in the subject might not be thrown away by the neglect of his successors.

4. Arboriculture, being one of the most important elements in the agriculture stability of the country, from the fact that trees counteract the fearful aridity of the climate in the hot months and supply vegetable manure from their decayed leaves, is intimately connected with the work of the Agricultural Department."

Even without an enumeration of special reasons, the suggestion was a most rational one on the face of it. The charge of arboriculture would have seemed more congenial and appropriate to a departmental chief whose business was agriculture, than to an officer whose *forte* lay in bricks and mortar, kunkur, and railway sleepers. Mr. Buck's plans were endorsed, but in a manner rather perplexing. A distinction was drawn between "arboriculture"—that is to say the planting of new avenues—and "maintenance of avenues"—that is to say old avenues. The former was made over to Mr. Buck, the Public Works Department continued to be responsible for the latter. But the question soon arose how long does it take a young avenue to grow old? The puzzle was as ticklish as the inquiry of the schoolmen into the number of angels that could comfortably stand on the point of a needle; and in course of years the problem might have set both the rival departments at loggerheads. Luckily, however, the P. W. D. gave it up, and the whole arboricultural work of the province was made over to Mr. Buck. His grant was at the same time raised from Rs. 17,300 to Rs. 85,000—a modest sum for the needs of the twenty-three thousand one hundred and odd miles of road in the forty-seven districts of the North-West and Oudh, to say nothing of the village and waste land plantations which the Director wished to make a beginning of, and the nurseries from which the road-sides and groves were to be supplied.

For the first year after the new arrangement, little was done beyond issuing instructions to the district officers. In the following year, operations were postponed till after the rains, so that the results recorded in Mr. Wright's report are more favourable than they seem. This, the first annual report on the subject, states that 1,430 miles of road were taken in hand during the year. One hundred and ten nurseries, exclusive of the establishments at Saharunpore, Cawnpore, and Lucknow, for the supply of seedlings are in working order. Only "trees producing food for man or cattle are allowed to be raised, or transplanted to the roads" Among the principal kinds reared are the mango, jaman, mahua, gular, pipal, babul, tamarind, and neem. Mere adornment has no charms for the practical mind of the Director; and even the siris, with its splendid but brief glories, has no place in his list of selected trees. In several localities, spaces have been set apart for groves, and supplied with seedlings: and instructions have been issued for beginning the same sort of work, on an extensive scale, in the Jhansi division. Less than Rs. 28,000, or more than four thousand three hundred rupees short of the full grant, was spent during the year. The balance lapsed to Government, " owing to the system not being in full working order, not because the full amount was not required. On the contrary, the grant is quite insufficient for the requirements of the forty-seven districts among which it is distributed, and many applications for further grants from officers, who may be trusted to see they are well spent, have to be refused." It appears that the arboriculture allowance in the North-West and Oudh amounts to less than half the sum granted for the same purpose in the Punjab. But if we are not mistaken, the North-West has the advantage as regards unity of management, and efficiency in the system.

As regards adornment, shade and ultimate effects on water-supply, the uses of arboriculture in arid countries like the Punjab and North-Western Provinces, are almost too obvious to require mention. We say almost, because it is surprising how people fail consciously to realize the share which the dreary monotony of their surroundings has in rendering their own lives dull. The utility of arboriculture in the way of improving the varieties of indigenous fruit trees has been less fully realized; but receives due prominence in Mr. Wright's report. We quoted the following sentences from his paragraph on the distribution of mango grafts :—

"The superintendents of the various gardens have had their attention called to the importance of improving the quality of indigenous fruits, and propagating superior species for distribution. Much attention has been paid to the mango, being the best and most common fruit in India; and arrangements have been made for the distribution among zemindars and cultivators of grafts of the best kinds at a very low rate. The system of inarching with small seedlings of the same year, brought to the notice of this department by Mr. Phillips, will, it is expected, prove of great service, as it reduces the cost of grafting, and, on account of their lightness, the freight in sending the grafts out. The selling price of each graft was formerly eight annas to a rupee, Now it has been reduced to two annas a piece. The net cost of each graft on this system is only half an anna. Difficulty, however, was experienced in obtaining a large number of grafts, for want of sufficient mature trees for inarching. The Canal Department was requested to allow their plantations in the Saharanpore district to be utilised for the purpose, and arrangements have been made for obtaining grafts in 1880-81. During the same year 5,000 grafts will also be purchased from the Khusbru Bagh, at two annas each, and about 2,000 more will be raised at the Cawnpore Farm Garden. All these grafts will be offered to the public at two annas each, exclusive of freight, and they consist principally of the three varieties, the Maldah, Bombay, and Lengra. Another variety, the Fazli, considered to be the best in Bengal, will also shortly be imported. The district officers have also been asked to set aside a portion of every nursery established for permanent maintenance, which should ordinarily be planted with mangoes of the best kinds, in order to establish a stock of mature trees, from which to raise grafts in future years for distribution."

In connection with this utilitarian aspect of the subject, it may be mentioned that very successful efforts have been made in Gonda, Rae Bareilly, Muttra, and elsewhere, to induce zemindars and cultivators to plant trees, on the condition that they may use the fruit and dead wood. Well directed attempts of this sort will have the double advantage of popularizing the system, and enabling the department to prosecute the work at the smallest possible cost to the State.—*C. & M. Gazette*

GARDEN.

THE *Indian Amateur Gardener* is a handy little volume by "Landolicus," published by Messrs. Newman & Co. It is really fitted to be what it says it strives to be, the *multum in parvo* of the amateur gardener in this country, whether in the plains or hill stations of Northern India. It opens with a calendar for hill stations and plains, pointing out what is proper to be done in each month of the year. Valuable instruction is given on the subject of soils and manures, the want of which often causes so much trouble and disappointment to amateur gardeners. Within a brief compass it contains almost everything about flower and flower gardens which the ordinary amateur in this country needs to know, and which, without such a guide as this, it is so difficult to learn. The man who would not be entirely dependent on his *mali* should procure a copy.

THERE is promise of a glut of apples in the United States. The Boston *Herald* reports the crops to be the largest for many years, perhaps to the extent of 40 or 50 per cent. To June 30th, 1880, the shipments from Boston to England amounted to 173,379 barrels, of a money value equal to over £70,000.

THE apple tree, originally introduced from Europe, has spread in South America from Valdivia to Osorno, and even crossed the Andes into North-Western Patagonia, and thence eastward. Indeed, it has become so widely spread, and so general, that the Indians from the distant regions of the Argentine rivers, Rio Negro and Rio Colorado, are called Manzaneros, or Apple Indians. As a matter of fact, they and their kin in the provinces of Valdivia and Osorno live far more on the fruit of the apple tree than any European people, for it affords them both food and wine.

SHILLONG EXPERIMENTAL FARM.

THE Shillong Experimental Farm was given up during the year, and the Forest Department has taken over the orchard, with about fifty thousand of young seedlings of the wild apple (*Pyrus Indica*) which it is intended to graft for sale. Stock plants of good varieties were partly bought in Shillong, partly brought from Lahore and Saharunpur, and some from England. There is not much variety, and they ought to be increased so as to ascertain which varieties are best suited for the different altitudes and localities, as well as the different seasons. Apples and pears thrive admirably, and would, no doubt, become a considerable adjunct to the food supply of the people, if they grow them extensively, as they no doubt will do as soon as they understand sufficiently the advantages derived from the systematic cultivation of these fruit trees, a number of sweet chestnut trees are also in the orchard. One variety was raised from seed received from Europe, the other received from the Botanical

Garden at Saharunpur; the latter seems the hardier of the two. Different varieties of Peach, Nectarine, Apricot, Plum, Cherry, Mulberry, Medlar, Currant, and Raspberry are also cultivated in the orchard of Shillong, chiefly with a view to facilitate their extended cultivation in the province.

THE TULIP-TREE.

I AM anxious to place before your readers a few remarks recently supplied me, in a most kind and courteous manner, by Mr. Freeman, Caroll, Baltimore, in the United States, regarding his own experience in the cultivation of the Tulip-tree. Mr. Freeman states that some time ago, owing to the death of several young Tulip-trees, he planted others of the same kind in the month of April, and when the leaves were about two-thirds grown, about twenty-four trees were planted, and all survived. These plants, about 6ft. high, were taken from a bed of seedlings in the woods, whilst the dead ones had been procured from a nursery, and were considered to be very fine plants in all respects when planted the previous autumn. Mr. Freeman had just succeeded a gentleman in the position he (Mr. Freeman) occupied—very much more experienced and older than himself,—who had finished the autumnal planting, and he (Mr. F.) was assisted by an old man who had been in the place for years as a labourer. The latter told Mr. F. it would be utterly useless to try and remove the trees. His predecessor had often attempted to do so, but invariably failed. He admitted, however (a most important admission), that their removal had always taken place in the autumn, or the more expressive phrase "fall," as generally used in America. Mr F. cut back the head, and took off all long leaves, and planted them with merely ordinary care. The very best results followed—a fine growth was obtained the first summer. He has seen hundreds die when planted in the "fall," but not one when planted properly in the spring. He considers that owing to the spongy nature of the roots, they will not bear mutilation unless when active, which also obtains with magnolias. The plants removed by Mr. F. had not a particle of soil about their roots. He cou[illegible] me to use care not to let the roots become dry when out of the ground. I am so satisfied that Mr. Freeman's advice is sound and good, that I will take care in future never to plant a single Tulip-tree before April. I would beg, through your journal, to thank most cordially and respectfully Mr. Freeman for his valuable advice.—J. COLEBROOK in *Gardener's Chronicle*.

TEA.

WYNAAD tea as well as Wynaad gold is in high favour just now. Large orders have been received from Australia, and sample parcels sent to England are said to have given great satisfaction.

WE hear from Assam that owing to unremunerative working the past season, several tea gardens will be closed, and expenditure will be largely curtailed on many others. This will, of course, throw many planters out of employment.

A FLUSH was picked on a tea garden in the Dooars last week. In the hills, bushes at the lower elevations are beginning to send out buds, we are told.

VERY remarkable is the expansion of the tea industry in Ceylon. In 1875 one thousand four-hundred pounds were exported; in the past year the exports amounted to 81,492lbs.

WE see from Messrs. Watson's Tea Report of the 5th ultimo that the deliveries of Indian tea in London for the year ending 31st December last, were 41,000,000lbs., against 35,200,000 lbs in 1879; 36,700,000lbs in 1878, and 27,900,000lbs in 1877. The stock in London at the end of last month was 20 200,000lbs., and on the same date of 1879 was 17,800,000lbs.

MESSRS. CARRITT & Co. in a recent Market Report have the following concerning tea:—The final reports received from the gardens show that our last estimate of 43 millions for export must be still further modified, and that, probably, not more than 41 to 42 millions will be available for shipment to Great Britain. Should the London deliveries during the next six months continue on the same satisfactory scale the new season's crop should arrive to a favorable market."

THE season's export of tea to America from China and Japan promises to reach 83 million lbs. The yearly consumption in America is estimated at 65 million lbs., thus giving a considerable surplus over requirements, if consumption does not increase. Much of this increased supply will be in Japan teas, but China supplies are liberal.

A CHINA paper gives some facts about the tea trade with America for the current year, which disclose the following state of things. It calculates that the deliveries from China and Japan of all kinds of teas in America, for the year ending the 31st July last, amounted to 73,000,000lbs., whereas the deliveries for the previous year amounted to 60,000,000 lbs. From some detailed calculations our contemporary estimates that China and Japan can dispose of 80,000,000lbs. of tea to the United States during the present season. As the demand for tea in the States has not advanced in a corresponding ratio to the overwhelming supply, the conclusion is gathered that a very low range of prices is inevitable.

WE are glad to observe that the Tea Syndicate have decided to continue their operations with Australia for another season, and will also despatch an expert to America to obtain information as to the best means of opening up that market. Attention will also be given to Canada. By means such as these it is that the popularity of Indian tea will be increased and the future success of the industry assured.

IT is encourging to learn that Indian teas are rapidly meeting with the appreciation of the Australians. From the Melbourne papers it seems that much interest was shown by Australian buyers in the sale of the Calcutta Syndicate teas, and that a very extensive trade is assured for the present year. This result, it may be well to add, is mainly due to the wisely directed efforts of Mr. Sibthorp, the Australian Commissioner of the Syndicate.

WE hear that a company, or syndicate of some sort, is, or soon will be, in process of formation, for the purpose of pushing the Indian tea-trade in the markets beyond the North-West frontier. The markets are certainly there, but the difficulty is how to get at them. Something might be done if the Cabul Government and the great Chiefs, who are all but independent, would even negatively support the trade, by refraining from the imposition of exorbitant duties.

THE *Ceylon Observer* writes:—The cultivation of tea in Ceylon must be acknowledged to be a success when a planter is able to report the gathering in one year of 40,000lbs from 120 acres, 20 acres of which bore very little, the whole being under five years of age, and planted at over 5,000 feet elevation above sea-level. What is wanted now is . . . . . . some of the capital which is still so freely given to tea concerns in India. Ceylon, in our opinion, presents a far more favourable field than either Northern or Southern India for new enterprises in tea, in view of its many advantages of cheap transport, healthful climate, easily managed labour, and general convenience, apart from the very satisfactory returns of crop already realised in most districts.

THE *Ceylon Times* in an article on "the Australian tea markets" writes:—

The prices quoted by the Melbourne brokers for the various parcels of teas exhibited by Ceylon growers range from 1s. 3d. to 2s. 6d. per lb., the lowest price being more than has hitherto been obtained in London for any but one or two particular marks, such for instance as the Windsor Forest teas. It is evident that all the quotations given in the list to which we are alluding, are paying prices. There can be no reason why the quality of Ceylon teas should not with ordinary care be maintained at its present standard—the more useful qualities evidently being Souchongs and Pekoe Souchongs to sell at from 1s. 6d. to 2s. per lb.—the demand for higher qualities being limited, at any rate for the present. Time is required to show whether a demand may not be created for teas ranging above 2s; in the mean time it will be well that shippers bear in mind the injunctions of the Melbourne tea brokers in reference to the most suitable size of tea packages. There appears to be no doubt, that the most suitable parcels for the Melbourne markets are half chests of 38lbs nett weight, with superior qaulities packed in half chests of 20lbs. each, and a few 11lbs. boxes. The reason given for this is the convenience of small packages over larger ones for transmission to the interior, especially beyond the lines of railway where in many casepack horses have to be used for transport.

THE same paper compares the tea districts of Ceylon with those, of India and observes:—

In the more suitable districts for tea where it is expected that from three to four hundred pounds of marketable teas can be produced per acre, there can be no doubt about profitable results to proprietors, even though growers in Assam complain that at this rate of yield estates are not worth carrying on. But Ceylon has advantages over the district of Assam and other outlying tea-producing countries of India, in not only a greater humidity of climate, but in cheaper labour and in far cheaper and readier transport. There is also this great advantage which Ceylon possesses over some parts of India,—that whilst according to Col. Money one of the reliable authorities on tea cultivation, the most suitable climate for tea in India is unhealthy as a place of residence for a man, our most productive districts for tea are also the most healthy as places of residence.

MESSRS. T. C. SILLAR have issued a chart illustrative of the history of the tea trade for a period of forty-five years. It shows the average monthly consumption and prices of tea since 1835, including the same particulars in reference to the Indian product since its introduction to England in 1859. It appears that the amount of common Congou imported has risen from 3,255,000lbs. in the former year to 13,500,000lbs. in 1880. At the same time the demand for Indian tea has grown from 100,000lbs. in 1860 to 3,400,000lbs. in the present year. By-the-by, we are told that certain private firms have anticipated the designs of the Calcutta Syndicate in diverting a portion of their Indian shipments to America. A belief is entertained in many quarters at home that the Americans could be made India's best customers, in the course of time, if Western tastes are a little humoured. While new markets are thus being sought for tea, a new grower is about to enter the field of competition. Southern Italy is to be a future tea country. A few years ago Count D'Amigo planted his farm near Messina with choice China tea plants, and these have thriven marvellously. The plantations are now to be considerably increased, and Signor D'Amigo is sanguine that he has struck out a new branch of agricultural industry for the south of Italy.

WE observe that Karen hill tea is advertised for sale by a Rangoon firm. This is the first year any tea grown in Pegu or Tenasserim has found its way to Rangoon for sale. It is grown on the Karen hills near Tonghoo, and we believe that Mr. Petley, of the Bombay-Burmah Trading Corporation, is the gentleman to whose enterprise we are indebted for this new produce. There is one tea estate in the Arakan division, formerly owned by the late Dr. Mountjoy, Civil Surgeon of Akyab, which produces excellent tea, in no way inferior to the Assam varieties. If the Karen hill tea is equally good, there should be a large demand for it in Burmah, where, besides Europeans, the Burmese are great tea drinkers. At present they use principally low class Chinese tea, imported from Penang and Singapore by Chinese merchants, and sent by them all over the province, through their agents stationed in the principal villages for buying produce, hides, horns, ivory, cutch, and grain. These men, again, send the tea out in small ounce-packets by pedlars, so that there is hardly a place in the interior of Burmah where it is not possible to buy Chinese tea. If Indian tea-growers packed their teas in small ounce and two-ounce packets, they would be able to sell much more of it in Burmah than they do now, where the smallest package obtainable is a one-pound tin. This is too much for a poor man to buy at one time, and the Chinese, who know admirably how to consult the pockets of their customers, make it easy for the poorest of them to purchase a packet of tea at a cost of a few pice. Numbers of natives of India drive a lucrative trade by selling tea and coffee ready-made to the Burmese, in the streets, at a pice a cup. The mess is very weak, but it is hot, for the kettle containing it is carried about with a live charcoal fire underneath it, and the drink which is sweetened with plenty of coarse sugar is said to be greatly appreciated.

THE TEA SYNDICATE.

WITH reference to the doings of the Tea Syndicate which met in Calcutta last month, the *Englishman* writes :—

It will, no doubt, be satisfactory to the majority of those interested in tea to learn that the Tea Syndicate has decided to continue operations for another year, and further to extend their operations. We say the majority, because at the late meeting, when the question was discussed, one gentleman expressed an opinion, " that a continuance of the Syndicate operations would be taken as in opposition to merchants, who were desirous of undertaking the business, and he recommended that the operations should be closed, as far as Melbourne was concerned, and the attention of the Syndicate directed towards the further development of the trade with the other Colonies. If it were decided to continue the trade, he suggested that the Syndicate should place its supporters in the same position as merchants, by charging a commission equivalent to the charges incurred by ordinary shippers, for brokerage, commission &c., and that particulars should be supplied to merchants of the probable extent of the Sydnicate shipments, in order that the former might judge for themselves of the expediency of supplementing the Syndicate shipments." It was explained, however, " that the Syndicate principally represented the interests of producers, whose only object was the introduction of Indian tea to Australia and other places, where it is comparatively unknown at present, and that as soon as this object was, in their opinion, accomplished, they would be quite prepared to leave the continuance of the trade in the hands of merchants or others prepared to undertake it. No opposition was intended, and it was only a question whether the trade, although most successfully started, was sufficiently established to depend entirely on private enterprise for its successful continuance." So it was decided to continue operations with Australia for at least another season. The next question discussed was " whether it is desirable, or otherwise, to endeavour to extend the trade with America, through the agency of the Syndicate, and, if desirable, the measures which should be adopted to carry out the scheme." This was decided in the affirmative, Canada being included as well as America, and a resolution was passed authorising the committee, " if they shall consider it advisable, to procure the services of an expert in tea, thoroughly conversant with this market, who may be despatched at once to America with instructions to visit the principal places, and furnish the Syndicate with detailed particulars of the requirements of the trade in that country, so that the proposed operations may be conducted with fuller knowledge of the class of tea likely to be appreciated than could be obtained by ordinary correspondence with American firms, who have had little or no experience of Indian tea." In order to obtain the necessary funds to carry out this extension of their business, it was decided " that the Committee be desired to apply to Government for a grant of money, and empowered to take steps with reference to the introduction of Indian tea to America and Canada, so far as such grant, and the available funds from the balance of the subscriptions as yet uncalled up for Australia, permit, and to make such commission charge, if any, on all teas sent for sale through the Syndicate as appears to the committee desirable." Another important subject brought before the meeting was " whether it is feasible or not to form a combination among producers to regulate the monthly supplies of tea on the market next season by extending the arrivals from the gardens over a longer period, say ten months.' This, however, was not considered feasible, but it was said to be " the intention of several proprietors largely interested, to discontinue the system of bringing forward their crops so rapidly as had been done this year, and the subject is one well worth the consideration of the tea interest generally."

INDIAN TEA IN AMERICA.

A GENTLEMAN in New York who has been giving special attention to the subject and making inquiries relative to the question of the introduction of Indian tea into the American market, writes as below to the *Home and Colonial Mail*. It will be observed he states it as the opinion of the firm of brokers he consulted, that " Indian tea must eventually become popular in America," and that this desirable object would be " considerably hastened" by consignees sending teas suitable to the American taste, which he proceeds to describe. Shippers from this country should bear in mind too, that tea is admitted *free of duty* into America *when sent direct from the country where it is grown*. Some useful suggestions are given for the guidance of intending shippers to America But we will not anticipate further :—

"In America all Indian teas are called Assams. Various small shipments have been made to New York and Boston, but hitherto the introduction has turned out a failure, in consequence of the teas not being the grade required for these markets. The flavour of Indian tea, as a rule, is too coarse and strong for Americans, and as no tea—retailers in this country make tea a speciality, they do not understand, or will not undertake the mixing of teas, a method so well known and carried out in England. In New York, which I am told is a guide throughout the United States, tea it retailed as a " grocery"—a store where, in addition to groceries of all kinds, bread, milk, fresh vegetables, wine, beer, liquors, mineral waters, wood, and frequently coals, are sold. In fact, an American grocery is a combination of an English Italian warehouse—tea grocer, greengrocer, cheesemonger, and chandler's shop, with a dash of butcher and baker thrown in. You can easily understand from the foregoing why tea retailers do not understand the mixing of tea—it would cost too much time and trouble. There was another drawback against the success of these tea shipments alluded to—the packages were too large. The firm of brokers by whom I was given these particulars, were of opinion that Indian tea must eventually become popular in America, and the use of it would be considerably hastened by consigners, whether from England or India direct, sending teas suitable to the American taste. The consumption of tea in this country is already very great and continually increasing. The teas mostly used in the United States, and which have the readiest sale, are Oolongs, Pekoe flavoured Congous same as Assam tea, Formosa tea, and Japan tea. The latter is becoming popular, especially in Western States, where the water is so much impregnated with lime. There are also teas from the North of China, fine Pekoe Souchong flavour, that are well liked. Should any of your subscribers anticipate making a consignment of Indian tea, carry out as far as practicable the following suggestions. Select a crop of tea of medium strength, so that it can be used without mixing, and the flavour similar to the kinds such as I have told you are mostly used here. Have the tea put up in boxes, so that dealers willing to try it can buy small quantities at first by way of experiment. *Price*—to cost wholesale at from 50c. to 60c., per lb., say from 2*s*. to 2*s* 6*d*. sterling A shipment of tea can be consigned to any responsible house. The consignee would simply have to give instructions to a good firm of tea brokers, and they would furnish a report. This report can be cabled or written back. Tea is admitted to this country free, provided it is shipped from the country where it is grown. Should it be transhipped, say from England, there is an import duty of 6 cents per lb., equal to about 3*d*. sterlin'

COFFEE.

THERE has been, of late, a satisfactory increase in the quantity and value of Indian coffee exported. The value of the exports for the first half of the current official year considerably exceeded a crore; the figure for the same period of last year being under 63 lakhs. It is a notable fact that more than half the total quantity exported went to France, where one gets good coffee.

LAST year's Java coffee crop is estimated at about half that of the preceding year.

THE Batavia *Dagblad* in a recent issue asserts, on the authority of advices from Mid Java, regarding the coffee crops, that the Hemileia fungus has done scarcely any harm to the coffee estates visited by it there. Hence this year's coffee crop in that quarter promises to be abundant, that of last year being short.

THE exports of coffee from Ceylon for the past season are smaller than those of the preceding seaon, by probably something like 100,000 or 150,000 cwt. This ought to influence the prices for the better qualities of coffee in the home markets early this year.

A CORRESPONDENT sends a Ceylon paper the original of the report furnished by a qualified chemist on White-weed Ash Analysis:—The ash yielded potash 21·57 per cent; chloride of potash 4·1; phosphoric acid 5·24. This, remarks our contemporary, shews the serious demand made on coffee soil by the white weed.

MR. C. S. SALMON, the Chief Commissioner, writes of Liberian coffee at the Seychelles :—" About 150 plants of Liberian coffee have been planted at Mahe Island at elevations varying from the shore to 1,500 feet above sea-level. It comes best, apparently, so far, in the open without shade. One plant at an elevation of about 300 feet without any shade, and close to a granite rock giving out considerable heat, has about 100 strong-looking flowers on it. This plant is eighteen months old."

THE ravages of the "leaf disease" among the coffee plantations of the old world, and of the "White fly" in those of the new, led planters a year or two ago to make trial of the Liberian coffee plant, which was first grown at Kew in 1872, and seeds of which were forwarded everywhere through its agency. The last report of Kew Gardens contains satisfactory accounts of its progress in such widely separate regions as Singapore and Dominica. It has not, however, proved altogether impervious to the "leaf disease," especially in Ceylon, while it is reported from Dominica that the "White fly," which had utterly ruined the old coffee plantations, has been seen to attack the seedling leaves of the Liberian coffee, although avoiding as yet the grown plants.

EARLY last month we were briefly informed by telegram that Mr. E. C. Schrottky had made some successful experiments in the cure of leaf disease in Ceylon. We now learn that his process is to cause the absorption of a chemical into the sap of the coffee tree by the cambium. The results of these experimental trials may be thus briefly stated:—It is shown that treated in its earliest stage of what are known as pin-spots, by the new process of inoculation the first germs of the newly-formed fungus may be destroyed, or at least their growth checked, as shown by the non-formation of the orange red dust or spores: consequently were it practicable to thus treat every tree on every estate, the fungus germs of the disease would cease to be propagated and the pest would disappear.

SINCE writing the above we learn that several agency houses have asked Mr. Schrottky to experiment on their estates, so that his supposed remedy for leaf disease will have a thorough trial. Mr. Schrottky himself is very sanguine of success, and should the results be favorable, it is believed that he will apply to the Dutch Government for the reward of £25,000 offered by them to the discoverer of a cure for leaf disease. A patent would also doubtless be granted in India and Ceylon.

IT appears, however, that Mr. Schrottky is not to have a monopoly in leaf-disease investigation. The *Ceylon Observer* just to hand states that "another agricultural chemist is now in our midst, in the person of Mr. Fretwell, an Indian Scientist, who has been for some years in charge of the Government Model Farm in the Bombay Presidency. Perhaps the news of Mr. Schrottky's experiments with our coffee pest, which was telegraphed to India some time ago, may have tempted his fellow scientist to pay our island a visit and see for himself what is being done."

WHILE Mr. Schrottky's experiments so far seem to have met with every success, it would be clearly unwise for planters to rush to any premature conclusions as to the ultimate efficacy of the new mode of treatment. It will probably have to stand the test of a whole season before it can finally be regarded as an unqualified success. Mr. Schrottky, we are glad to see, recognises this himself and the following extracts from a letter (dated 6th January) addressed by him to the *Ceylon Observer*, will be read with interest:—

. . . .

There is only one point that may possibly become of some interest to scientists if success continues, *viz.*, the absorption of chemicals in solution into the system of the plant by means of the cambium cells of the stem. I am not aware that even the possibility of such an absorption has ever been investigated by any authority. But that it can take place I satisfied myself two years ago, though at the time I did not even think the matter worth mentioning. I have no doubt that botanists will require some better proof than a mere assertion before they will accept this new theory, but based as it is on a well-known physical law regulating the movement of fluid matter in plant cells, positive proof will not be difficult. In the meanwhile it is practical results which we are watching for; theories can wait. . . . .

. . . .

The data I have collected are far too few and incomplete to enable me as yet to come to a definite conclusion as to the merits, *if any*, of the treatment I have chosen as having, among a number of experiments (external applications and otherwise), held out the greatest encouragement. The results at Bellongalla as observed on the tenth day after treatment were certainly most encouraging, and I satisfied myself that a decided check of the disease had taken place on the treated area. But the great question is: How long will the benefit last, and will it enable the trees to withstand the appalling vehemence of the attack that is just now observable on estates around Kandy. The whole matter is still in its experimental stage, and I should wish, if possible, to avoid the great danger of coming to too early and then probably erroneous conclusions. . . .

THERE appears to be no end to the inventive genius of some people, and many of them seem to have made a "dead set" upon coffee. We have had the celebrated pelatos coffee, which was simply baked acorns; more recently date stones have made their appearance in the London market under the title of *date coffee*. Yet another instance comes before us in the shape of a 'preparation of fruit,' under which name a foreign gentleman has obtained a patent for a preparation 'closely resembling Mocha coffee.' The fruit of the *Ceratonia Siliqua*, commonly known as carob beans or locust-pods, and vulgarly as Russian figs, is roasted and ground into powder, and is then mixed with a certain proportion of the roasted and ground seeds of *Vicia Sativa, i.e.*, tares. An infusion of this mixture may be used as a beverage, and if it is taken with a large quantity of imagination, it will closely resemble Mocha coffee.

MR. SCHROTTKY'S EXPERIMENTS WITH LEAF DISEASE.

THE *Ceylon Times* just received has the following brief but succinct account of Mr. Schrottky's progress so far, in the investigation and cure of leaf disease, by his new process:—

. . . . Mr. Schrottky labours with the advantage arising from acknowledge of previous failures; he has also the great advantage that whereas his predecessor in experiments (Mr. Morris) was a botanist pure and simple, he has made agricultural chemistry his professional study for many years, and has been for a considerable period engaged by the Indian Government as their adviser in matters relating to the science which he has made his special study and pursuit

Our readers have already been made acquainted with the results of certain preliminary experiments on estates in Dolosbagie and Kaduganawa: those results are considered highly satisfactory, so much so indeed, that nothing is wanting to establish them as a complete success, but the certainty of the permanency of their effects. It may be said, no doubt, that this is precisely where the "lime and sulphur" remedy failed; but it should be remembered that whilst that remedy consisted of an external application, the present process of acting on the organism of the trees by inoculation, is altogether an internal and constitutional remedy. Hence it is that those who are watching the present experiments with deep attention are hopeful that the effects will be of a permanent character. There is, of course, always this to be borne in mind, that a few acres of trees successfully operated on, when surrounded by some hundreds of acres of badly diseased trees, must inevitably incur a certain risk of re-infection, and hence it is that complete and thoroughly permanent success can scarcely be looked for until far more extended areas of coffee have been operated on than is at present the case. The estates recently experimented with have been Rosseneath, close to Kandy, Pallikelle in the vale of Dumbara, and the Peradeniya Estate. As we are given to understand, the condition of the trees on the two latter properties was precisely such as was most favourable for testing the remedy, the disease having been in the stage known as pin-spots. Not so, however, with the first named: there, unfortunately, the pest was very fully developed, so fully indeed as to leave little hope of any real benefit being derived from the inoculation process. As a recent visitor to the estate described it, "the appearance of the red dust on the leaves throughout thee state was apalling, it was indeed as bad as it was possible to be." We think it right to mention this circumstance because, as it is scarcely probable that success will attend the operations on that property, failure should be attributed to the right cause. It may have been a knowledge of the condition of this estate which led a contemporary to state that success there would be decisive. It will, however, be quite sufficient for all present purposes that success attend the application on the two other estates. Mr. Schrottky makes no claim to miraculous powers, and he does not pretend to be able to effect a cure after the pest has passed the first or incipient stage of pin-spots, although it is quite possible he may be able to mitigate the severity of the attack. The results of the two experiments to which we have alluded, added to the confirmation of previous successes in other districts will no doubt enable the operator to feel far more confident in his process than he could hitherto pretend to be, and we shall hope that on his return from his present visit to the interior, with the results of the various experiments before him, he will feel sufficient confidence in what he has achieved to favour the public of Ceylon with a detailed account of his process and his own opinions upon it. We may mention that he has in the meantime, obtained provisional registration for the specification of his process with a view to secure complete protection by patent. To this it will be admitted he has a perfect right, and we feel sure the planters of Ceylon will not grudge him any benefits that he may derive from the successful application of his remedy, seeing how largely the coffee industry is interested in the successful outcome of his operations.

MR. MARSHALL WARD ON COFFEE LEAF DISEASE.

MR. MARSHALL WARD'S second Report on Coffee Leaf Disease has come to light. We regret we cannot, on account of its great length—and it is too important to be curtailed in any way—reproduce the Report in our present number, but we shall endeavour to do so in our next. Meanwhile we make the following extract from some comments of the *Ceylon Observer* on the paper in question. After remarking that the Cryptogamist deserves great credit for the care and devotion he has displayed in the conduct of the investigation, our contemporary proceeds:—

No one can read this Report without feeling that Mr. Ward is giving his best energies to the task before him; and although the greater portion of the long document is of interest chiefly for its scientific information yet we have now, what was comparatively wanting in the preliminary Report, evidence that Mr. Ward does not ignore the practical and economic bearing of his investigation, but rather that he keeps steadily in view the object before the planters and the Government in arranging for the investigation, namely, the hope of discovering some feasible means of checking and mitigating, if not of extirpating the coffee leaf fungus. We must leave to scientific authorities any criticism of Mr. Ward's experiments and observations bearing on the diagnosis of leaf disease. It would, for instance, be specially interesting to learn the impression left on the minds of Dr. Thwaites and Mr. Abbay, and still more on those of Messrs. Berkley and Cooke, by the account given under the different sections of "pin-spots," "the second spores," the "filaments" (finally

pronounced to have nothing to do with *hemileia vastatrix*, a result which upsets Mr. Morris's "life-history"), and most important of all "the papillate spores (uredo spores)." Very interesting as well as eminently practical are many of the experiments described by Mr. Ward under these heads, as also in connection with "the action of the fungus on the cells of the coffee leaf," "the fall of leaves," and "the effect of leaf fall on the branches." Much light is thrown on various cognate questions which have higherto perplexed the planter in connection with the failure of his crops and "the insidious defunction" which marred and weakened his trees. The terrible drain on the coffee plant from the constant fall of leaves is most clearly illustrated with the aid of observations made by Messrs. Mackenzie, Anton, and Gabriel Ross in the Maskeliya, Pundaluoya, and Hantane districts, and we learn quite enough to shew that the persistent attacks of the leaf fungus are more than sufficient to account for all the deficiencies of crop, the disappointing appearance of the trees and many other evils (including possibly the liability to such enemies as "grub') experienced by the planter during the last ten years. "The fact must not be overlooked" (says Mr. Ward)—"and this point is of importance with respect to heavy manuring—that the continual renewal of leaf calls forth great energy on the part of the tree, and it no doubt follows as a direct consequence of this that the crop-producing capabilities of the tree are lessened." "At the same time" (to reverse the order of Mr. Ward's sentences in this case) "the marvellous power to reinforce itself that the coffee tree exhibits, may justly be insisted upon where other things warrant it; and *it seems impossible to doubt that the mitigation of leaf-disease would be followed by a rapid improvement in the crop-producing capacity of coffee.*" As we follow the various steps of this careful investigator, it is impossible not to be stirred by the hope of our being on the eve of important discoveries in connection with a tangible means of dealing with the planter's chief pest. Mr. Ward has commenced experiments with this end in view, the issue of which he is anxiously watching, and he promises to spare no trouble to thoroughly investigate and report upon the remaining phenomena of leaf-disease. The results of his experiments, as well as of those carried on under Mr. Schrottky's auspices, will be looked for with keen interest. But, meantime, curiously enough, Mr. Ward's one practical recommendation to planters exactly coincides with that most insisted on by Messrs. Morris and Abbay, namely the necessity of a thorough destruction of all fallen coffee leaves, as a certain source of propagation of the disease. Mr. Morris wrote :—

The most favourable season for the application of lime is just after a severe attack of the disease, say in September, October, and November, when the leaves have nearly all fallen. If quicklime is then applied it will destroy all the spores with which it comes in contact and by decomposing the withered leaves *in situ* prevent the danger of infection. The plan of collecting all the fallen leaves and burning them, which has been advocated as a precautionary measure with regard to leaf disease, is a good one if applicable to large estates, but I noticed that after a short time very few, if any, of the withered leaves under the coffee retain the spores upon them. The latter soon fall off and are found everywhere on the ground, where sooner or later they germinate and produce filaments which once more attack the tree. It is evident, therefore that by collecting the withered leaves and burning them; only a small proportion of the spores is destroyed, and taking into consideration the cost of collecting the leaves, the damage of a fire on a coffee estate and the probable scattering of the dry rip spores which must inevitably take place when the leaves are disturbed, I venture to suggest that it is much better to act on the old proverb, "to let sleeping dogs lie," and destroyed leaves, spores, filaments, and all with as little disturbance as possible by a plentiful application of quicklime The value of the lime as a dressing for the soil, and the facility and ease with which it can be applied, are additional points in its favour.

As an alternative process, where it is not possible to apply lime to the whole of the estate at once the recently fallen leaves together with a little of the surface soil might be scraped together after a severe attack of leaf disease, into one of the numerous waterholes found on most estates, and covered over by a small quantity of quicklime. In this way a large number of spores and diseased leaves might be destroyed at a very trifling cost.

Again Mr. Abbay offered the following counsel :—

In more than one district it has been noticed that a strong wind has apparently had a great effect in carrying the "disease" up or down a valley, most probably by spreading the spores from some badly infected estate over the comparatively healthy ones. If such is really the case, the fact points to the conveyance of the disease, as suggested before, to the tree through the stomates of the leaf and not through the roots. It might be possible under such conditions to moderate the virulence of the pest in some of the more isolated districts if all the proprietors *would combine to gather and burn, at the commencement of the chief annual attack, all the diseased leaves and twigs that at present are allowed to lie on the ground beneath the trees until they decay.* Such a plan would no doubt be expensive ; but it would certainly destroy a vast number of spores, and might sensibly reduce the virulence of the "disease." The sprinkling of quicklime on the ground beneath the trees has, in one instance at least, proved beneficial ; and as it would no doubt destroy all the spores it came in contact with, it is not improbable that the two remedies, if applied simultaneously, might be found in some degree successful. The tree should also be washed with some suitable disinfectant, and the watering of the ground about the trees with the same disinfectant might possibly prove more beneficial than sprinkling with lime. It would be of little or no use for one planter in a district to attempt these remedies if the others did not—the spores produced on a single badly diseased tree being so enormously numerous, that a whole estate of healthy plants might easily be infected by a single unhealthy plant in their neighbourhood.

We earnestly trust that every planter in the country will now do his best to carry out this recommendation, or rather injunction, realizing the benefit which must result to himself as well as to his neighbours "The sweeping and burning of leaves" ought to be a work insisted on by all proprietors and agents of coffee plantations.

PANAMA A FIELD FOR COFFEE PLANTERS.

IN the Consular Report on the trade of Panama (Columbia) the following appears :—"The main resource of the future wealth of this State would appear to be coffee. The high lands of Chiriqui, bordering on Costa Rica, are admirably adapted for coffee planting and have the great advantage over Costa Rican plantations of possessing easy communication with the sea ; coffee from Chiriqui reaching David, from which there is steam communication with Panama in forty-eight hours, by ox wagons, whereas from the coffee lands of Costa Rica to the sea is a journey of from seven to eight days, entailing, of course, a considerable expense for haulage and extra labour, and increased risks of loss and damage. Several immigrants from Costa Rica are now planting in Chiriqui. The trees are as yet young, but the samples of coffee produced are very good, encouraging the planters, and Colombia in general, to look with greater confidence to this new branch of Colombia's produce. The Government give a free grant to every settler of as much land as he can prove he is in a position to cultivate, and declare his plantation free from all taxes whatsoever for the space of ten years. There has been some trouble of late in obtaining legal titles to the soil, but an honest, unspeculative settler need not anticipate any such difficulty. Labour is cheap (about 1s. a day) and as yet is abundant enough for the demand. Women and children are chiefly employed for the picking, and at much cheaper rates. The laws are very favourable for the importation of foreign labour into the Republic. The climate of Chiriqui is pleasant, and in every way a healthy one, enabling Europeans to stand the labour with perfect safety. The best coffee lands lie from 2,500 to 5,000 feet above sea-level, with a temperature varying from 17° to 32° centigrade."

CINCHONA.

THE necessary plant for manufacturing quinine on a large scale, will, we are told, be shortly set up at Mongpo.

CINCHONA cultivation is to be the subject of experiment in Italy, with a view to lower the cost of quinine.

JAMAICA is likely to become a serious rival to this country in the growth of cinchona, especially as regards the quality of the bark. We are told that about £5,000 net was realized for 27,000 lbs shipped to London in 1879-80, and the prices obtained were very much higher than for corresponding descriptions of Ceylon bark.

THE increase of cinchona cultivation in Ceylon within the past few years is very remarkable. In 1869 twenty eight ounces of the article were shipped to London ; in 1879 the total exports were 507,368lbs., and it is estimated that for the present year the shipments will amount to a million pounds.

THE quinine production of the world is estimated at from 230,000 to 260,000lbs per year as follows :—Germany, 56,250lbs. ; Italy, 45,000lbs. ; France, 40,500lbs. ; England, 27,000lbs. ; America, 63,000lbs. ; India, 12,250lbs. Efforts are being made to acclimatise the cinchona in Italy. Its successful culture in India and Ceylon encourages the belief that it will grow wherever the soil is dry, the rainfall large, and the climate temperate.

WE hear that the Government of Netherlands, India, lately deputed to Calcutta Mons. B. Moens, Director of Cinchona Plantations in the Island of Java, a gentleman of high scientific attainments, to make himself acquainted with the system of Cinchona cultivation in Bengal. Instructions were issued by the local Government to Dr. G. King, M.B., Director of the Plantation here, to afford that officer every information in reference to the cultivation of the plant that he may require in this country.

MR. JOHN HOWARD ON THE CULTIVATION OF *CALISAYA*.

(*Concluded from our last.*)

A VERY important reflection is that the cultivation is nevertheless remunerative and capable of easy and of indefinitive extension. The only chance for Indian cultivation in the future consists in the choice of superior sorts, and the efficacy of high cultivation. If those requisites are attended to, considering the greater facilities in India of conveyance to the markets, there is no doubt a great future open to both countries.

It will also be evident that there is practically no limit to the age up to which the *calisaya* may go on yielding serviceable bark. It does not change with age like the *succirubra*. This is owing to the difference in the tannic acid.

In Bolivia, as in Java—attention is paid to the effectual drainage of the roots. Mr. Ledger says,* "I think you should advise all parties forming plantations to plant on slopes or sides of hills. I have never seen the trees growing on flats or the bottoms of gullies. Too much damp at roots is fatal. Almost all the largest and best 'patches' of cinchona are found on red (dark) soil. The bottoms are black soil."

Examinations of a *calisaya* grown by Captain Cox in Wynaad, in the latter conditions, singularly confirmed to me this observation.

Mr. McIvor's experience led him to the same conclusion. He says,† after visiting Ceylon :—"The red and crown barks seem to do best in Ceylon as they do here. But on the whole our cinchona plantations on the Nilgiris give promise of better results than the Ceylon plantations. Ceylon is wanting in the deep rich soils we possess, and cinchona is very liable to canker when the roots get down into the subsoil."

I fear that this must be admitted to have been the cause of 'canker' in my *Calisaya Anglica* also. Perhaps in forming the bed, I did not pay sufficient attention to obviating this evil, and it is certain that one deep root found its way beyond where I could easily trace it.

* In letter, December 19, 1879.
† In letter to myself, March 16, 1876.

In a recently prepared bed I have at length effectually shut out the possibility of such mischief.

The following table * of the average prices obtained for the 100,000 half kilos of bark sent home from Java in 1878, will give a fair idea of the relative value of the different sorts there cultivated :—

Succirubra	1·75	per cent. per half kilo.
Calisaya Javanica ...	... 1·38	" " "
" Josephiana ...	... 1·20	" " "
" Anglica ...	... 1·58	" " "
" Ledgeriana ...	... 6·31	" " "
Cinchona Hasskarliana	... 1·23	" " "
" Officinalis ...	... 2·80	" " "
Cinchona lancifolia ...	... 1·59	" " "
" caloptera ...	... 1·35	" " "
" Pahudiana ...	... 1·10	" " "

By this it will be seen that the *ledgeriana* greatly exceeds all the others, and that it equals or excels the cultivated *calisaya* or Bolivia; but the average of this sort now sent will be much higher if I may judge from that now selling at Amsterdam.

I wish this remark, however, only to apply to the true *ledgeriana*, for which as much as 15*s*. per pound has just been paid at Amsterdam ; but in packages recently bought under this name I find sample at a lower price exactly reproducing the finer *calisayas* of which I have been treating ; but containing not more than half the quinine of the *ledgeriana*.

I have examined the *officinalis* bark from the same sale, and find that it resembles in appearance the "knotty sort of Jussieu" It has no reference whatever to the true *C. officinalis*. I am persuaded that this (the *uritusinga*) has never found its way to Java. In all that I have seen from thence and in the excellent botanical specimens given me, I find the *angustifolia* indeed, but no trace of the *uritusinga*.

The important question of the relative proportion of supply to demand will gradually enforce upon the planters the necessity of cultivating none but the best species. I have long been insisting on this point both as to the cultivation in Java† and in India.

The prospects of the future in Ceylon are almost alarming, at least if we may trust the calculations of Mr. Dobree, Dikoya, Ceylon ; published in the *Ceylon Observer* of June 15th, 1880. He says :—

"I see by your Directory of 1876-78 that you estimate the total consumption of cinchona bark for the world at 12,621,000lbs. In Dikoya and Maskliza districts alone, during 1880, I believe I am under the mark in saying that there will be 6,000,000 cinchonas, exclusive of those planted in previous years.

"Nearly every other district in the island is also planting cinchonas ; and I do not think I am over-estimating the number of cinchonas that will be planted in 1880 throughout the island at 20,000,000 ; allow 5,000,000 for failures, and add 5,000,000 for plants, in previous years and now alive, and it will give you 20,000,000 cinchona trees, which in five years will yield either by taking strips, or mossing, or by the shaving process, about 10,000,000 lbs. of dry bark a year.

'Again referring to your Directory, I see you estimate the production of cinchona bark for the world at 13,471,000, of which Ceylon is put down for 150,000 ; but when it produces 10,000,000, as I believe it will, in 1885 the total production of the world will exceed the demand of 1876-78 by 10,847,000lbs."

It is proverbially uncertain to count one's chickens before they are hatched, and, considering the enormous mortality overtaking the plant (occasionally, if I mistake not, amounting to 90 per cent). I think the above calculation far too sanguine ; but, supposing it is correct (for argument's sake to the extent of one-half the estimate, I think I foresee one result. I do not choose to predict—as I never like to do this unless I am sure that my predictions will come to pass—but I think I may fairly anticipate crowded sales-room in this market in 1885, at which the representatives of various quinine manufacturers are attending, with the portentous word "rubbish" as a pencil note attached to certain vast consignments of Ceylon bark.

For proof of the probability of this anticipation, I refer to the account I have given of the whole of last year's importations in the *Gardener's Chronicle*. No doubt much good and profitable bark will also be imported (as is now the case) from Ceylon, and probably this will keep up its price, or nearly so. Dr. Trimen informs me that he has two new plantations of *ledgeriana* under his care, which are looking very well at present. Abundant information will be found in the *Ceylon Observer*‡ as to the successful efforts of private planters, on which I must not enlarge ; but remark by the way, that renewed *officinalis* bark from prospect estate on the Nilgiris, lately sold as high as 12*s*. 6*d*. per lb. This was from the true *officinalis* defined and published as such by Sir Jos. Hooker, and well described since in Bently and Trimen's Medicinal Plants.' It is the *Uritusinga* of the 'Nueva Quinologia' of Pavon and this name was retained by McIvor, from whom (before his lamented death) I received excellent specimens grown under his care. It is at the present time flourishing with me, and deserves no doubt the description given by a planter§ as being 'the largest leaved variety of the true *officinalis*.'‖ I have leaves up to 9 inches by 6. I observe with pleasure that this writer (W. E. L., of Leangapilla, Ranjala,) says, 'I think it by far the most profitable kind to grown in Ceylon.' No doubt both this and bark properly renewed from *C. succirubra* will always command a good price in the market, as being rich in produce of alkaloid suited to the quinine manufacturer.

On the whole I think it is evident that the true *calisaya* will assert its supremacy as the prince, or, as I should call it, the queen of all the cinchonas. Such indeed is the import of its name as 'the best of all barks' for the production of quinine. It is also quite clear that we are as correct in ascribing to Mr. Ledger the introduction of the unrivalled *ledgeriana* as we are in speaking of Columbus as the discoverer of America. Mr. L. has the merit of employing the accurate discernment of his faithful Indian servant for collecting the very best seed ; and in this he has shown the importance of knowing how to employ and to trust good subordinates—a secret of success in other enterprizes than that of the cultivation of cinchona. It is not by evolving theories out of our inner consciousness, but by patient observation of facts, and following out deductions from these to their legitimate results, that the cultivation of *calisaya* can be advanced. In this way Mr. Moens has the credit of introducing several improvements, which it would prolong this paper to too great a length to describe. I would simply mention the raising of the seed in porous earthenware pans, the subsequent care requisite to be extended over the young plants, the grafting of the *ledgeriana* on stocks of *succirubra*, and the mode of harvesting the bark by scraping. On this latter point I will remark that it is not in the *calisaya* that we find the striking preponderance of quinine in the outer bark, which I believe I was the first to demonstrate in the face of many authorities to the contrary. In the scrapings of the *calisaya*, so far as appears at present, there is not a greater abundance of alkaloid than in the bulk of the bark. The reason for this is in the difference of microscopical structure between one variety of cinchona and another. I have shown how remarkably this is changed in the renewal of bark of *succirubra*. The "lax cellular tissue" thus formed is full of alkaloid throughout its whole extent. The whole nature of the bark is thus changed.

* *Ceylon Observer*, June 15, 1880.

† *Pharmaceutical Journal.*

‡ June 15, 1880.

§ I have the hybrids called *pubescens*, alluded to by this writer, growing near, with longer and larger pubescent leaves, but I doubt all hybrids as to permanent good qualities.

‖ *Ceylon Observer*, June 19th, 1880.

SERICULTURE.

THE Government of Madras has issued a memorandum, through the Revenue Department, to Collectors especially, that as there is an extensive and increasing demand for Tusser silk in Europe, chiefly in France, speculations in this article are likely to prove very remunerative to persons embarking in the enterprise.

THE quantity of raw silk shipped from India in the year ending April 1, 1880, was 563,210 lbs., valued at £458, 505 ; of chussum or waste silk, 788,481 lbs., value £53,017 ; of cocoons, 49,815 lbs., value £4,604 ; thread for sewing, &c., 162lbs., value £132. Silk piece-goods 2,203,971 yards, value £217,893 ; silk fabrics mixed with other materials, 130,133 yards, value £10,474. The import in trade is considerable. In the year, 200,502lbs. of raw silk, valued at £683,235, were received ; 466 lbs. of silk-thread for sewing, value £1,337 ; 7,467,815 yards of silk fabrics, value £765,583 ; 1,035,643, yards of goods, of silk mixed with other materials, value £70,393, and other sorts of silk, value £576, making a total value of silk manufactures imported £837,890.

TOBACCO.

TOBACCO culture in Italy is coming into notice, and vigorous efforts are being made to increase the growth of the plant.

TOBACCO yielded a full crop in Rungpore, last year (1879-80) where it is a very important staple ; but in Julpigoree the out-turn was somewhat below the average.

THE *Morning Advertiser* suggests that the real cause of the troubles of Ireland lies in the fact that the growth of tobacco is absolutely prohibited under heavy penalties. Before this prohibition Ireland ranked among the regions producing the finer qualities of the leaf.

THAT all cigars are not exclusively made of tobacco is a fact more or less known to all. But we were scarcely prepared to learn on the authority of an American paper, that the tricks of the trade are so openly practised that an inventor has had the audacity to take out a patent for flavouring cigars with a compound consisting of rum, alcohol, oil of apple, tonka bean, valerian root, and laudanum.

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

R. KNIGHT,
Proprietor.

Calcutta, 1st Feb. 1876.

CONTENTS :

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah. *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

CORRESPONDENCE.

REPLIES TO CORRESPONDENTS.

TASAR SILKWORMS' EGGS.—If X.Y.Z. (whose letter appeared in our last issue) will ask Major Cousmaker, Poona, for some Tasar silkworm's eggs, between 15th June and 15th October, that gentleman will be happy to supply the same.

WEEDS ON COFFEE AND TEA ESTATES.

TO THE EDITOR.

SIR,—For the benefit of some, would a brother planter be good enough to give us his opinion regarding the advantages or disadvantages of allowing weeds to grow on coffee and tea estates. It is the opinion of some that weeds allowed to grow on an estate in reality do not take so much from the soil as they return to enrich it when cut down. As far as I have observed, the chief aim of planters here has been to keep gardens as free of weeds as possible. It is therefore a question if this constant weeding does not mean loss of vegetable soil, and destruction of a garden in course of years. Allowing that plants are heavily manured on some estates, I can hardly bring myself to believe this system can replace the damage done by so much of the upper soil being scraped, by, as I have said, constant weeding. But as it is, information I seek, I feel myself out of place giving an opinion, and I hope to benefit by hints on this subject from men of practical experience, which I trust may appear in the pages of your valuable journal.

Neilgherries. NOVICE.

NOTE.—The soil is not damaged by weeding, but the reverse ; it is improved by the frequent "scrapings" it gets in removing weeds. They should, if possible, not be allowed to seed, and should not be left on the surface, but hoed in, when they become green manure.—*ED., I. A.*

LOCAL INDUSTRIES : CEMENT.

TO THE EDITOR.

SIR,—The Calcutta *Fortnightly Review* of 10th February spoke of the advantage to be derived from developing the resources of the country. Amongst other articles, it mentioned the quantity of cement imported, although this country was able to produce the article equal in manufacture to that imported.

The State ought to do more than simply wish such industries success. Where it is in its power, the State should surely encourage such an enterprise, by using the cement manufactured locally for all public works.

I lately heard of an order from the mofussil on Calcutta for a large quantity of the cement manufactured in that city, provided the rate was reasonable ; but owing to the price being equivalent to that charged for the imported article, the order was cancelled, and the imported article obtained. This order was on behalf of the State.

FRIEND OF INDIA.

ABOUT PAPER FIBRES.

TO THE EDITOR.

SIR,—The remarks I made in my last letter "that as a rule paper-makers know but little about botany, and botanists, *per contra*, little about the requirements of paper-makers" may be considered a somewhat bold and broad assertion, and perhaps require some little qualification.

So far as India is concerned, it may be taken for granted that, very few English paper-makers having visited that country, tropical vegetation with its exuberant and prolific growth must be almost unknown to them, except so much perhaps as they may learn from botanical books ; some small sample parcels of a so-called new fibre occasionally are shewn to them by brokers or dealers, who as a rule know but little or nothing of the plant from which such fibre is produced, cannot tell them where it comes from (or will not), whether it can be supplied in continuous and reliable quantities, and other details essential for a consumer to know.

Now from the nature of his trade the paper-maker possesses or should possess what is phrenologically termed the "bump of caution." He is generally pretty well able to judge by inspection whether the *fibre* shown him will or will not make a fair quality of paper, but before he will purchase, or indeed make an offer, he desires to experiment; and experiments (if carried out practically) involve much cost and trouble. Naturally, therefore, he wants to know the price not merely for a few cwts or tons, but whether he can (should the price asked induce him to test it) fairly count on a reliable and continuous supply; and unless such an assurance can be given, he declines troubling himself further.

With regard to the botanist, *he* seems to consider "all's fish that comes to the net", judging from the list of fibres and fibrous plants enumerated in Mr. Liotard's memorandum,—some of them utterly unsuited for English paper-making requirements, either on the score of quality or cost; many on the other hand suitable, provided they are available in quantities and at a reasonable cost. Unfortunately however, with one or two exceptions, no attempt in Mr. Liotard's publication has been made to indicate the cost at which these fibres can be procured in India itself, or at any port of shipment, nor are any details given as to their treatment or preparation—I do not mean the chemical treatment to convert them into "stock," but the ordinary rough crude treatment to produce or reduce the real fibrous portion of the plants named to a commercially marketable condition.

One of the reporters in Mr. Liotard's memorandum rather, to my mind, begs the question, by "putting the cart before the horse" when, in referring to the "Agave", he remarks:—"Neither the ordinary cultivator nor the middleman can be expected to produce (the fibre) until a demand arises". In my simplicity I thought that demand for paper material was notorious; be that as it may, surely the writer of these remarks can hardly expect the paper-maker to offer to buy an article before it is produced, or before he knows its quality and cost, or whether he can be assured of supply.

Another writer in Mr. Liotard's memorandum remarks.—"In attempting to introduce a new material for paper, certain difficulties may be expected"; "no matter how well suited it may be for the purpose, prejudice will not be wanting"; "there will also be difficulty in inducing any one to be the first to bring it in, and still more in getting any one to be the first to use it."

These truisms I fully endorse from experience; there are *always* difficulties in introducing *anything new*, whether for paper or anything else. Prejudice, however, on the part of the paper-maker may be defined by a strong disinclination to commit himself until or before he is assured the fibre will suit him. He has two vital points to consider:—first, whether it will pay him to use it—that is, whether it will favorably compare with the existing material which he can readily procure—and then, whether it will make a suitable quality of paper. It may be well to direct attention to the fact that not only will every different fibre vary in the cost of treatment, both chemical as well as mechanical, but will make a difference in the quality of the paper produced. And it must be borne in mind that the paper-maker has to compete in the market, and suit his customer, the printer, or other consumer, as regards quality—no easy task in these days of keen competition.

The technical details in the manufacture of paper are somewhat—indeed, I may say very—complicated, especially in the choice and treatment of raw material. It is said that to make a good bowl of punch, the essentials are "some of sour, some of sweet, some of strong, and some of weak." So it is with paper-making: it being difficult to name any one raw material combining all these qualifications, the skill of the paper-maker and the quality of the paper produced mainly depend on a judicious mixture or blending of the raw staple.

My endeavour has been, and is, to point out the practical issues to which attention should be directed in the choice and attempted introduction of any new fibre or fibrous product proposed, so as to narrow the chances of failure to intending experimenters who might otherwise be misled by the very voluminous list of fibrous plants enumerated in Mr. Liotard's publication.

Broadly speaking, I am induced to believe that commercial success will most readily be attained by confining attention to plants of rapid growth, *viz.*, such as are produced annually from seed, or perennially, so to speak, from cuttings. Trees, that is forest trees, are too slowly produced to admit of their bark or bast being reliably and regularly procured in large quantities, more especially seeing the restrictions introduced of late in Indian Forest Conservancy. Although therefore, many of these barks which have come under my notice furnish good paper material, it appears to me the collection would be somewhat precarious and costly.

If some practical botanist or forester would give a list in your columns of some of the quick-growing trees, those especially of a shrubby habit, which might be grown as coppice, others which pollarded would furnish annual shoots, or which might be cultivated as the Japanese and, Chinese do the *Broussonetia papyrifera* and, I believe, the Nepaulese the *Daphne* tribe—he would do good service both to India and the English paper-maker.

I need not recapitulate the long list of bark or bast-producing trees enumerated in Mr. Liotard's work, or those mentioned in Dr. Brandis's "Indian Forest Flora," and Dr. Royles' "Fibrous Plants of India," Dr. Balfour's works, and others—but I doubt not many might be so cultivated with profitable results.

My great predilection is for the bamboo (which however is not a bark, the whole of the plant stem, or tree, having proved available). It will make a very superior quality of paper, and is moreover most simply and economically treated and converted into "stock." Then there is the fact that a large annual crop is available by season cuttings, that it requires little or no cultivation, no attention, only judicious cropping; is of perennial growth, the present stool lasting many years; exists in enormous abundance in native forest or jungle, and so on. Under such favorable conditions the "stock" from bamboo can be produced and laid down in the English market cheaper, and certainly more abundantly, than that from *any other* raw fibrous plant which as yet has come under my notice.

One and only one objection to the introduction of bamboo exists—that being, that from its bulk and lightness, it cannot be exported from India as a purely raw product so as *to pay*. It must be converted into "stock" where grown, or near thereto. But as I believe that this objection applies more or less to *every other* raw fibrous product—one and all of which must for the same reason undergo some preliminary treatment—and the fact having been proved that bamboo is a *first* class material, I am satisfied its introduction is merely a question of time.

THOMAS ROUTLEDGE.

Claxheugh, January 1881.

HOT ICE AND ARTIFICIAL INDIGO.

TO THE EDITOR.

SIR,—*Heat* and *cold*, we are taught, are merely relative terms, and that *heat* is simply the absence of a certain degree of *cold*, facts which give great solace and contentment if remembered during the hot weather, when tormented with prickly-heat. But what of *hot ice*? An old Indian to whom I mentioned the fact of hot ice having been produced, turned pale, and replied "don't talk——rubbish to me!" The fact, however, remains that Dr. Carnelly in England has actually heated ice, until it indicated by a thermometer a temperature of 356° Fah. or 144° above the boiling point of water?

The apparatus employed by Dr. Carnelly to produce this phenomenon was recently exhibited at a meeting of the Chemical Society of London, and I take the following description from the proceedings of the Society. "The apparatus consisted of a wide glass tube ¾ inch in diameter, and about 5 to 6 feet high. This is placed in a vertical position, and is connected at its upper end with a strong glass flask placed horizontally and surrounded with a freezing mixture. The apparatus having been inverted and filled with mercury, the lower end of the tube is closed with the thumb and placed under the surface of a layer of mercury about 10 inches deep. On withdrawing the thumb the mercury sinks in the tube to the barometric height, and a large Torricellian vacuum is obtained, which is surrounded as far as the flask is concerned, with a freezing mixture. A small quantity of boiling water is now introduced, which rises to the top of the mercurial column and surrounds the bulb of a thermometer suspended inside the tube. The water is frozen, and the depth of the layer of mercury in which the tube stands is reduced to about 3 inches; in consequence the mercury in the tube sinks and leaves a detached column of ice with the thermometer bulb in its centre. This column acts as a cock, shutting off the large vacuous space above from the small vacuum below. By carefully heating the tube the ice is melted round the circumference of the plug, and a fine angular opening is made between the ice and the inside of the glass tube. This restores the communication between the upper and lower portion of the vacuum. As soon as this is effected, any aqueous vapour which is formed is at once condensed by the freezing mixture, and the vacuum is kept intact. Under these circumstances the author has made ice so hot that the thermometer in the centre of the cylinder stood at 180° before the ice melted."

From hot ice to artificial indigo is but a step; and the accompanying remarks by a Mr. E. B. Broomhall, in the *Home and Colonial Mail*, ought to cheer the spirits of indigo planters, especially after the rumours that the indigo plant is rapidly being superseded by the produce of the chemist's laboratory. It is true that recently a German chemist has patented a method for the production of artificial indigo, in which he makes nine claims; the first four of which apply to the artificial formation of indigo, blue and allied colouring matter, the remainder to the production of materials capable of being used in the preparation of the

same. It would be impossible to go into a full chemical history of the process here; suffice it to say that it is a long and tedious one, and that each successive substance obtained is very small in quantity, so that when indigo is reached the quantity obtained is almost infinitesimal as compared with the original base. The formula is a new one, but the manufacture of artificial indigo is old.

"The supersession of madder by the success of artificial alizarin must not for a moment be taken as a proof of the probable success of Professor Baeyer's discovery. Fine commercial indigo contains 85 per cent, and perhaps even more of pure indigo, while the amount of alizarin—the active colouring principle—in madder does not exceed one per cent In addition, the processes by which cloth was dyed with madder were costly and difficult, whereas the use of indigo meets with no such drawback, dyeing with indigo being perhaps, of all dyeing operations the most simple."

"From the above it will be seen that whereas in the case of madder there was scope for the artificial production of alizarin, it is very vastly different with indigo. At present it costs twice as much two produce this dye stuff artificially as compared with to-day's market quotations, and there is no doubt that, given average harvests in India, the planters would make a profit at half the present price, and were more scientific attention given to the manufacture of the plant into indigo, I have no hesitation in saying that the article could be produced at still even a greater reduction. Although it would be presumption on my part to say that the artificial production of indigo will never be a success, still it is now only in the laboratory stage, and it will probably be long before it can compete successfully with the natural dye, if ever."

"The many blues, blacks, &c., derived from aniline cannot be used for the fundamental work of indigo; it may be generally known that all our best blacks, blues, greens, and many other coloured cloths, have first to be dyed with indigo and then finished with the colour desired. The indigo gives a depth of tone and weather-resisting property to the material treated, which would not otherwise possess. Instead of being rapidly 'superseded,' the production and consumption of indigo yearly increases, and the new colours affect it only in a subsidiary degree, inasmuch as they give the public a greater range of choice of shades, whereas had it not been for the coal-tar dyes they would have been confined to a selection of the good old fashioned tints, which would bear rain, fog or sunlight, without any deterioration so unlike the many beautiful colours now in vogue, which do not look to particular advantage after a slight shower, leaving alone the fact that many of their colours are actually poisonous to the wearer."

SHADE FOR CACAO.

I.

(To the Editor of the Ceylon Observer.)

DEAR SIR,—Any information regarding the cultivation of cacoa is of interest at the present time, and this I trust may excuse me troubling you with a few notes on my experience of the culture of *Theobroma*, (food for the gods) in the plantations of the West Indies. Your late supplement was most interesting, containing the report of Mr. Preston, the Government Botanist of Trinidad, on his valuable services, in providing for Ceylon seeds and plants of the best strains of cacao, and its shade plant, *Erythrina umbrosa* or the *Bois Immortelle* of the French. This tree no doubt forms a most excellent shade, but was not in such general use in Grenada (where my experience was principally gained) as in Trinidad. The *Bois Immortelle* was more used in the former island, as a boundary tree, between estates, and its specific name, I take it, arose from its almost indestructible nature and tenacity of life, and not from the facility of its propagation by the smallest cuttings, as mentioned by Mr. Prestoe. It was looked upon by us as a sort of everlasting tree, and hence invariably used as a land mark. We have an excellent shade *Immortelle* in Ceylon, a close ally to the W. I. *Erythrina*, and of the same family; it is the *Butea frondosa*, the *Eramuda* of the Singhalese, a tree of middle size, with large trifoliate fleshy deciduous leaves, and bright red racimes of pea-shaped flowers, It is one of the most common fence sticks, used by the natives, and strange to say, it and its sister tree (*Butea superba*) are here used as *boundary* trees, in the same manner as their congeners *Erythrina* are in the West.

Now as regards *shade* for cacao, or say tea or coffee, I believe many erroneous ideas have existed. I can at least vouch for it that my own theories—before experience was gained—were of a very crude nature. It is frequently overlooked that the *roots* of plants are the members most in want of shade, and that to accomplish this is the principal object for temporary shade over the young plants. Leave out of view precautionary measures for protection against wind, and I say that in very few cases will any permanent shade be required after the plants have formed mutual shade for one another, or as the phrase is *have bowered*. In the cultivation of cacao in Grenada, this fact was recognised in all sheltered situations, and the plantain tree, as a rule, formed the only temporary shade. As to the importance of shading the roots of young plants, I would be inclined to go further, and question how far it is judicious to weed so scrupulously clean between the rows as is generally the custom. Many will have observed for instance in the case of young tea plantations, how luxuriant and healthy the plants often look when half smothered with *Ageratum*, as compared with their neighbours which have been thoroughly weeded, and whose roots have been more or less exposed to the scorching sun. Where it practicable, I believe the best of all shade would be a good sound litter of ferns, grass, or brushwood, but of course the danger of fire prohibits such a system. To return to our Ceylon *Immortelle* (*Butea frondosa*) I think it would make an excellent shade tree, quite equal to *Erythrina*. One great advantage the *Immortelles* have over many other trees, is that they are poor feeders, with a spongy good-for-nothing wood which requires little sustenance from the soil. Fruit trees in Grenada were frequently planted along with cacao, such as alligator pear, nutmeg, pimento, breadfruit cloves, and all the orange tribe. These were, however, intended more as a shelter from the wind, than as shade trees,—a free exposure to the sun not being looked on as prejudicial to cacao, where an average rainfall could be relied on.

A query appeared sometime ago in the papers, as to whether it would be advisable to plant cacao trees on their permanent site. I never knew any other plan adopted in the West Indies; planting out from bamboos, pots, or baskets being almost entirely unknown, I believe planting out seeds at once would be very advantageous in Ceylon, provided a proper system of shade was adopted. Mr. Fraser seems to have had great success with his Trinidad seeds of *Erythrina*, and it would be interesting were he to try, by way of contrast, our Ceylon *Immortelles*. I would also strongly recommend the plantain as a shade tree; it answers admirably in throwing a temporary shade, and once it dies down, a large mass of fleshy decayed vegetable matter is left at its roots, which forms valuable sustenance for the cacao. The plan adopted was to dig oval or oblong holes, placing a plantain shoot at one end, while at the other a couple of seeds of cacao were dropped. The fruit yielded by the plantain was supposed to pay all expenses until a return was got from the cacao. Our native *Immortelle* is extremely easily propagated, and a good sized branch stuck in the ground, will become a tree, in a marvellously short space of time.

A. WHYTE.

Kandy, 20th Dec. 1880.

II.

DEAR SIR,—I write to prevent, if possible, trouble to planters in trying to secure the plants named by Mr. A. Whyte in his letter in your Saturday's issue, as shade trees for cacao in Ceylon, and to give some facts respecting the plants named by him, which I trust may be found useful:—

1. *Erythrina umbrosa* is a native of South America between La Guayra and Caraccas, where it is called *Bucare*, and where it is planted in rows to shade the plantations of Theobroma cacao. It is also used in Trinidad for the same purpose.—*Don*. Its specific name indicates that it is a shady tree and may be useful as such. This tree may be called *Bois Immortelle*, but the tree bearing this name in Barbados, is the *Erythrina corallodendron*.

2. *Butea frondosa*, the Gaskela of the Singhalese, is a remarkable historical tree, from the fact that the battle field of Plassey, near Calcutta was so called from Palasa, the Bengali, or Palas, the Sanscrit name of the tree, which grew in this plain. The tree is so rare however, in Ceylon, that I think it is most likely Mr. Whyte has never seen one, unless he has done so in the Royal Gardens at Peradeniya.

The paragraph in question indicates that he has mixed up our own two *Erythrinas* with the *Butea*, the *Erabadu*, and *Yak-Erabadu* of the Singhalese, the *E. Indica*, and the E. *ovalifolia*, which grow readily from cuttings, and are used as described by Mr. Whyte, but these trees are remarkable for shedding all their leaves, and for flowering just before the development of their leaves. Why they should be called *Immortelles* I do not know, as a tree which is often and for considerable periods of time devoid of leaves and flowers, can scarcely be called *everlasting*. The *E. umbrosa* may prove a valuable shade tree, but I can scarcely recommend our two native *Erythrinas* for this purpose. Moon in his catalogue, 1824, gave the *Butea superba*, as a native of Ceylon. This plant is said to differ from *B. frondosa* mainly by its scandent habit. It is not given in Mr. Morris's list even as growing in the Royal Gardens, and I may assure Mr. Whyte that Dr. Trimen will be very grateful for any specimens of this supposed common plant which he can send him. It is not given by Dr. Thwaites, nor is it given in the Flora of British India as a Ceylon plant.

I may conclude this note by quoting a Singhalese proverb or fable like that of the fox and the grapes:—"As the jackal praised the beauty of its flowers (*Butea frondosa*) to induce them to fall down." Flattering when a favour is wanted.

W. F.

CINCHONA NURSERIES: PRACTICAL HINTS

(To the Editor of the Ceylon Observer.)

DEAR SIR,—In recent issues of your paper, a number of inquiries appear, in reference to the rearing of cinchona plants.

When one considers the millions of seedlings reared and the small, very small, proportion of plants returned; perhaps a few practical hints may not be altogether unacceptable to the many who are now interested in cinchona.

Planters have often expressed their surprise to me at the enormous percentage of deaths which occur in cinchona supplied among coffee, or put out into clearings, and conclude therefrom that cinchona is delicate, and a successful clearing depends upon most favourable planting weather.

That plants die by thousands, I admit, but that cinchona is delicate, I deny. The reason of most of the deaths is, in my opinion, attributable to badly reared plants in nurseries. I have seen nurseries where the plants were estimated by millions. The seed had been sown and allowed to grow as thick as possible the shade gradually removed, and the tops only hardened, but where were the roots of these so-called plants? In a square foot where the plants could be counted by hundreds how was it possible for roots to form, or the stem near the ground to harden?

There is no wonder that such plants as these die but a very great wonder if they live. My cinchona nursery has returned seventy-five per cent of very fine plants with branches of roots from seedlings pricked out; and I feel assured if the same process is adopted, equal success will attend other efforts.

The first thing in beginning a cinchona nursery is choice of ground. Great care should be taken that the soil, is not of a fatty or clayey nature. The freer the soil the better. The nurseries I have seen on Patna land where the earth was black and fatty, have been *complete failure.*

It is not necessary to dig the ground up the same as a coffee nursery. Beds should be rounded at the top a little, to admit of nice drainage; sticks and all rubbish removed to the depth of five or six inches, then good free jungle mould brought thoroughly cleaned and *fired* before putting on the bed as a final dressing.

The firing process is recommended by Mr. McIvor, but is not usually adopted, and does not accomplish all he says it will. All insect life, eggs, worms, and caterpillars of all kinds are destroyed; but seeds of some varieties of weeds retain their vital energies, although the earth is heated to scalding point. I need not enlarge upon the necessity of having all vermin removed. The advantages must be patent to any one.

The best way to fire the earth is to get an ordinary sheet of corrugated iron, which is used for roofing, raise it far enough from the ground to admit of a good fire being made under it, then put on a half-dozen baskets full of the jungle earth above described, stir it well up till it is scalding hot, and empty on a heap, and keep for a day, to allow of it gradually cooling, when it may be used. This earth need not be put on deeper than three inches.

The next thing is to erect roofs over the beds. They must be put up in such a manner as to admit all the light of heaven, and at the same time exclude the rays of the sun. If the roofs are of such a form as to exclude light, and allow a semi-darkness to prevail in the centres, the seedlings will scarcely sprout at all, and what may come up will be spindly, delicate, and so very sensitive to the rays of the sun, that when pricked out under ferns they will be scorched off by scores.

The advantages therefore of having all the light possible on the seed beds are obvious. The seeds sprout ten times better, and as they grow, gradually harden, so that when pricked out under ferns, they are able to withstand the sun's rays. I have seen a dozen different kinds of seed beds roofs, and the one I have chosen as the best, gives all the advantages to the seedlings, above described, with none of the evils.

First of all, the seed beds should be made parallel with the course of the sun, that is, one *end* of the bed should face the east, and the other should face the west, and should not be more than four feet wide. The roofs should be erected over the beds facing the north. The top of the roof should not be less than five feet high, and the back about eighteen inches from the ground. The roofs should be erected behind each other. Care should be taken not to build the roofs facing the south, for then the sun would play upon the seed when sprouting, and kill it.—Yours,

CINCHONA.

Calcutta, February 1, 1881.

SORGHO CULTIVATION.

(To the Editor of the Madras Mail.)

SIR,—In reply to "L.," I regret that I have no personal knowledge of Mr. Stewart's new process of manufacturing sugar from sorgho; the methods however are, it is stated, described in Commercial Blue-book No. 1 of 1879, called "Report by Mr. Drummond on sugar production in the United States." A book-seller will procure this if it be ordered. The ordinary sorgho if procured fresh from the Government Farm at Madras, is probably the best obtainable in this presidency; the Otaheitan variety of imphee is as good as sorgho, but is probably not procurable. "L. will find directions for growing "sorgho" in the *Mysore Gazette* of the 20th July 1872, which also mentions the uses of the plant Mr. Robertson of the Madras Farm, considered the result of the Bangalore experiments to be very encouraging, the plant seeming suited to the Mysore climate. In considering the results of previous experience in sugar-making, which have not been altogether satisfactory, it should be especially borne in mind that the experience was all long prior to 1879, and that Mr. Stewart's discovery of a new process, whereby the manufacture of sorgho sugar is said to be made certain and simple, will, if correct, render previous negative experience of no value as a guide for future experiments. There is an account of sorgho taken from Powell's "Punjab Products" in Drury's "Useful Plants of India." It is planted in drills 3 or 4 feet apart; the stocks grow about 2 feet apart. It makes a fourth to a fifth of its bulk in good syrup (query, "juice'). On the first trial 70 average canes, passed once through the rollers, gave 38 gallons 1 quart of juice, and a second time 2 gallons of juice, the 40 gallons so obtained yielding 8 gallons of syrup. An acre of land planted in rows 4 feet apart, and with stocks 2 feet apart should give about 5,400 canes, the yield of syrup would be above 600 gallons. This, at 6lb. of sugar per gallon, would be 4,800lbs. over 2 tons per acre.

N.

The Indian Agriculturist.

CALCUTTA, MARCH 1, 1881.

MR. SCHROTTKY'S REMEDY FOR COFFEE LEAF DISEASE.

THE alleged discovery by Mr. Schrottky of a remedy for the leaf-disease which has produced such baneful results in Ceylon, seems to be absorbing a deal of attention in that island. The Colombo journals are full of it; meetings are held, and discussions inaugurated, all tending to a consideration of this great discovery. So far as we can learn from these journals, the consensus of opinion is with Mr. Schrottky; but a careful examination of the whole literature of the subject fails to convert us, or to change the opinions we expressed on a previous occasion (Vol. IV. page 399.) We are willing to accord Mr. Schrottky credit for having discovered a palliation for the disease, as there does not seem any reasonable doubt that his remedy has a beneficial effect. This effect, however, is not permanent, and to quote the discoverer's own words, the effects do not last over a few days:—"And now as to the "time the beneficial effect of either treatment lasts. Speaking "chiefly of the vaporisation, its effect may absolutely be depended "upon for ten days to a fortnight." It is not then a cure at all. A specific for any disease, which only wards it off for a few days, is not likely to achieve much success. We have watched these experiments with much interest, because, having taken up a certain position at the close of 1879, we should have been compelled to abandon it, had these experiments proved entirely successful. That they have done so to a certain extent, is no doubt very much to Mr. Schrottky's credit, and we trust he will continue his investigation, until he masters the difficulty thoroughly. He belongs to a race who develope strong perseverance in the pursuit of an object, and we are sure Mr. Schrottky will not be found wanting as a patient investigator. The position we have already taken up is, that this disease is not a leaf-disease at all, and consequently no topical treatment will meet the difficulty. It is in our opinion a radical disease, and as such, requires constitutional treatment for its cure. Had Mr. Schrottky's remedy been a complete one, we should naturally have been compelled to abandon our opinion; but the whole gist of Mr. Schrottky's lecture would seem to indicate that he is at one with us, as he nowhere speaks of a permanent cure having been effected. The most he promises the Ceylon planters is that the evil effects of the disease may be minimised,—perhaps entirely annihilated—by three applications of his remedy, at two seasons of the year. As one course of treatment is estimated to cost Rs. 8 to Rs. 12 per acre, the remedy

will entail an annual outlay of, say, Rs. 21 per acre. This is not out of the way to secure success, and we are sure that no planter would grudge the amount. We do not profess to be deeply versed in chemistry, but we fear Mr. Schrottky is incorrectly reported when he is made to say:—" The chief point in evaporation " was to produce vapour of carbonic acid, which continued in " the atmospheric air for a period of, say, six to eight days." This seems to us to require explanation. It is surely not intended to convey the opinion that if vapour is thrown into a plant, it will hang about it, and exert its curative influence for a week.

We do not so much object to the cure as to its mode of application. If it is desired to have the "medicine" absorbed by the plant, why innoculate the stem, or vaporise the bush? Nature has provided a medium for purposes of absorption, and it would surely be the most natural process to place the remedy within reach of that ordained medium, the roots. Even were this done, we very much fear that but small success would follow. We must cease to treat it as a leaf-disease, and give the plant instead, constitutional treatment. It is no answer to this to say that the disease only appears on the leaves. Skin eruptions of the human body only appear on the skin, but no medical man would treat them as if they were merely skin diseases. He may apply topical remedial means to relieve the suffering, but if he desires to get rid of the complaint thoroughly, he seeks the root of the disease, and most probably finds it in a diseased or debilitated condition of the blood. Such, we apprehend, is the case with this disease under notice. For years we have grown coffee on the same fields, never varying or changing anything, but year after year expecting a crop; and when at length we found Nature rebelling, we took to pruning, to compel the plants to make an effort. This they did, but at the expense of their general health. If we grow the same grain year after year on the same spot, we find a deterioration takes place; but as the coffee plant is a perennial, we cannot, without heavy expense, change the locality of our soil. Under these circumstances we ought to come to the rescue by giving the plant generous treatment. This we only do to a very limited extent; and it is absurd to expect the plant to retain its healthy habit under such treatment. The same treatment, only in a more exaggerated form, is given to the tea plant, and consequently it too has rebelled at even an earlier stage of the industry. The tea plant is subjected to treatment which is entirely opposed to its habits, and therefore it is not to be expected that its normal condition should be one of health. It is prevented from maturing its seed, in order to carry out the grand reason for its existence. The plant is every year cut down and compelled to grow as a bush, whereas it has the habit of a tree—but the China variety, having the habit of a bush, is not subject to these diseases as a rule—and week after week, as the plants put forth their recuperative powers, the young and vigorous shoots with their tender leaves are systematically stripped, to meet the requirements of the planter. The two diseases, of the coffee and tea plant respectively, may be the result of different fungoid growths, but the primary and predisposing cause in either case is we believe the same, *viz.*, poverty. In reply to this it has been stated that the young seedlings in Fiji showed symtoms of the disease, although they were growing in absolutely virgin soil. This, however, is only a further proof that the disease is constitutional; for it must be remembered that the seedlings referred to were raised from seed from Ceylon or Southern India, and consequently were diseased.

Although we have never dogmatised on the subject of leaf disease, but have put forward our views subject to correction, we have never yet met an argument which has led us to change our opinion. While others have advanced their several hypotheses, we have advanced ours, and we have not failed to give reasons for our opinions. Let more attention be given to our cultivation, that we may to some extent compensate the plant for the abnormal treatment to which we subject it. Let us remember that we are deliberately thwarting the natural instincts of the plants by our modes of treatment,—modes albeit rendered imperative by the demands of the industry. The tea and coffee industries are of course carried on with a view to profit, and if with this aim in view we have to thwart the natural growth of the plants, we should not fail to help the recuperative powers of those plants which are so remunerative to us. While we hold the opinion that the plant wants, and deserves, more generous treatment, it does not follow that the soil is exhausted. That this is not so, is proved by the fact that on any given patch of land where this blight does not appear for a time, a fairly remunerative crop is obtained. Were the land generally exhausted, coffee would cease to give returns at all commensurate with the outlay or capital invested, and the industry would speedily be abandoned.

There is a singularly close analogy between plant and animal life; and as we find in the latter, that a certain variety of food is essential to a healthy existence, so we find with the former, that if one element in plant-food be absent from the soil, the plant may grow; but will never fully achieve the objects of its existence—in short, will never become a really healthy plant. Now the coffee plant has a very large proportion of lime in its composition, and as it is cultivated year by year, necessarily on the same soil, it is not unreasonable to suppose that, in process of time, the true proportion of lime required for the due nourishment of the plant becomes deficient. The plant thus gradually acquires a debilitated habit, and becomes a prey to diseases of various kinds. Our theory is, that if the plant were vigorous and healthy, it would not only be able to throw off these parasitical attacks, but would be able to prevent them altogether. A corroboration of this theory occurs quite accidentally, and is thus described in a Colombo contemporary:—

We have learned to-day a rather important practical corroboration of the value of carbolic (carbonic?) acid as a remedy for leaf-disease. A few years ago, Mr. Wm. Smith of Matakella, Dimbula, obtained from Colombo a certain quantity of gas lime, for some purpose which afterwards passed out of view, and not knowing what to do with the strong-smelling stuff, he had it thrown over a certain part of his coffee. He very soon noticed the beneficial effects, and for some time this was his show-field of coffee.

This application of gas lime was given when an attack of leaf-disease had just commenced, and the planter found that a second application was not so effective, possibly because the conditions of the plant had changed, just as a medicine applied to a healthy subject does not take effect so markedly as when the experiment is made on an unhealthy one. We feel convinced however, that what is wanted is a scientific investigation, not as to leaf-disease, but as to the general conditions under which planting is carried on, with a special view to ascertaining the nature and quantity of plant-food absorbed from the soil every year. This ascertained, the application of the proper remedy—to the soil, to the leaf, or the stem—will follow as a matter of course. "The knowledge of a disease is half the cure", and this has as much force when applied to plant as when to animal life.

THE TEA COMMISSION.

I.

THE report of the Commission on Act VII. (B.C.) has now, we imagine, reached and been thoroughly discussed on the remotest tea garden. That much diversity of opinion on the result of the Commission's labors will arise we may expect, but, as the amended Act will no doubt receive the assent of the Government, and be passed into law, we recommend the planting community to acquiesce in its provisions. It is not our intention to review the preamble in its entirety, but merely to comment on such sections as appear to us the most important. Much, indeed, of the old law the Commission propose altogether to expunge and the modifications of other sections seem to us to be just and demanded by the altered condition of the tea industry and those engaged in it, from the time when the original Act was promulgated. Many planters are of opinion that an entirely new Act would have been better, as it would have been more clearly and easily understood by those unaccustomed to the verbosity of all legal phraseology; but so long as lawyers endure, we presume that such verbosity must continue. The prospects of tea planting are such that the draft Bill, to have any ameliorating effect on the industry, must at once become law; but in sections 5 and 6 the Commission indicate a wish for further discussion and the expression of opinions from those interested in the matter. This, if allowed, must of necessity entail great delay, and we think Government might, until such opinions have been sifted and digested, suspend most of the vexatious restrictions on immigration which the new Bill proposes to abolish. At the same time we would urge on planters and their agents the great importance of rapidly recording their opinions; the Commission ought to have been appointed

eighteen months ago; but though we pointed this out at the time, it is useless to dwell on it now.

Section 10, in which the contract time is raised from three to five years, will meet, we presume, with pretty general approval, for the argument in favor of such extension is just and equitable alike to both parties; but we should have liked all reference to the bonus omitted. In the latter part of this section a clause occurs which is hardly fair to the coolie, as it is proposed that he should work on any estate belonging to the firm for which he is engaged; thus, a man may elect to work on an estate that he may have worked on before, and yet find on arrival that he is destined for an out-garden opened since he went to his country, and, perhaps, situated in an undesirable locality; this, we submit, is a matter that needs revision. Section 16, dealing with the registering officer, is at least a step in the right direction, and as, during the immigration season, it is seldom that the magistrate is in the station, full powers ought to be conferred on the Civil Surgeon, who is (or should be) a fixture, and is certainly the best qualified person to inspect, register, and pass immigrants. Sections 17 to 41, embodying the Commission's views on sirdari recruiting, appear reasonable; for anything tending to prevent unnecessary delay in forwarding newly-recruited coolies to their destination is to be recommended, and nothing is more apt to encourage dissatisfaction and desertion than the keeping of a body of men dancing attendance at a cutcherry for an indefinite time, exposed to the exactions of the amlah and danger arising from crimps. If it is deemed necessary to take coolies before a mofussil officer for registration or inspection, we are of opinion that each station and sub-division within the recruiting district, and on the line of route thence to the tea district should be constituted a registration station, as it might be frequently advisable to avoid certain stations either on account of their remoteness from the line of march, or the presence of epidemic disease. The entertainment of numerous local agents within the recruiting districts themselves will entail, at the outset of the proposed scheme for free immigration, considerable expense, but as experience proves how unreliable garden sirdars are when left to their own unsupervised devices, this cost must be faced or the present frequent embezzlement and frittering away of funds would be largely increased. If natives are employed as local agents, it would be better that they should be either the headmen of villages, or persons of standing and respectability, and their remuneration, whatever it may be, should be paid on the arrival of the batch on the garden, not on the gang leaving the village. The local agents, moreover, must be provided with all necessary authority to prosecute defaulting sirdars, many of whom have, it is well known, established themselves as money lenders and *moodees* with the moneys entrusted to them for recruiting purposes. It will, we fear, be a difficult task to bring home to a recruiting sirdar the offence of paying into contractors' or crimps' hands, and the hopes of counteracting such practices lie in the probability that free immigration will abolish the contractor altogether. The suggestion as to the way bill is also a good one, inasmuch as it will provide reliable records of the sirdari recruiting system. The detention of diseased or sick coolies by any magistrate is a necessity, but where are they to be lodged, and what is ultimately to become of them? The concluding paragraph in the section under notice runs thus:—

"If any employer desires to have his laborer brought through Calcutta and inspected by his agents there, this can be done under section 43 even although the contract may have already been executed at another registering station."

Now we think it most undesirable that coolies should be brought into the city, but would suggest that a clerk from the agency house should go up to the selected depôt and inspect the coolies there. It has been pointed out time after time how unsuitable Calcutta is for junglies and up-country men, while the risk of acquiring epidemic or contagious disease and disseminating it among the halting stations on the upward route, would be much greater than if the emigrants were forwarded direct on their journey from the mofussil depôt. In the interests of the city itself, the municipal authorities ought to protest against the influx of such considerable gangs of men as the free immigration scheme may bring down country. The section dealing with the establishment of depôts by contractors, and the granting of and suspension of licenses, call for little remark; but in all cases where an officer cancels a license the reason for such proceeding ought, we think, to be endorsed on the back of the documents, as it is now usual merely to inform the contractor or the manager of the gardens that such license has been cancelled, and request that the man may not be sent up again, the details of the alleged misconduct which necessitates the step not being furnished. Whether the restriction of the medical examination to ascertaining simply that intending emigrants are fit to travel and are free from contagious disease is wise, may be doubted, as it would leave room for considerable abuse on the part of both contractors and sirdars, who in addition to the useless dependents could include in their batches many men and women utterly unfit for garden work, but whom under the proposed restriction, the medical inspecting officer would be powerless to prevent from proceeding. Without meaning to insinuate aught against the inspecting officer, we may remark that the payments of fees on all, whether rejected or not, and the hint conveyed in the words—

"the work imposed on a registering officer is greater in the case of a rejected, than of an accepted laborer,"

appear to offer a premium on the passing of the halt, the blind, and the maimed.

The proposals relating to transport appear to have been well considered, and doubtless the scale of diet and medical comforts, together with the rules for accommodation, have been drawn out more in accordance with the dictates of common sense than appears to have been formerly the case. Sections 78 and 79, altering the method of payment of carrying licenses, is, we think, equitable, as is also the suggestion that the measurement of vessels (regularly engaged in the transport service) every trip should be discontinued. We hope that the anticipation of the Commission of an accelerated steam service between Dhubri and Debrughur will be realised, Mr. Brown's extraordinary minute notwithstanding, which is certainly out of place attached to the report under notice. We trust the suggestion as to simplifying way bills, and consigning the useless form and passes to the waste-paper basket of the past will be adopted. The application of all surplus funds, accruing from fees, to the reduction of such subsequent expenses will no doubt be conceded, as Government cannot, we presume, wish to make a profit from such sources. The argument adduced in favor of the proposal that the Inspector of Laborers should give previous notice of his intended visit to the garden, will probably result in the adoption of such a line of conduct, although there may be some officials, to judge by what we have heard, who would oppose it. Sections 112 to 116 give, apparently, power to the Inspector to interfere with the task-work on the garden, but it is to be hoped that this officer's decision on such matters will not be final, for the memory will be fresh still, in the minds of old planters, of the mischief wrought by an Inspector who had to be summarily removed from his office, some fifteen years back, by the then Lieutenant-Governor, Sir William Grey. True, men of that stamp are not likely to be entrusted with power under the present *régime*, but any interference on the part of a Government official with the interior economy of garden work must manifestly be subversive of the manager's authority.

Those sections relating to the sick and incapable laborer call for no special remark, and the Government, in justice to both parties, cannot consent to give up all control in the matter. Managers in these days may be trusted to look after these people, whose families would probably form part of their labor force Sections 121 to 127 deal with the important subject of the food supply, and no better plan than that recommended by the Commission,—of leaving this matter to be dealt with by the local Governments,—could be adopted, as planters for their own interests will presumably take care that a sufficient supply of suitable food is placed within their coolies' reach at reasonable rates. With reference to the subject of closing gardens against a particular class of laborers, that matter can, we think, be reasonably left to the discretion of the Deputy Commissioner acting in consultation with the local medical authorities; for it is a well-known fact that places where mortality among North-Westerns, as they are called, has been absolutely appalling,

sink to the *minimum* when this class of coolies is replaced by men from the Santhal Pergunnahs. The suggestions as to dealing with insubordination and disregard of sanitary regulations should meet all requirements; but the suppression of habitual drunkenness is a matter more difficult to deal with. The illicit distillation of liquor on a factory can to a great extent be controlled by the factory authorities; but its clandestine introduction from without, especially in the neighbourhood of the hills, where no abkari laws are in force, is almost impossible of detection. The canteen system has many advocates, and perhaps is the best that could be adopted; but there are many coolies who can be trusted to spend a quiet evening with half a dozen comrades over a bottle of liquor in their own huts, and to compel them to consume what they wish for at the bar, because one or two men, with purely animal tastes, prefer getting solitary drinks and creating a disturbance, would be most unjust. If only one or two, as is frequently the case, are such incurable drunkards as to endanger the peace of the factory, it would be better that they should be expelled and refused a discharge ticket. They must then either reform, or return to their country, becoming waifs and strays like their similarly affected brethren in other countries. Section 141 will somewhat flutter those managers who have heretofore stocked their factories at the expense of their neighbours; and although the infliction of the punishment of incarceration is seemingly left to the discretion of the local magistrate, we believe most of the Deputy Commissioners hold the opinion that nothing short of extreme measures will check the practice the section provides for. One month's imprisonment appears, on the face of it, but slight penalty for downright robbery, but it must be borne in mind that it carries with it a stigma entailing the loss of social position, and few but the most callous would care to return to their situations on release; and in the interests of all concerned in the tea industry, as well as for the good name of a body of Englishmen engaged in conducting an important enterprise, we trust the local authorities will not shrink from exercising to the full extent the powers confided to them, and thus put a stop to a practice that has grown into an intolerable evil of gigantic proportions. With the exception of the concluding paragraph, which we notice in a separate article, the remaining sections speak for themselves. On the whole the Commission appear to have given the greatest care and attention to the accomplishment of the task confided to them, and, however conflicting may be individual opinions, they deserve the best thanks of all interested in the tea industry.

II.

In their concluding remarks, the Commission on Act VII. do but endorse the views that have been so persistently urged in our columns for a long time past, though it must be patent to all concerned in the industry that the only solution of the tea problem hinges on the question of cheap and rapid means of transit between Calcutta and the tea districts. It is manifest, we think, that Indian tea,—despite the advantages claimed for it, of purity, strength, and flavour,—to prove remunerative must be laid down in London at a maximum cost of ninepence the pound; for, the fall in prices must we believe, be taken as the future market value, and unless measures to secure this end are rapidly set about, the almost universal collapse of the enterprise appears a foregone conclusion. We fully concur in the opinion of the Commission that the cheapening and accelerating of the transport service will be more effective than any scheme that can be proposed of a Government system of free immigration; and the re-peopling of the fertile land of Assam and Eastern India will follow as a natural sequence, these parts resuming their former position as the great granary not only of India, but of North Burmah and Western China. Sufficient evidence that they *were* so is afforded, not only by tradition, but by the remains of temples, towns, and fruit trees, indicating former village sites—those silent monuments of antiquity that shew both the ravages of ruthless invasion and the prolific capabilities of the country. With the present jungle wastes brought under cultivation for food grains, and a rapid means of distributing such throughout less favoured parts of India, the periodical famines we witness would be but matter of history and, as the truth of this assertion is self-evident, Government, whose credit is now so good, might undertake the laying down of the two lines of rail necessary to bring about this desirable consummation; for it seems hopeless to look to private enterprise to do this. If the recent loan so rapidly and liberally subscribed indicates the rate of interest that such sums as 14 millions can be had for, we would urge upon the Government to invite tenders for a loan solely for the construction of lines of railway from end to end of the Assam and Soormah Valley, connecting them if practicable with the Northern Bengal State line, or at any rate bringing them down to the nearest point of existing East communication with the metropolis. The network of lines indicated by the Commission would, we believe, from the knowledge we possess and information we have been able to glean concerning the districts they would traverse, render their commercial success a certainty, and such success would be greatly enhanced as they became linked with the Assam lines proper. It was beyond the province of the Commission, we know, in treating of communications, to indicate the different commodities of import and export, but in asking Government to construct a series of lines entailing an outlay of several millions sterling of borrowed capital, it will be necessary to furnish such reliable statistical information as would justify the authorities in entertaining the scheme. And herein lies considerable difficulty; for, the advocates of the lines have two steamer companies to contend with in the first instance, and the Eastern Bengal Railway Co. in the other. The latter line, however, will ere long become the property of the State, so that its interest will be identical with the lines proposed for, and in connection with, Assam. But the battle with those whose interests are vested in the two opposition steamer lines will, (owing to the large number of shareholders), doubtless be a tough one. Some opposition may also be expected, we fear, from district officers who regard railways from the Indian point of view rather than the European and American. An axiom has been laid down by some would-be authority or other, that unless a country has a population of 400 to the square mile, a line through it will not pay—quite oblivious of the fact, as the Commission points out, that almost every railway in Bengal must be a profitable investment for capital, the exception, we presume, being the Port Canning line. It is gratifying to learn, on the authority of the Commission, that the Government of Bengal is fully alive to the commercial and administrative importance of connecting the central districts of the presidency with those under the Chief Commissioner of Assam; and we presume neither Government is likely to be deterred from carrying out schemes for the benefit of the people and the countries entrusted to their charge, by the representations of those who are interested in retaining the *status quo* of tedious, exorbitant, and tardy means of communication. The manner in which the late Chief Commissioner has pushed forward the rail and tramway as far as Dhubri, is deserving of the warmest thanks of all interested in Assam, and it is to be trusted that his successors will prosecute the good work until the iron-horse daily traverses the whole distance from Dhubri to the Bhramakund. It is by this means, and this alone, that the vast mineral and agricultural wealth of the richest valley in the Indian Empire can be thrown open to the world, a revenue secured to Government from a province that is now a drag on the finances, and famine, if not rendered impossible, at least robbed of its horrors.

How the Commission came to permit Mr. Brown to append to the Report his extraordinary minute it is impossible to conceive—unless indeed upon the principle of giving a man rope enough, in which case it has succeeded most admirably. Surely this gentleman, while recording his protest against Government running a line to Assam, must have been fully aware that the company or companies whose champion he apparently constitutes himself have not a single steamer in their fleet that could compete either in speed or cheapness with the railway. Government no doubt would be quite willing to leave the development of the Assam provinces to private enterprise and energy even now, but it has waited sufficiently long to have had forced on it the conviction that these qualities are non-existent, in Bengal at any rate; and however much Mr. Brown and his compeer may deplore the fact, it must be self-evident to them that the days of steamers on the rivers of Assam are numbered. These com-

panies have had their day, and a profitable one—it has been; but to endeavour to stem the tide of progress in these days by an attempt to create opposition to a Government that is developing trade, simply because the apathetic (so-called) commercial community will not do it for themselves, is mere puerile selfishness. Moreover, if we mistake not, Mr. Brown's firm, in addition to being interested in river steamers, is also agent to the largest Tea Company in Assam, and how that gentleman can reconcile his duty to the Assam Company with his cavilling at the projection of a railway through the Valley, by which that company would be vastly benefited, we leave for his own serious consideration. If he does not agree that "the proposed acceleration is so urgent as to demand Government interference," will he tell us in what way his own or any other steamer company purposes providing the requirements of the province with such. As for the liberal offers, we have had quite enough of such liberality, and the handsome dividends of the I.G.S.N. Co. show clearly enough that reductions both in freight and passage-money could be made. Not that we expect that Company will make the concession, until railway competition forces it do so or runs it off the rivers altogether. The history of river steam companies, as pourtrayed in this minute, is merely the history of stage coaches and postchaises of our grandfathers' days, and there are possibly some among your readers old enough to remember the opposition of the Parliamentary Committee even to George Stephenson's railway. But that a gentleman engaged in commercial pursuits in the capital of British India should remonstrate against Government undertaking a commercial enterprise, which those most interested in, either will not, or cannot, do for themselves—reflects but little credit on the enterprise of the commercial community of the chief city of the Empire. Had the river steam companies possessed a spark of energy, they would, by altering their vessels to light draught—*real* river steamers, of the American pattern—have postponed the projection of the proposed railways by some years; but their whole history shows that the very last thing they ever consulted was the public convenience. It is but recently on the Assam line that they have shewn any attempt at punctuality; as for the Cachar service, the utter want of system has become a byword, and this remissness is likely to lose them the greater part of the traffic this coming year. They certainly have no one to blame but themselves.

The concluding paragraph of this minute, alluding to the tendency of Government to engage in trade being alarmingly on the increase, is hardly applicable in the present instance, as for months the advertisement for swift steamers for the Dhubri and Debroghur service remained unanswered, and hence Government was compelled to place them on the line itself: and now to ask for the reversal of this "policy," solely in the interests of a section of the community who are interested in retarding the opening up of an important province (for the protest amounts to nothing else), is as likely to be endorsed by general public opinion, as would be a denunciation, by the ghost of Vasco de Gama, of the Suez Canal, the P. & O. Co., and the Overland route in general.

PSEUDO-GUTTA PERCHAS.

Or Substances Supplementary to Gutta Percha.

FOREMOST amongst Pseudo-Guttas as we use the phrase, stands Balata Gum. It is obtained from the *Mimusops Balata* of Gœrtner (*Nat. Ord. Sapotaceæ*) and is synonymous with the *Sapota Mulleri* of Bleekrod, the *Achras Balata* of Aublet, &c. It is found in Demerara, Berbice, British and French Guiana, Antilles, Jamaica, and Surinam. It has many vernacular names, amongst which may be mentioned, Balata, Paardenoleesch (Dutch-horse-flesh), bullet tree, &c.

One of the first writers on this substance was Professor Bleekrod, who communicated some information as to the plant and its product to the Society of Arts, in 1857. He, too, described the plant and named it *Sapota Mulleri*. In 1860 Mr. Walker communicated samples &c., received from Dr. Van Holst, of Berbice, to the same society, and in 1864 Sir William Holmes also drew attention to the same subject. The tree is a large one with a trunk of about six feet in diameter, and furnishes a wood much liked for building purposes and of the colour of horse-flesh—hence the Dutch name. The bark is thick and rough, and the fruit is of the size of a coffee berry, sweet like a plum, and with a hard white kernel which yields a bitter oil. The leaves are glossy, oval, and acuminated. The milk is drunk by the natives, in cases of diarrhœa, and when diluted with water it is used as cow's milk. The trees grow in groups and in alluvial soil.

The "Balata" gum is of a character somewhat between caoutchouc and gutta percha, combining in some degree the elasticity of the one with the ductility of the other, freely softening and becoming plastic and easily moulded like gutta percha. What small parcels arrived in England met with a ready sale and were remarkably free from adulteration. But, unfortunately, through the difficulty of collection—the undertaking being so dangerous and unhealthy—the supply of this excellent article has fallen off. It is collected by making incisions in the bark about 7 feet from the ground, and a ring of clay placed round the tree to catch the milk as it exudes. The yield is said to be in profusion especially at the time of the full moon, and the operation can be repeated every two months in the rainy season. It takes six hours to bring about coalescence by simple atmospheric influence, but very quickly by boiling in water. A large tree is said to yield as much as 45lbs. of "dry gum." The tree in every way is well worthy of a trial by acclimating it.

In India there are several plants whose products may be classed as Pseudo-Guttas. First and foremost of these we have the Pauchontee or Indian gutta tree, the *Bassia elliptica* of Dalzell, the *Isonandra acuminata* of Lindley, but now known as *Dichopsis elliptica*. It is found in the Wynaad, Coorg, Anamally and Neilgherry Hills, Sholah Forest, Cochin, Sichar, and, according to General Cullen, "appears to be common in all the forest tracts at all within the influences of the south-west rains." This tree, which is now placed in the same genus as the true gutta percha, is a large one—from 80 to 100ft. high—and was first met with by Mr. Dalzell in North Canara, near the falls of Goirsuppah, in 1849. Since that date General Cullen and Dr. Cleghorn have used every exertion to bring the substance prominently forward, but without success. The gum is obtained by tapping, a pound and-a-half being obtained from one tree by five or six incisions, a large tree yielding as much as 20 to 40lbs of sap. Many experiments have been made with specimens of the raw milk, *i.e.*, milk simply dried by exposure to the atmosphere. The results of these experiments have shown that for telegraphic purposes it is wanting in some essential qualities, but it has been recommended as a sub-aqueous cement or glue. When dissolved in ordinary gutta percha solvents, it, after the evaporation of the solvent, remains some time soft and viscid, and partakes somewhat of the character of bird-lime. When cold, it is hard and brittle. Without wishing in the slightest degree to throw doubt or discredit on the many and valuable experiments made, we would suggest that good samples be collected and treated in the same manner as recommended for gutta percha. We have no doubt that many a parcel of what would otherwise be *good* gutta percha, is spoilt through not being well boiled *immediately* after collection from the tree. At present this is the only way in which we see there is a possibility of ascertaining whether this product can be utilized, and we have the more hope from the fact that the structural character has led the plant to be placed in the same genus as the true gutta percha—structural affinity agreeing so often to chemical affinity.

There are in India other nearly allied *Sapotaceæ* which deserve attention in order to ascertain whether any of them yield a milky juice likely to be of commercial use. Amongst the *Euphorbiaceæ* there are two plants worthy of notice. The *Euphorbia cattimandoo*, found in various parts of India, was first brought to notice by the Hon'ble W. Elliot, and a prize medal was awarded for this substance by the jurors of the 1851 Exhibition. This spiny Euphorb grows to the size of a shrub or small tree, and the milk flows out freely when a branch is cut. The natives use it as a cement to fasten knives in handles, &c. Under the influence of heat it becomes soft and viscid, and when dry very brittle. The *Euphorbia tirucalli*, the milk hedge or Indian tree spurge, is a succulent unarmed plant attaining a height of 20 feet, and its inspissated milk is used for various—chiefly medicinal—purposes, and has been recommended as a gutta percha substitute; but, like gum *Euphorbium*, it has a very acrid character, and the collection is a very dangerous operation to the eyes.

Alstonia or Pala gum is obtained from the *Alstonia scholaris* (R. Brown) of the Natural Order *Apocynaceæ*. The tree is found in India and Ceylon, and attains a height of 50 feet; the wood and bark are much valued for their medicinal qualities. The milky juice which the tree yields abundantly was first, it seems, recommended as a gutta percha substitute by Mr. Ondaartjee who brought it before the Society of Arts in 1864; it seems well worthy of examination.

Mudar gum is the produce of the *Calatropis gigantea* which grows to a height of 6 to 10 feet. Ten average trees yield a gutta-like substance which becomes flexible in water, and in other ways behaves like gutta percha. In Ceylon there are many *Sapotaceæ* nearly allied to the true gutta percha, but nothing has ever been done, it seems, to collect and prepare specimens so as to judge of their value. As to whether any of these Pseudo-guttas can be utilized (save and except Balata, which has an assured value of its own) remains to be answered. The remarks concerning Pauchontee and its preparation is equally applicable to them all, and we should be happy to receive from any of our correspondents any such samples.

ALOE FIBRE EXPERIMENTS.

The aloe, vernacular Kinva, *Agave Americana*, grows freely over most parts of Northern India. It is very hardy, attaining a favorable development under the varying conditions of heat, cold, drought, and moisture; this is particularly noticeable in the lower hills, where the plant grows in places in which it would seem impossible to derive moisture save from rainfall, the scanty vegetation in the Punjab Siwaliks having reduced the hygroscopic power of the soil to almost a minimum. Yet amongst boulders, bare and arid sand, out of clefts in the conglomerate and freestone which "crop out" considerably in these hills, the aloe vegetates with ease. It will also grow in the Kangra Valley and Lower Himalayas up to 4,000 to 5,000 feet above sea level. It is an excellent hedge plant, impenetrable by man or beast, all animals having a wholesome horror of its sharp spear-like points. For fences and enclosures of all kinds, nothing could surpass it, and it is a question whether for railways on this side of India, aloe would not be cheaper than wire fencing, the only drawback being its slow growth, and the time it takes to form a good stiff barrier. As a *natural defensive* element in a system of permanent fortification, aloe would, it is believed, be of great service, especially when planted out at the "foot of the glacis" along the bottom of the ditch, and on the superior and exterior slopes of the parapets. A post or armed work so environed would be safe from any attempt to carry it by escalade, the boldest form,—even a *Ghazi*, well primed and let off at high pressure—would think twice before attempting to force his way through a *chevaux de frise* composed of *Agave Americana*. The aloe does not suffer like the *Cactus Indicus* from the attacks of the cochineal insect, and, owing to the large amount of sap in the stalks, an aloe hedge could not be ignited or fired by shell, carcass, rocket, &c.; projectiles could only make a clean round hole through the stalks, which would in a great measure mitigate the murderous effect of splinters from shrapnel and shell.

The preparation and use of aloe fibre seems to have been understood in most countries where the plant is met with. Royle relates that in Mexico Humboldt saw a suspension bridge 131' span, the main cables of which were of aloe fibre 4" diameter. In South America, Spain, Southern Italy, Algeria, the inhabitants of these countries turn the fibre of the aloe into various uses, such as cloth, mats, rope, paper, fishing lines, &c. When twisted into rope, aloe fibre possesses great strength, and will compare favorably with "Sanu"—*Crotalaria juncea*. Dr. Royle in his excellent work "The Fibrous Plants of India," says that, in a trial made at Calcutta, a rope of aloe fibre 3" circumference broke with a weight of 2,519lbs., whilst ropes made of "coir," hemp, and jute, similar in every respect, broke with weights of 2,175; 2,269; 2,456lbs, respectively. In an experiment made at Paris with Algerian aloe and hemp, both ropes being of equal dimensions, the former broke under a weight of 2,000 kilogrammes, and the latter with a weight of only 400 kilogrammes, 1 kilogramme=2·2046lbs. Dr. Royle also mentions an experiment made at Toulon Dockyard, where two ropes, one of hemp and the other of aloe, were tested, after a six months' immersion in sea water. The former only bore a weight of 2,538lbs., whilst the latter *carried* a weight=3,810lbs., showing a clear surplus of strength of 1,272lbs in favour of the aloe or pita.

On the other hand a trial is quoted, made at Madras Arsenal, where a coil of aloe rope was received at the Arsenal, immersed in a tub of water for 24 hours and then exposed to the open air, and after a few showers of rain, was found to be quite rotten. The same results were obtained after similar trials on various ships in the Royal Navy.

Kahars and water-carriers make rope of this fibre in the Punjab. It stands moisture fairly, and has one great advantage, *viz*, that, bulk for bulk, it is lighter than hemp or *Musa textilis*.

During the early part of the year the writer of this paper endeavoured to see if the stalks of plantain, *Musa paradisiaca*, could not be utilised for paper stuff or rope. A certain quantity of plantain fibre was prepared and tried, but it was disappointing to find that it was excessively weak; it would not stand "heckling;" the long, soft, silk-like fibre, 36" to 48" long, would snap and tear, even when drawn through the teeth of a fine hair comb Care was taken not to *steep* the fibres at all. The operation was as follows:—The long stalk was cut into lengths of four feet, and divided into four by two cuts, at right angles to each other, passing down the axis or peduncle of the plant. The sheaths or lengths of stalk were then passed between the *iron* rollers of a small sugar mill. One operation of this kind was quite sufficient. The strips of bark or more strictly speaking sheaths, were next laid on a clean washed board held in the left hand, and the operator, with a blunt piece of flat iron, or the back of a pruning knife, held in the right hand, firmly, though gently scraped off the green pulp and herbaceous matter. The strip was then turned over and scraped on the other side. When perfectly free from pulp and other substances, the strips of fibre were shaken and washed rapidly under a jet of water, put up to dry in the wind, and again taken down, slightly damped, and the fibres drawn out. After this they were finally dried and ready for packing.

The great drawback to the country plantain fibre is its extreme delicacy and fragile nature, which of course enhances the cost of production. Some specimens were sent down to Calcutta to Messrs Ahmuty & Co., asking what price the fibre might fetch in the market. Their reply was discouraging, inasmuch as they gave it as their opinion that fibre of the description sent would not realise more than Rs. 2-8 to Rs. 3 per maund in Calcutta. Supposing that the introduction into Upper India of the *Musa textilis*, or even a plaintain yielding a fibre superior to the *Musa sapientum*, were possible, it may not be unprofitable to ascertain what the fibre would cost, say, landed in Bombay or Kurrachee. There are no means, unfortunately, existing in India by which the cost of production of plantain fibre can be determined, such an industry being unknown, certainly in the Punjab. But assuming (1) the fibre to be good, and (2) that the cost of cultivation is more than covered by the value of the fruit—we have all the stalks and resulting fibre to the good. To make the concern pay, the working establishment would have to stand at not less than the following strength:—

Two men to cut up and slice the stalks; 3 boys to carry the stalks to the mill; 1 pair of bullocks to work the mill; 2 boys to attend and serve the mill, as well as to distribute the fibre to 15 women who would wash, scrape, and clean, each, 10lbs of fibre per diem.—

∴ 10 × 15 = 150lbs.

Daily working expenses would stand at—

	Rs.	A.	P.	Rs.	A.	P.
1 pair of bullocks				0	8	0
2 men @ 2·5 as.				0	5	0
5 boys @ 1·5				0	7	6
15 women @ 2 as.				1	14	0
				3	2	6
Drying and packing ...	0	4	0			
Freight to Sea Port ...	1	12	0	2	0	0
				5	2	6
Contingencies				0	5	0
Rs.				5	7	6

∴ $\frac{2240}{150}$ = 14·21, and 14·21 × 5·5 Rs = 78·15 Rs., or in round numbers £8 per ton. The West Indian fibre has been delivered in England at a price varying from £10 to £11 per ton.

Plantain fibre not proving a success, attention was turned to aloe *Agave Americana*, and, on a grant from the District Fund Committee being received, experiments were commenced with a view to ascertain the cost of production, the value, and quality, of the fibre. The process of preparing and cleaning the fibre was in almost every respect similar to that adopted for plantain. The long leaves were cut off close to the stem, tied in bundles of 50 and 60 each, and brought up to the mill; they were then passed between the rollers, two and two together, and laid down on a trestle table close by. After a certain number of bundles had been thus dealt with, the crushed stalks were taken up again and passed a second time through the mill. The second operation completely expressed the fœtid and unpleasantly odoriferous sap, as well as breaking the outer cuticle of the leaves. This sap blisters and irritates the skin considerably, and will produce a serious inflamation of the eye, should a stray drop chance to find its way into that organ; this had to be guarded against, and until the workmen had anointed their arms, legs, and chests with oil, they never set to work. After having passed through the mill a second time, the stalks were taken up and scraped with a *blunt* knife, to remove as far as possible the green pulp and herbaceous matter, after which the stalks were tied up in convenient sized bundles, taken off to the banks of a "toba" (*kutcha* tank), and buried in wet sand for four or five days. On the fourth day the bundles were taken out, washed in a running stream, lightly beaten with a wooden maul or beater, washed and beaten again, and washed the third time. After the third beating and washing, the fibre was clean and of a dull yellowish color. The bundles were then hung up to dry in the shade, but exposed to the wind; during drying the fibre gained the silky white appearance which in Mexico and South America has gained for it the name of "silk grass." The next process was that of "heckling." Heckles, the writer had none, but was obliged to resort to the local market. Two were consequently made up, but the only contrivance which indigenous *art* was capable of producing, was an instrument bearing a close resemblance to a small garden rake; it was certainly better suited for the purpose of "rippling" flax or hemp, than that of heckling a fine fibre; moreover the temper of the metal teeth was inferior, and in drawing the "strick" or lock through the comb, the teeth gave and bent, causing a great waste of long staple, the greater part being left as tow or codilla. Samples of fibre, twisted rope, and tow, were sent to the Calcutta Chamber of Commerce for a professional opinion. The following extract from the proceedings of the November meeting of the Agricultural and Horticultural Society of India shows what chance the fibre has of succeeding as an article of commerce:—

Mr. W. H. Cogswell, a member of the fibre Committee, gives the following report on the above samples, Mr S. H. Robinson concurring: "With reference to the samples herewith, alluded to in the foregoing memorandum, I beg to observe that the washed and heckled fibre prepared from the *Agave Americana*, or common aloe, is about the best I have seen, being beautifully clean, and well freed from the bark or outer skin of the plant; of good colour, there being but a very slight tinge of greenish which it is impossible to thoroughly eradicate without extra steeping, or the addition of chemicals, to the injury of the

fibre; it is of very great length, and fair strength, and a really good commercial commodity, its value to-day being about Rs. 8 a bazaar maund. The samples unheckled I would value at Re. 1 per maund less. The samples of combings, generally known as tow, could be used in this country for paper-making only, its value as such being about Rs. 3 per maund; but in England, where spinning machinery can be applied to it, a good yarn might be produced. As a produce for shipment thereto, it is of greater value than being consumed locally for paper-making: for the latter, I am of opinion it is too good and costly, as jute, tow, and such like fabrics, are so cheap and plentiful in this country."

In preparing the fibre there were sundry difficulties to be overcome; the operators were new to the work, they had never seen fibre prepared from aloes before. The sharp points pricked their hands, the fœtid offensive looking juice was found to be a painfully powerful rubefacient. The mill rollers were *iron* and *not wood*. The motive power, instead of a pair of bullocks, consisted of two "Sainis" working at the end of a horizontal lever, and the resistance to be overcome was sometimes considerable, which meant that the two Sainis had to exert considerable muscular force. These were considerable prejudices in the eyes of the Aryan brother, and took time to tone down. Also, it was only experience which shewed the proper amount of "retting" in wet sand and the degree and duration of beating required to finally separate the green pulp from the fibres. The rollers of the mill used in these experiments were vertical. A system of horizontal rollers in an iron framing, worked by belting from overhead gearing, would give better results; the shafting to be fitted with a fast and loose pulley, so as to throw the mill out of gear when not required for work.

The question of motive-power next demands consideration. The motive-power available in India is—bullocks, water, steam, and wind. Bullocks would not be economical for many reasons. Water is not always to be had, except near canals or close under the hills. So that it resolves itself into a matter between steam and wind. Steam means the employment of skilled labour and a plentiful supply of good fuel. In Upper India, coal, any distance from a railway, is too dear to be thought of; wood is seldom to be had under four maunds per rupee, and the only other substance available is grass or straw. In the "Khandi" or submontane tracts there are thousands of acres of land covered with long grass—*Saccharum sara*, *S. spontaneum*, *Andropogon involutum*,—which would serve as excellent fuel in any engine fitted up with a large fire box and one of Messrs. Head and Schemidth's patent straw burning apparatus; 20lbs to 22lbs of grass being fully equal, in calorific effect, to 6 lbs of best Welsh or Newcastle coal. One of Messrs. Ransome Sims and Head's* 10 H. P. engines, working at a high rate of expansion, and fitted up with the most recent improvements, would in a working day of 8 hours consume 8×10×22=1,760, or in round numbers 1,800lbs. of grass fuel. This grass sells for 16 loads of about 80 seers each, for 1 rupee; the daily consumption of grass would not at this rate exceed two rupees per diem.

With regard to wind power, we have in India a vast natural agent almost wholly unutilised, as there is seldom a day in which we have not wind enough to propel machinery, provided suitable gearing and apparatus be forthcoming. A wind mill having a sail area of 500 square feet, would, under a wind velocity=14·67′, or 10 miles per hour, give a useful effect of about 11 H. P.

By the following Formula, H. P. $= \frac{A v^3}{1080000}$

where A=Total sail area.

V=Wind velocity, in feet, per second.

H. P. $= \frac{500 \times 14{\cdot}67^3}{1080000} = 14$. Allowing 80 per cent only for useful effect we have 11·20 H. P.

Each such wind machine could work four mills, each mill consisting of a pair of rollers 3′ long, 1′ diameter; and the amount of skilled supervision required would be almost *nil*. One boy or man to oil and lubricate the bearings would be ample.

With regard to the yield per acre of an aloe *plantation*, the following were some calculations made:—

One acre would hold 1,000 plants, each plant would give 1·5 lbs of fibre.

Supposing acreage of plantation,=1,000. ∴ $\frac{1000 \times 1000 \times 1{\cdot}5}{80} = 18{,}750$ maunds.

Of this amount 60 per cent would be fibre suitable for yarn, rope, &c., and the remainder, 7,500 maunds, a material fit for tow and paper.

Then—

	Rs.
Cost of production of 11,250 maunds @ 6·5 per maund	73.125
Carriage to sea port of " " @ 1·0 "	11,250
Carriage to sea port of 7,500 " @ 1·0 "	7,500
	Rs. 91,875

This would fetch, according to valuation given in a former para, as follows:—

	Rs.
11,250 maunds of long staple at Rs. 8 per maund ...	90,000
7,500 " tow &c, at " 3 " ...	22,500
Total ...	Rs. 1,12,500

According to this, the surplus of receipts over expenditure would equal about Rs. 20,000. In this calculation the cost of production has been taken at a maximum, and with suitable appliances this should not exceed Rs. 0·25 or 0·0 per maund.

Would cultivation improve the quality and yield of the fibre? Hemp, flax, &c., have been improved in India by judicious cultivation. The yield and quality of cereals depend on the care bestowed on the plants. Napoleon *Ière's* "Ediet" prohibiting the import of English sugar &c. into France and other continental countries, however short-sighted a measure in itself, had one result—it compelled the growers of beetroot in France to devote their energies to develope the cultivation of that plant, and it ended in their raising its percentage of saccharine matter, from 5, to 10 and 11 per cent. With these facts before us, it is not too much to anticipate similar beneficial results in the case of the aloe.

Deboisement and destruction of forests seem to go hand in hand with civilization, in India as well as in other countries, and would seem to be one of the unqualified (?) benefits inseparable from the introduction of British rule. And even if nothing else were to be done to reboise the Lower Himalayas, perhaps long deep zones of aloe, planted along some of the present bare and desolate "Revers" of the Punjab Siwaliks, would do a great deal to check, if not wholly mitigate, the terrible evil which threatens to make certain parts of this glorious province as bare and wild as the Sahara itself.

Before concluding, it might be as well to remark that in Mexico the aloe sap is evaporated, and the residual substance used as soap. Also, further experiments might show that the green sap is capable of being used as a dye.

Annexed is a memo. showing some trials made with a view to ascertain the breaking strain of aloe rope—

Rope used was 1·5″ circumference

		lbs.
Trial No. I	It was loaded, and broke with ...	587
" II	" " " ...	890
" III	" " " ...	728

There was a wide difference between each result, and these trials were not accepted as conclusive, on that account. The rope was of three strands, laid up by a "sainsar" or native rope-maker, and twisted by a small English rope twisting machine. After trial No. I., the rope was carefully examined, and the point of fracture in the three strands was found *not* to be in the same horizontal plane. The portion subjected to strain was cut off and the weight suspended from the other end. On the second trial the fracture of all three strands was simultaneous, and in the same horizontal plane. In Trial No. III, a fresh portion of rope was used, and, as stated before, gave way under a strain of 728lbs or 9 maunds. Again the three strands did not part simultaneously. According to the best authorities the breaking strain for ordinary rope is expressed by the formula—

B=$C^2 \times 2$ (B being breaking weight, in tons) which would, with the rope used, give us about 1,000lbs. Trial No. II., gave results approximating the closest to this theoretical value.

*Note.—It is not overstating the fact by remarking that this eminent firm seem, by general excellence of workmanship, durability, and economy in actual performance, to have brought their steam machinery for agricultural purposes as near perfection as possible. They seem to have left most other competitors in this branch of the profession a long way behind.

EDITORIAL NOTES.

THE prospects of the spring harvest, according to the latest accounts are now "good and fair" in almost all parts of the country, and in Northern India have been somewhat improved by the recent rain. The following is the official report for the week ended 22nd ultimo:—

General, though for the most part moderate, rain fell during the week in the North-Western Provinces and Oudh and the Punjab, and has done good, especially in the latter province. Slight showers are also reported from some districts of the Central Provinces and a few States in Central India. Elsewhere there was little or no rain. More is needed in many districts in Bengal, where, however, the prospects of the crops are, almost without exception, promising. In parts of the North-Western Provinces and Oudh, as mentioned in previous reports, the unirrigated spring crops have suffered severely.

The unirrigated *rubi* has suffered especially in Rai Bareilly, but in other places where the harvest has begun, the pressure of distress has been relieved. Prices generally in the North-West seem stationary, with the exception of a slight fall in some districts. We regret to note that cattle disease continues in Kumaon and has made its appearance in Lucknow. The accounts from the Indigo districts of Bengal are not so good as last year. Messrs. Moran & Co., in their last report tell us the October plant in Lower Bengal is "not well spoken of," but that it would now be much benefited by rain.

SINCE our article on Coffee leaf-disease was in type, we have received Professor Stevenson Macadam's report on the subject. It so clearly justifies what we have said that we have found room for it in another column, *in extenso*.

IN our October number of last year, page 284, are two short notes on Asiatic and African Caoutchouc, respectively. We extracted these, if we remember aright, from the Ceylon papers. But a correspondent has since pointed out to us that the whole of the matter has been taken from the "Report on the Caoutchouc of Commerce," made to the then Secretary of State for India, by Mr. James Collins, F.B.S., and published in 1872. We regret to see, however, that Mr. Collins' name is not once mentioned in the notes above referred to, nor does anything occur to show the source whence the information was derived. But what is still more lamentable is the supineness of the Indian Government in not circulating copies of Mr. Collins' Report in this country for whose use it was specially intended, and where it would have proved so valuable an adjunct to the literature extant on agricultural topics. We fear, however, this is all of apiece with the apathetic indifference and

want of intelligent interest in respect of agricultural matters, that has all along characterised our rule in India. Such a state of affairs is the more to be regretted inasmuch as India is so essentially agricultural a country, if our rulers would but open their eyes to the fact. But the Government prefer keeping information piled up in cellars; and so, often, work is done over and over again,—and who pays the piper? Still, this is no reason why Mr. Collins should not be accorded the well-deserved merits that attach to his labours on the subject of Caoutchouc and its acclimatization in India Among the latest of this able and experienced writer's contributions to the literature of agriculture and commerce are the two valuable articles on Gutta Percha—a subject on which Mr. Collins is eminently qualified to speak—which have found a place in the editorial columns of the last two issues of this journal, as our readers must be aware.

We would call the attention of Government and the municipalities of our various large towns and centres of population to the important and exceedingly interesting paper on "Town Sewage" which appeared in the editorial columns of our last issue. It was kindly placed at our disposal by an esteemed correspondent, and it will be seen at once from the thoroughly practical way in which he deals with his subject, that it is a matter with which he is intimately acquainted. Indeed, the great value of the papers seems to us to lie in its thoroughly practical turn. Our correspondent is in fact a professional Engineer, and as such, his opinions are entitled to all consideration, and cannot fail to command respect. An extract from his private letter to us which accompanied the paper in question, will interest our readers; we only regret having overlooked it in our last issue. Our correspondent writes:—"I am this day sending "you a few remarks on 'Town Sewage' and its utilization, for "which you may perhaps be able to find space in the columns of "your valuable journal. The subject is one of considerable "importance, and in India where the natural conditions are highly "favorable to the extensive utilization of town sewage, the time "has in my opinion fully come when Government should step "in and *insist* that municipalities should devise and carry "out, each in their respective towns, some rational method of "disposing of their sewage to the best possible advantage. But "I am afraid we are not likely to see such a state of things "brought about until we have a Minister of Agriculture with "a seat in Council, and supreme at the head of a properly "organised Department. We give the Aryan brother education "on most subjects, but it would be more practical if we "taught him how to fill his stomach and turn to better use "the fruits of the Earth and to develope the resources of the "wonderful soil with which God in His great bounty has "endowed this country."

We have ourselves, on various occasions, of late drawn attention to the increasing importance of this question of the useful disposition of town sewage, and have at all times been glad to encourage any steps taken in a right direction with this end in view: we cordially endorse the above remarks of our correspondent. In reply to his letter we wrote to him privately, and while agreeing in all or nearly all he said, we pointed out the difficulty (which had already been witnessed in Allahabad and other parts) in the shape of caste prejudice among the natives which might stand in the way of a largely extended or universal adaptation of town sewage to agricultural purposes in this country. We were glad to receive our correspondent's re-assuring reply:—

"*Apropos* of town sewage," he said, "I may state that the "'Arains' or Mussulman market gardeners have no prejudice or "objection to use this fertilizer, and are only too glad to get it. "It is generally distributed by gravitation, but in many places, "wells or pits are dug, and it is baled out by "Dhinklis" into the "fields. The 'Sainis,' or Hindoo market gardeners, sometimes use "it, only not so freely as their Mussulman *confrères*. I once "attempted to induce a Mussulman native gentleman to apply "it to his sugarcane, but he said that he personally had no "objection to it, but Hindus would not take it, nor could be "get a sale for the resulting molasses or *gur*, as it (town "sewage) imparted an unpleasant taste to the raw cane; "moreover, the juice though plentiful was watery and deficient "in [illegible] matter. He admitted, however, that no other "manure had been given to the crop during a small trial he once "made which would of course account for the failure; also the "there had been very heavy rains that year, and the sewage he "used had been largely adulterated with storm water."

These statements confirm the intelligence received some months ago from Poona and Umritsur, in both which important towns the experiment of utilising night-soil as a manure, either in the shape of poudrette or in a liquid state, has met with great success, the ryots availing themselves eagerly of its advantages. And thus it is that prejudice will ever fall down before self-interest. The success of the experiments at Poona and Umritsur ought to be sufficient to induce the municipalities of our large centres of population to take the matter up at once as a surely profitable undertaking, not to mention the sanitary benefits that would accure. They should commence at once, and not wait for Government to step in and compel them to such action.

A valued correspondent writes to us from Hoshiarpore that a small experimental farm is about to be started there, the project having been drawn up and the cost estimated for one year's working expenses:—"Our model or rather experimental farm has been taken in hand; the buildings are in course of construction. We intend growing sugar, wheat, maize, cotton, tobacco, *Arachis hypogœa*, and fodder crops such as turnips, kohl rabbi, beans, &c., under a system of judicious rotation. The first crops I am going to put in will be sugarcane, tobacco, and *Arachis hypogœa*. Arrangements will be made to get in the sugar-cane crop before the hot weather sets in. With well irrigation and a good soil, our chances of success are favorable. I may add that an improvement has been effected on the 'Kaiser' plough. I made up one, following Ransome and Sim's pattern known as the 'Primitive' plough; natives like it wonderfully; ordinary cattle can draw it."

We wish our enterprising correspondent all success in his venture. We shall be glad to hear more about his improved plough. The "Kaiser" has hitherto been looked upon as one of the best in the market, the advantages claimed for it being—its extreme simplicity of design and construction, so that it can be repaired by any village blacksmith when damaged; its lightness, so that it can be drawn by any ordinary pair of cattle; its efficiency,—it can be made to turn up the earth to a depth of twelve inches we are told; and its trifling cost—only four rupees. This 'Kaiser' plough has been tried very successfully at the Cawnpore farm, and has since, we learn, been introduced with advantage into Mysore by the local Government. He is indeed a benefactor who can surpass these claims.

In another column will be found an important and practical paper on some experiments conducted with aloe fibre, which has been forwarded to us by an esteemed correspondent from whom we shall be glad to hear further. He is in a position to know thoroughly what he writes about, and his paper gives evidence of his not writing as an official who draws his knowledge from a study of blue-books, but as one who understands from practice what he treats of.

The Annual Report of the Bhadgaon Experimental Farm, in Khandesh, for 1879-80, is to hand, and deals with the usual topics. The season was on the whole "a very favourable one;" there was but little damage done by rats, and the Bhils appear to have been better employed than in giving trouble by grain thefts. At Bhadgaon, as elsewhere, the Bamieh cotton proved a complete failure. The experiments made with this variety in the previous year were likewise, it will be remembered, all failures, the Superintendent attributing it to the soil of Khandesh being "too stiff," and "the heat and rainfall too severe." It is time, therefore, that the experiment were given up; for the conclusion seems inevitable that though this variety may do well enough under garden cultivation, it is not fit for general sowing. Much attention was paid to raising pedigree seed of acclimatized American varieties of cotton; and by a careful system of retention, some improvement seems to have been effected, instead of the deterioration which it was supposed had set in in the *Dharwar* variety. But we regret to see that the outturn of clean cotton is again so small. From a total crop of 185 acres,—of which three-quarters was pedigree American, the remainder being made up of the Hingunghat variety with some small plots of Bamieh and other new kinds—the average outturn did not exceed 95lbs. This is certainly better than the result of the previous year's operations, when the outturn was only 69lbs to the acre, but still it seems very small when we remember that in America the average is close on 300lbs. The

Teosinte *(Reana Luxurians)* has succeeded to a certain extent at Bhadgaon, and the cultivators appear to appreciate the plant as a fodder. That it is a palatable forage there is no doubt, but that it can compete with the common *jowar* is very doubtful. Experiments in growing the Ram-Bhendi (*Malacra Capitata*) as a fibre crop resulted in its being proved that it cost nearly three times as much to prepare the fibre, as it would fetch at the mills. There seems little chance of the *Bhendi* ever being able to compete with brown hemp, the quantity of fibre that the washers can extract from the latter being so much larger. Success was obtained in the introduction of potatoes and other English vegetables. In arboriculture, experiments were made with the carob, the rain-tree, the divi-divi, and the cassia florida, with some degree of success. The seeds of the cow-tree (*Brosimum galacto-dendron*) failed to germinate. This useful tree belongs to the natural order *Urticaceæ*, and when wounded, discharges a milky nutritious juice in such abundance as to render it an important object to the poor natives of the Cordilleras. Some attention is paid at Bhadgaon to improving the local breed of cattle and horses, and of raising mules; but nothing very thorough appears to have been the result. Sericulture proved a failure; the tasser worms appear unable to stand the variations of temperature. A further attempt will be made with a view to test the value of the *Lagerstrœmia Indica* as a food plant for the tasser worm, and then it is to be hoped sericultural operations will be made over to an expert from home, as in the N.-W. P., or abandoned altogether.

Mention is again made this year of the aversion of the students obtaining their agricultural education at the farm to such training as would take them out of doors. As we remarked before—how youths are to become practical agriculturists without instruction in the field is beyond our comprehension. But this mild kind of aversion is by no means confined to the Bhadgaon farm, and the explanation seems to be that many young men come forward in numbers under the impression that at the end of their services Government employment would somehow or other be found for them. It says little, alas, for the value placed in the agricultural education obtainable at our "experimental farms;" but it would be well, we think, to remove the above misconception once for all. For we quite agree with the Commissioner when he says that "to turn out mere theoretic farmers unwilling to put their hands to the plough and endure exposure to the season, would be misdirected energy—useless even if successful." We had an excellent illustration of the average intelligence of these "theoretic farmers" in the person of the gentleman who conducted some experiments with new ploughs in the Trichinopoly district the other day.

A FEW months back a rumour prevailed in Assam that Government was about to undertake a systematic survey of the Khasia and Jaintia hills, the investigation to consist of all branches, geological, botanical, and Archæological. A botanical exploration of the hills including the Garrow and Mecker country would, to a certainty, result in bringing to light plants of numerous and rare varieties, in such quantities as would astonish the botanical world; but the drawback to making a perfect collection is that the work must be pursued throughout the rains; for most of the hybridised orchids, lilies &c., flower only in the months of June, July, and August, and many a man whose botanical knowledge enables him to identify plants by the leaves and bulbs only, would, unless he saw and preserved the flower, be induced to append names to specimens that would turn out most startlingly different. It would be necessary for the botanist to prosecute his work in person; for Khasias, though willing enough to engage in collecting plants, cannot be made to understand that any that do not possess gaudy and large flowers, can be of use. Hence, there are plants valuable as febrifuges and possessing other medicinal and economic properties (fibres especially) that escape notice from being burnt up at the time when it is considered healthy to travel in the hills off the line of road. In many parts of the hills, if precautions are taken against the effects of a daily drenching, the explorer's health will be unaffected, provided he is a man of ordinary robust constitution; but unfortunately, in those localities where from the dense nature of the forest the most valuable plants would be found, the climate will be found most trying to anyone not inured to jungle life. Yet, to do the work thoroughly, the moist changeful climate must be faced; for it must be borne in mind that the search for plants will entail the exploration of the whole country, and the botanist must be down in a hot steamy ravine one day and have to encounter the chilling blasts of the monsoon, with drifting rain on high ridges, the next. Government at one time did establish a cinchona garden on the edge of the Jyrung forest, below the Nongklow bungalow, but the gentleman in charge (the late Mr. Bierman of the Botanical Gardens) suffered so severely from fever, as did also his subordinates, that the prosecution of the scheme was abandoned.

IT may not be generally known that along the edge of the northern forest surface of these hills, at an elevation of some 4,000 feet, the ipecacuanha plant is indigenous; that near the Kollong rock, a short distance to the west of the old Assam road, between Myrung and Nongklow, a tuber resembling very much the salap-misree of Central Asia is found; and the Syntengs, in the neighbourhood of old trees, dig out a coarse though palatable truffle. One of the most lamentable mistakes made by the Assam Government was the selection of the bleak exposed site for the farm. The district officers were to blame for this, as the Farm Superintendent himself, so he asserts, protested against the place as unsuitable. Three miles from the station, on the Jawai road, plenty of good land is available, but of all places that would, we feel certain, prove successful, is the large stretch of meadow land lying north of the Maodmai inspection huts. This land is sufficiently clear of stone to permit the use of ploughs, and in many places reaping machines as well, while the sleek appearance of the cattle indicates how suitable the locality is for the rearing of live stock. Some are of opinion that sheep and imported cattle would suffer from foot-rot, but we have made particular enquiries and find the disease unknown. If ever the Assam Government finds itself in a position to afford the resuscitation of an experimental farm, a trial of Maodmai should be made. Farther again to the eastward, about five miles from Jawai, lies another stretch of prairie land, in the middle of which a large tank has been excavated; and although this place may possibly be within the rain belt, the cultivation round about shews that it would produce wheat and barley, grown as cold weather crops, while what is left of the forest proves the suitability of the site for the planting of timber and the hardier fruit trees.

IN Calcutta, as elsewhere, the salutary effects of holding annual flower and vegetable shows, where prizes are awarded to successful competitors, is becoming more widely recognized; and no better practical illustration of this could be desired than the splendid specimens of flowers and vegetables that are exhibited every year at the shows held under the auspices of the Agri-Horticultural Society. The flower show held in the gardens of this Society on the 3rd ultimo, under the distinguished patronage of his Excellency the Viceroy, Lady Ripon, and his Honor the Lieutenant-Governor of Bengal, was unquestionably the best yet held. The collection of both flowers and plants was not only numerous but rare; and credit is due to the Society's gardener for the care and good taste displayed in the arrangement. Prizes were awarded for the best collections of camelias, roses, begonias, verbenas, asters, heartsease, phloxes, portulacas, pinks, crotons, dracœnas, geraniums, ferns, lycopods, and new and rare plants. Besides the above there was a very fair exhibition of petonias, tropœolum, cacti, and annuals. The show, which opened at 3 P.M. and lasted till dusk, was visited by an unusually large number of the rank and fashion of the city.

ALL persons interested in botanical pursuits, says the *Pioneer*, will be glad to learn that considerable progress has been made in the preparation of the material for the unpublished portions of the *Flora of British India*. All the Orders down to Gentianaceæ are ready for publication; Dr. Watt has written the Primulaceæ; Mr. Phistleton Dyer, the Apocynaceæ and Asclepiandaceæ; and Dr. Hooker the Compositæ. The other Orders have been written by Dr. C. B. Clarke, so well known for his previous good work in Indian botany and as editor of the reprint of Dr. Roxburg's *Flora Indica*, published a few years ago in Calcutta. There is now some hope of this great work being completed during the life-time of the present generation.

A curious memorial, of which we have been favoured with a copy, has just been submitted to the Governor of Madras. The students of the Saidapet Agricultural College have a grievance. It is not that they have any complaint against their teachers, or that the instruction afforded them does not come up to the standard which they think they have a right to expect. They admit, indeed, that they are deeply indebted to Government for providing them, at a considerable cost—we follow the words of the memorial—with the means of acquiring so much useful and practical knowledge. What they learn, they aver, "is not only pleasurable in the abstract, but the subjects of study, besides securing an intellectual training which is not inferior to that given in other technical educational institutions in India, furnish ample means of increasing individual and national wealth." And still they are not happy, but "with a grateful acknowledgment of the rich benefits received from the Government," they beg of his Excellency Mr. Adam "a slight extension of these favours." What the souls of the students of the Saidapet Agricultural College yearn after is—a title! While they "most readily acknowledge the superior advantages of a really useful instruction" which will enable them "to pursue independent and respectable paths of life," the unfortunate young men are "unable to avoid the painful consciousness that it does not confer the least social significance." They point out enviously that in the Medical College Madras, before its affiliation to the University, the successful candidates were designated as G.M.M.C.; those of the Bombay Medical College, in the same way, were styled G.G.M.C.;" and they pray Mr. Adam to grant them, along with their diplomas, the privilege of appending to their names "titles similar to those granted in other institutions under like circumstances." The memorial is signed by twenty-three "late students" and thirty "present students" of the College, of whom eight of the former and nine of the latter hail from the Bombay Presidency: these are chiefly Parsees. The prayer of the memorialists is not a very formidable one, and we see no particular reason why, if it pleases them, they should not be allowed to write the "title" of G.S.A.C. after their names.

The proposed exhibition of agricultural produce, cattle, and implements that is to be held this month at Lucknow, is intended specially to excite interest in the improvement of agriculture in Oudh, and to, if possible, initiate some decided action in this direction amongst the talukdars. It will be held under the auspices of the Talukdars' Association, and theoretically, is but a mere adjunct to a conference of members of the Association for the purpose of discussing any and every mode of improving the agricultural system of this country. India is, however, hardly ripe for Social Science Congresses and similar opportunities of riding out special hobbies, and it may safely be predicted that the main interest will centre in the show of cattle, agricultural implements (old and new fashioned), and samples of produce, either the long-established staple of the country, or some newly introduced fodder or fibre. The exhibition is, as we have stated, chiefly intended for Oudh; but it will be supplemented by an exhibition of the ornamental ware manufactured in the N.-W. P., and also by a contribution from the Department of Agriculture and Commerce, which will take this opportunity of placing more prominently before the public its suggestions and proposals for the improvement of agriculture.

Our Agra contemporary remarking on the agricultural prospects of Upper India, says:—

Six months ago alarm was justly excited at the failure of the rains in the second half of the Monsoon, and gloomy forebodings of approaching scarcity set in. We are now approaching the end of the cold season, and can judge how happily those forecasts have been belied. In the first place the crop of cotton has been an unusually heavy one, the early rains in June and the absence of them in August and September having apparently developed the plant to its highest perfection. Up to date the value of the staple exported from Agra alone exceeds half a million sterling, more than enough to pay the land revenue of three districts; and yet farther receipts for the next three months are expected. In regard to the other rain crops it would have been unreasonable to have expected similar results, but the winter ones seem to be as flourishing as usual, though they were sown without rain and have had none to speak of since. Contracts are already being made for the delivery of wheat at 19 seers, and gram at 28 seers, per rupee—prices low enough to make the British farmer quake when he reflects that they are the quotations for a comparatively [illegible] year. The fact is that the agriculture of Northern India is grad[illegible] being emancipated from that entire dependence on the rains which has been its greatest drawback. The spectacle of the Punjab, where enormous crops of wheat are raised almost without any rainfall, is a proof that there is nothing in the nature of things to prevent the N.-W. P. and Oudh from doing the same. It is only a question of wells and irrigation, and these wants are being gradually supplied.

The experiment of farming out cattle pounds has been tried in ten districts of Bengal, with the financial result of an increase of 59 per cent in the average annual profit. This result appears to Sir Ashley Eden to be most satisfactory and to have been gained without any additional burden being imposed on the people. His Honour is evidently no believer in the maxim, *ex nihilo nihil fit;* but adduces no better argument in support of his views than that complaints are now frequently made by the lessees that fewer cattle are impounded by the police than formerly. He sees no reason why the farming system should not be as capable of general extension, and succeed in the end as well, in the case of pounds as in that of ferries. The classes likely to take leases of pounds are far more numerous than the class who take leases of ferries, and competion will therefore be greater. The local authorities have therefore been called on to report whether they can recommend the introduction of the system into the districts under their charge. The system should not, Sir Ashley Eden thinks, be introduced anywhere unless the ryots are able to take care of themselves, and to complain of oppression on the part of the lessees.

The following information regarding artificial indigo, from a well-informed quarter at home, should be re-assuring to the indigo interest—"In the first place, it is not intended to supersede natural indigo, but simply to produce a new 'fashion color,' for the purpose of *Hautes Nouveautés*, where indigo, so to say, is not used and another color does just as well, which, if not so real, is, however, more easily employed, and for a perishable color is paid dearer than natural indigo. Up to the present time not quite two pounds in weight of this artificial produce have been made (not the slightest fulcrum exists as to its cost,) but ultimately, in the course of years, the manufactory in question hopes to be able to supply two or three of the largest printers with its produce; but we think that even after the realisation of the eventualities, the consumption of indigo will neither materially decrease, nor will there be much change in prices."

Mr. Petley, the gentleman who has recently succeeded in producing tea for the Rangoon market at Tonghoo, has, according to the Commissioner of Tenasserim's report, 10,000 young plants doing well. Mr. Petley has likewise some 600 or 700 coffee plants bearing, which were planted about four years ago, and he also seems to have been more successful with cinchona cultivation in the same district than the Forest Department whose legitimate business one would think this cultivation would be. Mr. Petley has about 2000 cinchona trees, of all sizes, some from 18 to 23 feet high, which were planted in 1875. The cinchona plantation at Laketho in the Tonghoo Hill Tracts, belonging to the Roman Catholic missionaries, is also said to be flourishing. Mr. Petley has likewise raised a crop of about 40,000 lbs of potatoes on the Karen hills, which were readily bought for the use of the European troops at Tonghoo. The Karen potato crops in the same locality were said not to have realised remunerative prices, though Mr. Petley's success in all the cultivation he has undertaken is most encouraging. When the Tonghoo Railway is completed it is to be hoped he will realise considerable profits as a reward for the enterprise he has displayed in a country not remarkable for Europeans stepping out of old grooves to risk their capital in new undertakings.

The Spaniards abroad have a pleasant way of dealing with people who presume to bring indifferent produce to market. In India attempts are made, on the Bombay side, to make the growers of cotton virtuous by enactments against adulteration, or the services of the State are enlisted in relieving merchants of the obligation of seeing for themselves that they receive the actual goods that they agree to buy. In Manilla the Government are still more paternal. The Governor of the province of Camarines Norte has addressed a circular letter to the local authorities, pointing out that in consequence of the hemp grown in that province being so deteriorated in quality there was scarcely any demand for it; there

was a strong probability of its shortly becoming unsaleable, which would cause the misery of many families, and the ruin of the province, as that fibre is the principal cultivated product there. The Governor has consequently ordered the headmen and hemp-growers and dealers to assemble in their respective villages, and has informed them that, by persisting in their present course of badly preparing the fibre, they will be ruined, but that by more careful modes of preparation, they will gain sure profits by the inevitable rise of prices. The growers and dealers have also been informed that if persuasion fails to improve matters the Governor will take stronger measures. The Governor has also ordered the hemp dealing firms in the province not to admit into their store-houses, at any price, inferior hemp but to admit only that of good quality, and has directed them to inform him of the names of persons bringing badly prepared hemp to their store-houses, so that proceedings might be taken against them.

THE following interesting remarks on the mustard plant and mustard seed oil are taken from the *Journal of Applied Science*:—

The mustard plant thrives in California, and grows in such profusion that it becomes a pest to the wheat fields, especially in the coast valleys, as for instance, from Alamoda south to the Santo Cruz and Pajaro basins. It stubbornly resists extinction, and so grows and overtops the grain with its yellow flowers that a stranger might readily mistake it for the crop intended to be raised. A small quantity has always been gathered for table use, it being of excellent quality, but of late years it is found to yield an excellent oil, adapted even to the uses to which olive oil is applied. It is gathered by Chinamen, who thresh and bring the seed to the oil mart in San Francisco, where they dispose of it at two to three cents per pound. Many who have made trial of it prefer this oil to that made from lard or the olive oil, for cooking purposes; it holds out against rancidity longer than the latter. It is also extensively used to adulterate olive oil. Mustard seed oil is sold in the San Francisco market at a dollar the gallon in five gallon cans, and a dollar and a quarter in one-gallon cans.

A CORRESPONDENT sends the following recipe to the *N. B. Agriculturist* as a cure for grass on pavement:—

Some time ago I noticed in your paper a letter from some one inquiring a remedy for the above. I am glad to be able to tell him of something that will put an effectual stop to grass growing in a paved yard for many years to come, if properly applied. Thoroughly root out all grass, and when the ground is perfectly dry, cover it with a very thin coating of coal tar, sweep it with a brush to prevent it running into pools, and immediately throw on sand until it has a uniform covering one inch in thickness; if two inches, all the better. After lying for say, ten days, sweep off all sand which the tar has not absorbed, and the result will be a clean dry yard in all kinds of weather.

ACCORDING to careful calculations made by Mr. H. L. Roth, in a work on the sugar industry, taking the mean of the years 1864 to 1878, according to population, the following was the average consumption of sugar and molasses per head of population in each of the Australian colonies:—

	lbs.
Queensland	92·13
Western Australia	91 50
New South Wales	85 19
Victoria	84 76
Tasmania	78 51
New Zealand	73 18
South Australia	71·31
Average for Australasia	78· 7

In the United Kingdom the average annual consumption is only about 67lbs.

AN American invention, we learn, has been brought out for preserving potatoes so that they will keep sound for years and retain their natural flavour. The operation, we are told, consists in a simple process of applying great pressure to the potatoes, so as to express the moisture. After undergoing compression, the potatoes are, with a view to the same end, put into a driving apparatus, and after every suspicion of moisture has been got out of them in this way, the resulting product is ground into a coarse meal ready for use. Some first shipments of potatoes cured by this method of their septic properties, were made last year to England from California, and met a profitable reception in the English market. It is stated in an American paper that there are 300,000,000 acres of uncultivated land on the Pacific slope eminently adapted for potato growing, and it is said that the only obstacle towards extending potato cultivation in this tract has been the impossibility of finding a suitable market for the product. If the system of preserving potatoes turn out a commercial success, vast potentialities in the way of markets seem to open out to the enterprising growers of the "wondrous root," as Lord Beaconsfield once termed it.

IT is stated that the cultivated area in the United Kingdom has increased by 126,000 acres since 1879; but there were last year nearly 600,000 fewer acres under wheat than in 1870. Oats, beans, peas, and maize are also on the wane, while barley has not increased in quantity. On the whole the area of the corn crop has diminished by 1 per cent since last year, and by 7 per cent during the last ten years. On the other hand, potatoes have increased in the last twelve months by 10,000 acres, and 260,000 additional acres have been laid down as permanent pasture and meadow. There are 5,000 more acres of orchard land now than there were in 1870, and 3,000 more acres of market garden. Woods and plantations have increased 10 per cent since 1872.

MISCELLANEOUS ITEMS.

THE annual exhibition of the Madras Agri-Horticultural Society was held on the 19th ultimo at the "Company's Gardens." The attendance was good, though not perhaps quite as large as on previous occasions. The show of plants was admirable but that of flowers did not come up to the standard of previous years. The show is more and more indebted every year to native gentlemen, for its attractions. The display of ferns by one of these enterprising natives was incomparable.

THEIR third annual Flower Show was held at Dinapore on the 17th ultimo. There was a brillant display of phloxdrummondi, pelargoniums, geraniums, asters, pinks, pansies, verbenas, violets, and some fine roses. As regards vegetables, the tomatos exhibited by Dr. Griffith were very fine, particularly the greengage and oblong pink varieties. Lettuce, onions and spinach, grown in the hospital gardens by the soldiers, from seed brought from Cabul by Major Home, were a novelty. Great credit is due to Major Home, Colonel May, and Dr. Griffith, for the way in which the arrangements for the Show were carried out.

THE Wadhwan Agricultural Show which opened on the 10th ultimo, and lasted three days appears to have been a great success. The exhibition of live stock was good. Farm produce comprised fruits, vegetables, grains, seeds, fibres, cotton, tobacco, dyes, and forage plants. Several implements and machinery were exhibited, and ploughing matches were held. All the chiefs of Kattiawar, we are told, take great interest in these shows which have done much to improve the breed of horses and cattle and to promote the interests of agriculture generally.

THERE is, we read in the Mysore Administration Report, very little horticulture in the province: a small attempt is made in the Lal-Bagh at Bangalore at cultivation of new varieties of trees, foreign as well as Indian: and the success though not great, is not altogether discouraging. The Superintendent of the Lal-Bagh reports favorably on the present appearance of the manilla and the cocoa plants of more than three years old, and on the newly introduced rubber trees and the *Eucalyptus Saligna* and *E. Citriodora.*

WE see that a movement is on foot for the erection of a Cotton Spinning and Weaving Mill in Lucknow, on the basis of a Joint-stock company. The local paper thinks the very successful working of the Cawnpore Mills justifies this new enterprise. "There is a practically illimitable demand for cotton twist and calico in Oudh, and the promoters see their way clear to supply these everyday essentials at a minimum cost to consumers."

THE Lahore paper of a few days back tells us that a light handy plough of superior construction may now be seen at work on the arable land in the Lawrence Gardens. It has a good English ploughshare, and the wood-work is not unlike the native fashion, but lighter and less clumsy. It has no beam like the native plough, but is merely dragged by a rope attached to the front. As a native plough is at present worked alongside of it, the contrast between the two as to speed, depth, and apparent ease of working is very marked.

THERE are nineteen breweries in India,—3 in Madras, 1 in Bombay, 5 in the North-West Provinces, 5 in the Punjab, 3 in Burmah, and 2 in Mysore. The estimated production of ale, beer, and porter from these breweries, during the year 1879, was 1,569,026 gallons, of which 872,2[illegible] gallons were purchased by the Bengal Commissariat Department for the consumption of the troops.

A PROFESSOR BAYER of Munich, is the man who is said to have discovered an artificial way of making indigo, "by means of cinnamic acid in a nitro-bromic combination." According to the continental papers which started the story, a manufactory at Mannheim makes the cinnamic acid from tar oil.

THE following is the specification of an invention that has been filed in the North-Western Provinces by Mr. P P. F. Michea: "For the complete separation and conversion of the indican of the indigo ferce and for increasing thereby, in the presence of alkalies, conjointly with rapid powerful oxydation, the production of indigo."

PAPER-MAKING was unknown in Europe three centuries ago, but in Japan they have made it for over 1,200 years.

THE trade in that useful article the Burmah pony at Rangoon is said just now to be very brisk. During this season the Shans brought down

225 ponies, which were sold through the agency of the Rangoon Pony Mart. The sales realized Rs. 34,200, or an average of Rs. 152 per pony. The demand at Madras appears to be even greater than in Calcutta, though certainly in the latter place the supply is not equal to requirements.

THE *Ceylon Observer* says :—The preparations for the approaching pearl fishery are actively in progress. Sample oysters have been gathered, and agents of Indian merchants are engaging houses at large rents.

AUSTRALIAN seed potatoes are finding their way in large quantities into Calcutta. A trial of these potatoes was made on a small scale, and proved most successful : hence the attempt to introduce tons. Edible potatoes in the North are scarce, while the greatest facilities for raising the esculent are offered both in soil and climate.

THE New Orleans *Times* reports having received from Ruatan three stalks of sugar cane measuring respectively 17 feet 9 inches. 16 feet, and 16 feet. The first had 57 joints, the other two 53 each.

THE manufactories of agricultural implements have doubled in the United States during the last ten years. In 1850 this industry gave employment to 5,361 hands. In 1880 it gives employment to 40,680.

THE cultivation of pampas grass, now so much used for decorative purposes, has become quite a profitable industry in Southern California. Three quarters of an acre planted in pampas grass yielded, at 2½ cents per head, 500 dols. Another grower sold all he could raise at 7½ cents per head. Last year 10,000 heads or plumes of this grass were sold from that region.

A BRILLIANT correspondent of the Putnam (Conn.) *Patriot*, who evidently cares little for agricultural matters, suggests the following themes for discussion by the Farmer's Club of Pomfret :—" Why do not cows sit down to rest the same as dogs ? Why does a dog turn round a few times before he lies down ? Why does a cow get up from the ground hind end first, and a horse fore end first ? Why does a squirrel come down a tree head first : and a cat tail first ? Why does a mule kick with his hind foot, and a sheep with its fore foot ?"

OFFICIAL PAPER.

MR. MARSHALL WARD'S SECOND REPORT ON COFFEE LEAF-DISEASE.

To the Hon'ble the Colonial Secretary.

SIR,—In preparing the report which I have now the honour to lay before you, my great difficulty is to select from the numerous facts accumulated, so as to place prominently those which appear to have the simplest and weightiest bearing upon the questions to be discussed. It is a source of satisfaction that none of these facts are opposed to the statements already made in my preliminary report, but, on the contrary will aid considerably in understanding them. I am justified not only in further insisting upon what was before brought forward, but also in thinking the newly-opened-up lines of investigation of the utmost importance to the inquiry into the causes of leaf-disease.

My time has been employed partly in the comparative study of various fungus forms occurring on cultivated coffee, and in collecting facts on estates, partly in the closer study of certain selected examples of these forms, in order to come to conclusions as to their real position in the research. I have accumulated much information relative to the soil, climate, and elevation of coffee in Ceylon, and am naturally in a better position to form judgments respecting the various methods of cultivation employed. Observation of the changes undergone by coffee over large areas from time to time is still yielding valuable results. The facts gained by microscopic analysis will be presented below, and are of the utmost importance.

As to the present aspect of the coffee districts south-west of Nuwara Eliya, a recent inspection was encouraging : with a few exceptions the trees were luxuriant in wood, and leaf formed during the moist season of the late monsoon. The wet weather experienced during the earlier months of this year appears to have played a considerable part in producing the dark green appearance of many estates, and it is probably matter for congratulation that a consequent production of leaf and wood has enabled the trees to gather strength and material for the work of next season. The short crop, partly consequent on the growing forth of flower-buds into leafy shoots during the wet weather, will probably tend to the same end, and the trees may be looked upon as having gained by the rest thus afforded them.

I shall have the honour of laying before you, in some detail, numerous experiments and observations, drawing what appears to be legitimate influences from them later : it is too soon to rest satisfied with even the best of these, but the careful securing of each step in advance must prevent hasty judgments on this difficult matter.

One group of these observations is of importance in aiding the diagnosis of leaf-disease, and in this connection will be given reasons for attributing certain appearances, commonly ascribed to the action of *Hemileia vastatrix* to other causes.

Sec. I.—"Pin-spots."

It is generally acknowledged that a severe outburst of the " rust " or spores of *Hemileia* is heralded by the appearance of pale yellow spots ; these are often detected only by holding the leaf up to the light, but are sometimes opaque, and have received the popular name of " pin-spots."

¶ 1. Microscopic examination of the substance of the leaf so affected shews some differences, according to the age of the spot, and various minor circumstances. In some cases, where the " spot " is hardly observable, the cells present little difference from those around ; in more advanced " pin-spots " there are often brilliant globules of large size, or masses of granular matter. Older spots shew a well-established, branched, coral-like mycelium, quickly spreading into the surrounding tissue. Still later certain branches become aggregated beneath a stomate, grow out together in a mass, and form groups of spores on the exterior.

I have found considerable difference in detail in different parts of the coffee districts, and hope to bring all under some general statement before long. Many coffee leaves present at times pale patches of one softer tissues, which are due to deficiency of green colouring matter merely : the is a phenomenon of the same kind as the " variegated leaf " so common in other cultivated plants. In one case, at least, the application of potash salts appear to have brought back the normal dark colour.

Sec. II.—The Second Spore (Teleutospore.)

¶ 2. In my preliminary report (§1) I described a second form of spore of *Hemileia vastatrix*, differing in important points from the well-known papillate spore constituting the main mass of the orange-coloured rust, and I also drew attention to the fact that it produces on germination a four-chambered structure (*promycelium*) whence arise four small *conidia* at the tips of lateral branches. This is not the place to discuss the scientific importance of this discovery ; but there are some points of fact which must not be passed over.

The smooth turnip-shaped spore arises late in the history of the disease spot, sometimes not until it has turned brown in the centre : it is produced by the same compacted mass of mycelium which produces the papillate spores, and consequently occurs intermingled with them on the rust patch. This mass of mycelium is constricted into a kind of neck where it passes through the stomate ; it then expands into a somewhat conical body which produces the spores from the ends of projections forming its sides and top ; in vertical median section the whole presents an appearance something like a *fleur-de-lys*. As the branches grow through the stoma, they appear to fuse laterally, and so form the productive head (*hymenium*) There appear to be no structures comparable to sexual organs.

¶ 3. This smooth, turnip-shaped spore is easily germinated in water, weak sugar solution, or more complex fluids, in all cases producing the same 4-chambered tube whence arise the 4 *conidia* : the tube varies in length according to the nature of the medium. These spores also germinate in the same manner while still attached to the coffee leaf, provided the atmosphere be damp and warm.

I can also get the *conidia* to commence germination in various fluids : in the best examples, however, nothing more than a short delicate tube has been formed. Sometimes, and especially in complex solutions, acicular crystals are deposited on the *conidium*. Though less readily than in pure water, these *conidia* will commence germination on the coffee leaf, but they soon die : I have never seen them germinating on estates. It is remarkable that they appear to form no structure on or in the coffee leaf.

¶ 4. Now there can be no doubt that these *conidia* play some part in the reproduction of the fungus, and it is of the greatest importance that this rôle be established. The smooth turnip-shaped spores which produce them are far commoner than I at first supposed though they occur in much smaller numbers than the pupillate spores which constitute the main mass of yellow " rust " I shall give reasons for believing that it is the latter which are the chief agents in reproducing the fungus on coffee.

Sec. III.—The " Filaments."

The greater portion of my time has been occupied with the study of various forms of fungoid growths found on the exterior of the leaves and branches of coffee as spores or filaments. As already stated (prelim. Rep. § 6) there are several different kinds of these, and a comparative examination of them over large areas has shewn that they vary considerably : about half-a-dozen are widely spread, and I have selected four of them as met with everywhere at different times.

¶ 5. It would be tedious and unnecessary to enlarge upon the less commonly occurring forms. Many of them are spores accidentally fallen on the leaves, which do not germinate there ; others start a slight growth in the adherent moisture, but not finding suitable media soon die ; a few appear to feed on the decaying remains of dead spores, &c., and are somewhat common on old disease spots. Of all these forms, not one shews any signs of doing harm to coffee : they belong chiefly to groups of fungi well known to be capable of living on dead and dying matter, but not able to destroy living plants.

However, from their general occurrence and vigorous growth on the outside of coffee, I may remark in some detail upon certain branching networks of delicate filaments, varying in quantity, modes of increase, and other characters. These are found chiefly on the under-side of green leaves in the moister weather, but also appear on the upper surfaces and on the branches, and, less abundantly, in dry weather. Their detection and comparison are easy, if the leaf be dipped whole in some weak colouring solution (iodine, magenta, &c.), which is absorbed by the filaments, but not by the epidermis of the leaf ; on stripping off the latter, the microscope reveals the filaments as coloured networks on a colourless field Prolonged study of these structures over all the coffee districts enable

me to state certain facts about them, which have compelled an entire reconsideration of the subject.

¶ 5. An examination of the drawings and notes made from the commencement of my work in February last, convinces me that there are four different kinds of these filaments; their distinction from one another depends on their modes of branching and jointing, their diameters and contents, the characters of the spores to which they are traced, and certain other peculiarities. It would be of no advantage to state these differences in detail without the aid of drawings; but as it is important clearly to apprehend the possible bearings of these structures on "leaf-disease," it is my duty to shew how far and with what results they have been traced.

They all arise from spores which, in shape, size, colour, and other peculiarities present no resemblance to the spores now known to belong to *Hemileia vastatrix*. Three (of the four) are easily grown in artificial solutions [illegible] in their modes of reproduction [illegible] nothing indicat[illegible] [illegible] general characters of growth, present [illegible] of relation to *Hemileia*. Even in cases where [illegible] branch blocks up a stomate, I can detect no junction with the [illegible] mycelium of *Hemileia*. Neither have I succeeded in establishing [illegible] relation between the prevalence of these filaments and [illegible] of "rust" patches (c.f. App., A. and C.) I am therefore of opinion that they have no genetic connection with the fungus in question.

The one filament of which exception is made above however, has hitherto given much trouble. I have not yet succeeded in making it bear fruit and have with great difficulty got it to grow at all in solutions. It arises from an oval septate spore many times smaller than a spore of *Hemileia*, and is usually tinged with olive when old it produces branches pretty regularly at right angles, from which short branchlets may arise and block up stomata in the neighbourhood. I have not traced any connection between these branchlets and the internal mycelium of *Hemileia*.

¶ 7. The nature of my work prevents the drawing of any conclusions except from observed facts, hence I am unsatisfied as to the relations of this filament until its fructification is discovered. Thus much, however, appears certain: the spore from which it arises has nothing to do directly with the papillate spores of *Hemileia vastatrix*.

The action of reagents upon these filaments is simple enough they are destroyed by weak acids and alkalies, solutions of carbolic acid, sulphurous acid (as evolved by the inter-action of sulphur and lime in presence of moist air), &c.

Sec. IV.—The Papillate Spores (Uredo spores).

In paragraph 7 of my last report it was stated that attempts to directly infect coffee plants with leaf-disease had failed: I have since been more fortunate, and after some doubtful trials have obtained a result in most respects satisfactory. I will premise by describing what occurs in experiments.

¶ 8. I have already (preliminary Report, §. 3) described the formation of germinal tubes by the orange-coloured particles of "rust," and used this fact as the basis for my statement that *each grain of the "rust" is a true spore* (*Uredo spore*), and I further stated that the contents of the spore pass along the tube and fill a swelling (simple or branched) formed on the tube. The reason why these germinal tubes have not been hitherto described, appears to be due to the extreme transparency of the empty portions, and to the fact that they grow somewhat rapidly and apparently, especially at night.

Numerous observations of these phenomena of germination have obtained more information. On the estates I find the yellow spores germinating in the water attached to the leaves—dew, rain, &c This is no more than should be expected, seeing one obtains such excellent results on glass slides and it also follows that they can germinate on the fallen leaves, &c., as I have actually observed

¶ 9. But there are some peculiarities about these germinal tubes on the living coffee leaf. They appear to form very quickly, and are shorter and less branched than those obtained on glass slides Very commonly they do not branch at all. They have nothing to do with the much finer and complex web of filaments commonly found on the leaf, as already described.

Very generally, especially on arriving at the orifice of a stomate, the end of the tube dilates into a swelling, usually simple, and the contents of the germinal tube pass into this, as already seen in glass-slide experiments. Sometimes, however, I find no such dilation, but the tube appears simply to empty its frothy granular contents (protoplasm) on to the leaf surface: similar masses which I have found before on leaves and slides may have this origin.

¶ 10. Experiments made from time to time throw still more light upon these facts. On growing these germinal tubes from the orange spores placed in various nutritive fluids other than pure water, certain difference of behaviour may be thus summed up: so far as I have proceeded a longer more branched and delicate tube appears to be formed in watery solutions containing traces of sugar, or the ashes of coffee, tobacco glass, &c., than in stronger and more complex solutions such as Pasteur's fluid,* sugar and minerals, &c., &c. The shorter tubes sometimes burst and emit their contents as clouds of granular matter on the slide. In some cases the spore emits such a mass without forming a tube. In all sowings a large proportion of the spores become empty without my being able to trace the fate of their contents.

¶ 11. Supplementary to these facts are a number obtained by sowing yellow spores on the leaves of young coffee plants grown in pots and kept as clean as possible. The spores were taken from vigorous, rapidly-formed spots of "rust" and placed in drops of pure water on the lower surface of the leaves chosen; these were young, and as vigorous and healthy-looking as I could get. After certain intervals, I took a small sample of the mass of spores sown, and examined with the microscope: on finding that the spores had germinated and thrown out tubes freely, I cut slices from the leaf substance over which the sowing was made, and so observed the changes in the interior. Similar observations have been made on clean quickly-grown shoots, cut off and placed in pure water under glass.

In most cases I find germination vigorously going on after 24 hours, provided the conditions of moisture are kept up—the drying up of the drop of water in which the spores are sown must be prevented by damp cells, or slowly dropping water from a siphon. Not all, but a (variable) number of the spores germinate thus readily, and at the completion of the process the surface of the leaf is found strewn with empty, papilliate, colourless remains of the spores and a number of greyish frothy masses of protoplasm, while here and there are remains of germinal tubes so transparent as to be hardly distinguishable. Over some, often many orifices of stomates occur the swellings before spoken of they have the appearance of bladder-like vesicles, often wrinkled, and with remains of germinal tubes attached In early stages the germinal tube may be traced from the bladder-like swelling to the [illegible] empty papillate spore-remnant, looking as if twisted or wrinkled [illegible] by the contraction of its delicate walls

¶ 12. [illegible] Sections of the leaf vertical to the surface not only confirm what has been described as seen from above, but also shew that the contents of the spore and tube pass into the swollen vesicle, and thence, after a short [illegible] Here they are to be recognised as a greyish [illegible] granular and irregular mass from which the coral-like mycelium [illegible] some one [illegible] details [illegible] which require still further [illegible] upon one point of importance [illegible] which do not thus penetrate the stomata

¶ 13. I will now give in some detail an account of an experiment upon which the above facts bear directly On the evening of September 11th, I placed in a Wardian case a well-grown plant of *Coffea arabica* in its pot it bore [illegible] pairs of fine dark green, clean-looking leaves Every precaution was taken to ensure the absence of fungus spores from the case, soil, and plant and as always, the only water used was previously boiled and filtered. On the under side of one of the topmost young leaves I made a small sowing of yellow spores ("rust") taken fresh from a new disease patch, adding one drop of pure water; a small glass cell was then placed over the sowing, and gently held in place by a brass clip The glass-roof of the Wardian case was then closed tight, the whole stood in a well lighted room, of which the average temperature was 78° F.

On September 13th, early in the morning, an examination of a small mass of the sown spores taken on the point of a needle showed that the spores had vigorously germinated and thrown out tubes on the [illegible] surface of the leaf in all directions.

By September 30th most of the spores had germinated, though some still remained apparently unaltered, many appeared to have lost their contents without developing tubes Among the *débris* of empty cases were several other fungal filaments, apparently vegetating on the mass of remains The weather had been dry for some days and the interior of the Wardian case was somewhat dry, but the plant showed no signs of drooping The most careful scrutiny failed to discover any external appearance of disease, and on holding up to the light no "pin-spot" or other sign could be detected.

On October 16th, however, a pale yellow spot of some magnitude was observed close to the area on which the sowing of yellow spores had been made five weeks previously, and in the centre of this a few rosettes of yellow spores were making their appearance. The plant was somewhat drooping from hot dry weather

On October 19th a well developed patch of "rust" was evident, and already the centre had become tinged with brown

On November 15th the spot was quite brown, and very few spores (orange rust) were to be seen the remainder of the leaf, and all the other leaves showed no external signs of leaf disease, but were still of a bright green colour and to all appearance vigorous *

¶ 14 This experiment is selected as being peculiar in several respects, In the first place (assuming total absence of spores at the commencement) the yellow spores were confined to a small area of the leaf. Secondly, no motion caused by wind or rain could have brought yellow spores And yet lastly, the disease patch, when it did come was developed in the particular area selected—and this area was *on a very young leaf* There are difficulties, and great ones, in dealing with objects as minute as these, but all the facts are in accordance with the view that in this experiment I *propagated the disease by means of the yellow spores directly*. If the disease spot had arisen from spores blown by the wind or otherwise conveyed on to the plant, it is difficult to explain why it arose on the particular part selected of a young topmost leaf, and nowhere else; for it will be noted that the disease spots, as usually found, occur first on the older lower leaves. We must either suppose the apparently improbable falling of some spore during an incautious exposure on the very spot selected, or accept the view taken above—a view which is intelligible in the light of the other facts given (c.f. App. B).

Sec. V.—On the action of the Fungus upon the Cells of the Coffee Leaf.

In this connection I propose to consider the facts at present discovered, which throw light upon the phenomena of growth and increase of the "coral-like mycelium" in the well-known yellow diseased-spots: I have also much to say respecting the smaller so-called pin-spot but this will be more conveniently deferred for the present.

¶ 15. On cutting sufficiently thin sections of somewhat advanced disease patches in which the internal coral-like mycelium is vigorously developed, I have discovered certain organs by means of which the contents of the cells of the coffee leaf become transferred to those of the fungus. Such tapping or exhausting organs (*Haustoria*) are formed on a common plan. Within the cavity of a cell of the leaf is a minute pear-shaped or sub-globular body, connected by a delicate tube *which passes through the wall of the cell* into a branch of the mycelium of the fungus: according to circumstances and the age of the various parts, this structure is hollow or solid. When fully developed; the intra-cellular globular portion is hollow and contains a few bright granules, the tubular neck long, and the piece of mycelium where they join closely applied to the outer wall of the cell: all these parts are colourless

Now it is possible to demonstrate that as this exhausting organ increases in size and age, the contents of the leaf-cell in which it occurs gradually diminish in quantity—that, whereas the leaf-cell at first presented orderly arrangements of fluid and solid, coloured and hyaline parts, each with its functions for the carrying on of work and life, we at length find either an empty shell or a mere mass of brown vegetable matter.

In some cases I find one of these organs in a cell, at other times two or even three; and in a well-developed specimen almost every cell has its walls pierced by them.

¶ 16. Putting the above facts together, they appear not only to confirm the statement made in my last report (§ 2), but to shew the *modus operandi*, by which "the tubular branched mycelium of the fungus has been feeding upon the contents of the leaf-cells," as there stated. Having thus pre-

* A complex solution of tartrates, phosphates, &c., with sugar and ammonia, well-known as very nutritious to ordinary fungi.

* Up to December [illegible] no other rust patch appeared on this plant.

vided itself with food robbed from the plant, the mycelium at length grows rapidly underneath the stomata and forms peculiar compact masses which grow together through the orifices: from such a mass the orange-coloured spores are produced by successive budding in great quantities forming the main mass of rust so easily dispersed.

In this manner the leaf becomes rapidly exhausted of its cell-contents and the beneficial effect it exercised upon the plant as an elaborating and producing agent is materially lessened; not only is it robbed of much material, but its life is shortened in many cases, and the double work thrown upon it (so to speak) has to be accomplished in a shorter time. But the damage done to the leaf cells, and therefore to the leaf as a whole does not end with the mere removal of matter: the manner in which functional processes depend upon one another has to be taken into consideration also, and great injury must result from so profound a disturbance of the nutritive elements in the plant as has been indicated above.

¶ 17. In tracing the action of *Hemileia* on the leaf, and the results of premature destruction brought about by it, it cannot be too strongly urged that the leaves of the plant are the organs in which are prepared those materials necessary for the production of fruit and fruit-bearing parts of the plant. If we can show that of two sets of leaves otherwise equal, one set contains more of these materials than another, we are justified in pronouncing the former set to be more useful to the plant as cultivated.

The materials in question are chiefly carbohydrates and nitrogenous matters and the former (substances allied to starch and sugar) are especially dependent upon healthy leaf action for their formation and proper distribution.

Some information on this head may be gained by examining the results given by Mr. Hughes in a report to the Planters' Association (c.f. App. D.). According to his analysis, the solid matter in diseased leaves is sometimes much less by weight than that in healthy ones, if compared under similar conditions; the solid constituents of the diseased leaves were found to be different in proportions, and probably therefore in arrangement.

Now it is easy to shew that the above conclusions, arrived at independently, are in accordance with my own microscopic analysis. If the contents of the leaf-cells pass into the tubes of the fungus, and thence, undergoing change meanwhile, into the spores which are shed in such profusion, and if those substances also are used in building up the structure of the fungus, we have no difficulty in understanding the changes in quantity and proportion of the constituents. The fungus is composed of nitrogenous and carbonaceous matters similar to those of the leaf-cells; it absorbs such material from the leaf cells, and it throws off large quantities in the numerous spores so profusely shed at intervals; unless, therefore the leaf cells can supply both this drain on their contents and also the natural demands of the plant on their products, it is clear that either the fungus or the coffee tree must suffer, if only from want of nutrition.

Another point of interest is that certain easily decomposable carbonaceous materials in the healthy leaf have been found to suffer a large decrease in diseased leaves, while a considerable increment of another carbonaceous substance (cellulose) was found to occur in the latter, as had also certain nitrogenous matters. This is quite in agreement with the fact, that the mycelium and spores of the fungus have their walls composed of such a carbohydrate, and contain such nitrogenous matters as have increased; if the leaves examined contained a large amount of mycelium, &c, we should expect just such an increase of these materials.

There are many and great difficulties in trying to explain the detailed differences of analysis, but I feel justified in concluding that the above facts, are all in agreement and tend to the same conclusion.

Sec. VI.—The Fall of Leaves.

The question how far this unseen damage to the leaf cells becomes visible to the unaided eye, may well be raised. It is the almost universal opinion of planters that the fall of leaf is now much greater and more frequent than formerly, and is directly due to leaf-disease (c.f. App. E. F. and G.).

¶ 18. I have had occasion to notice and compare several cases of leaf showers, and, so far, they appear to vary in several respects. In some cases a large and sudden fall of leaves has occurred over considerable areas of green coffee, on reaching the ground the leaves appear dark green on the whole, but examination shews a mottled appearance such as is so common before the "rust patches" appear on the outside. In many cases I can detect the fungus mycelium inside, and consider its action the main cause of the fall, isolated trees, here and there, being in great part exempt from both disease patches and leaf-fall. In other cases, where the brilliant orange rust comes out suddenly on the still attached leaves, the connection between the "virulence" of the disease and the rapid and large leaf-fall cannot escape attention; in a short time the whole branch may be almost denuded of leaves, from below upwards.

¶ 19. But in the more usual case, where the fall of leaf is distributed over a long period, there can be no doubt that other factors complicate the question: though the leaf-fall may be very large, and is always in the main from below upwards, it is very improbable that "leaf-disease" is the sole cause, and others can readily be detected. It is generally admitted that a large proportion of the leaves of coffee always turn yellow during the last stages of crop, and at length fall in showers—the autumn of the coffee in effect; now it is a common occurrence to find a tree with much crop and few leaves standing next to one with plenty of leaves and no crop or very little. In such a case the fall of leaf, however much hurried by the action of the fungus, is partly due to the same causes as are always recognised in the maturity and decay of leaves; the tree with no crop preserves its leaves longer, and this not because it has no leaf-disease, but because the sum total of drains upon the contents of the leaves is less than in the above-cited example. But in many other circumstances of the many under which coffee is grown, I find other causes at work also. Wind not only aids in detaching weak leaves, but, by drying and stunting them it helps to bring about the weakened condition—the smaller deformed leaf does less work for shorter periods. Damp soil, drought, &c., act in various ways to the same end.

Sec. VII. The effect of Leaf-fall on the Branches, &c.

¶ 20. The "dying back" of branches, &c., is a feature of diseased coffee much insisted upon by the planters, and I have devoted considerable attention to it during my journeys. A good example was afforded by the Jamaica coffee plants referred to in my preliminary report (§ 1); the majority of these became so badly affected with disease that they succumbed. The lower leaves rapidly dropped as the "rust-spots" turned brown: progressing upwards, the fall of destroyed leaves occurred faster than the formation of new ones by the apical bud, until at last only one pair of leaves remained, even these being diseased. This imperfect pair of leaves not being sufficient to keep up any large flow of sap in the single thin stem they shrivelled up, together with the upper part of the stem, turning brown and "dying back." There are several peculiarities here; as always even when rapidly progressing, the advance of the disease-wave is forward—the leaves most affected are almost invariably the oldest and lowest, and the fall of leaf occurs at the lowest parts first. It is commonly complained of that "young plants suffer more from the disease than older and well-established trees." If by this is meant that they shew more quickly and obviously the extent to which such damage as the above is done, it appears to be generally true; but I find no evidence to shew that they are in any way more susceptible to the attacks of *Hemileia* than well-established coffee. It is, however, true that taller trees can easily shed spores from their greater height on to young plants in the neighbourhood, and though the surface of the latter is less, it will probably be the more fully occupied: the period of inter cellular life enjoyed by the fungus may also be lessened by the total food supply being less, and hence a rapid outcome of yellow rust gives the impression of greater virulence on a small plant. On a larger plant though the fall of diseased leaves is quite as great on each twig, it is not so soon remarked (c.f. App. G.)

But when the fall of leaf reaches a limit and the young plant has but one apical bud, a rapid drying up of sap in the upper parts may be fatal; whereas when similar denudation occurs to the various lateral branches of a larger and well-established tree, the total flow of sap up to the whole mass of terminal buds may be sufficient to carry on the work of leaf-formation longer, and a drying up and consequent dying back be delayed or even prevented.

¶ 21. The importance of the leaves to the branches and stem which support them cannot be too strongly insisted upon in this connection. When crop is on the trees, the groups of fruit situated in the axils of the leaves are also to be looked upon as deriving nourishment from the latter through the branch, and when leaf-disease is bad—as is commonly the case during the period that crop is maturing—some explanation is possible according to the above statements, for the leafless and shrivelled condition of many branches. Exhausted on the one hand by crop, and on the other by fungus, no wonder the leaves become rapidly poor in food materials, turn yellow, and fall all along the branch up to the terminal bud; whatever sap then flows upwards will be used by the crop, and never reach the bud, which consequently dies. Hence the branch dies back in its upper part, and a greater or less quantity of fruit also; while in other cases the starved crop is "light."

¶ 22. As might be expected, there are several sources of complication. A simple case is when a rapid fall of leaf occurs during the middle stages of crop from coffee on dry soil; the flow of sap is here not vigorous, and a dry twig is soon all that remains on the end of the branch. In deep soil, or under more favourable conditions of shelter, &c., an actual drying up of the end twig may not take place, but the want of leaves diminishes the amount of woody fibre formed, and a result is "bad wood." Nevertheless I often find the crop mature, apparently from the flow of sap in the tree generally being vigorous.

Another case may be selected from damp districts, where the leaves often fall in immense quantities during the prevalence of the fungus "rust." Here the denuded branches have no means of ridding themselves of surplus water, and a rotting back of the wood may take place: such cases may be attended by scorching in the midday sun, especially if the wind is dry.

It will thus be seen that numerous evils arise directly from a large fall of leaf, and that the details may be complicated in several ways. Wind, especially in high situations where the soil is dry and poor, may be even more disastrous than ordinary drought: not only does it dry up the parts but aids in the more effectual stripping of the branches by tearing off weakened leaves.

¶ 23. Into the outer dying portions of such branches as I have referred to, a fungal filament is commonly found penetrating the rotting tissue; this fungus is one of a group which can only feed on dead or dying matter, and is incapable of injuring the healthy branch. Its "fructification" is soon accomplished as the very minute black dots so often shewn to me on estates: as the branch becomes black and shrivelled, they are not easily seen, but on rapidly dried "bad wood" they shew up well on the greyish ground. This fungus is the same as the one producing the black dots so numerous on old, dead, or dying disease patches on the upper surface of leaves: in the latter case they penetrate the brown rotting mass brought about by the ravages of *Hemileia*, but have, of course, no connection with it.

¶ 24. But there are still other secondary phenomena dependent on the fall of leaf: in young coffee plants it may happen that the leaves fall during a hot dry period, and a drying up and final destruction of axillary buds be produced. This occurs sometimes with one-year-old plants early deprived of their leaves—protecting as well as sustaining organs and a woful want of secondaries may result: such a state of things means loss of time as well as strength until equivalents are produced to say nothing of damage to the shape of the young tree. A similar result may be brought about by damp rotting off the injured buds.

¶ 25. Yet other evils, especially on damp subsoils, arise from those enumerated: where the loss of leaf becomes so great that transpiration is not sufficient to prevent a general dampness and coldness of the plant, the roots and lower part of the stem may rot to a greater or less extent. I have had occasion more than once to examine such trees, and can refer the evil to no other causes. Nevertheless cases occur where the age and treatment of the trees, and a general history of the estate point to other causes at work in no way connected with leaf disease. I find great difficulty in getting the necessary information in some of these cases, not from any fault of the planters at present on the estates, but on account of the age of the coffee and the many changes of circumstances it has undergone. There can be no doubt, however, that heavy crops in the past, the effects of wash, ill chosen manuring or even none at all, as well as the great age of the trees, have had some effect on the present state of affairs. It is no valid argument to speak of old coffee now doing well, unless it is at the same time shewn that such coffee has undergone as great hardships and is at present no more favoured than the other. At the same time the marvellous power to reinforce itself that the coffee tree exhibits, may justly be insisted upon where other things warrant it, and it seems impossible to doubt that the mitigation of leaf-disease would be followed by a rapid improvement in the crop-producing capacity of coffee.

The fact must not be overlooked—and this point is of importance with respect to heavy manuring—that the continual renewal of leaf calls forth great energy on the part of the tree, and it no doubt follows as a direct consequence of this that the crop-producing capabilities of the tree are for the time lessened.

[Here follow Mr. Ward's summary and appendix which will be given in our next number.]

SELECTIONS.

MOVEMENTS OF PLANTS.

MOST people will no doubt be surprised to learn that plants have any power of movement at all. We have always been taught that one great distinction between plants and animals is that the latter have the power of movement, while the former have not. But there are movements and movements; and the kind of movement in which plants are deficient as contrasted with animals, is that of locomotion. So far as observation has hitherto gone, plants have no power of changing their place by their own impulse. But with this exception, the readers of this, the latest work from the fertile brain of our greatest biologist, will learn that every part and every organ of a growing plant is in a state of ceaseless motion. All Mr Darwin's works have a family likeness. Starting with some suggestive fact or idea, he records a long series of experiments conducted with the greatest precaution and delicacy, and from those he deduces, with the greatest caution and reserve, the most obvious conclusions to which they point. Such also is the method of the work before us. One or two German botanists have noticed that certain parts of plants are constantly moving, in a special kind of orbit to which they have given the name of circular nutation. The point of the leaf of a growing plant, for example, describes during the twenty-four hours a small orbit, more or less elliptical, and in the case of climbing plants creeping round their supports, this course is approximately circular. Mr Darwin and his son Francis, who has himself already done some remarkable work in botanical research, have for some time been conducting a long series of experiments to discover what is the real nature of this curious elliptical motion, to which they give the name of circumnutation, and to what extent it prevails among the various classes of plants, and the various organs by which plants carry on their functions. The conclusions which they have been able to reach are very remarkable. The motion of the root downwards in the ground, the motion of the stem upwards to and in the air, the motions of the leaves from day to day, the peculiar nightly set of leaves known as sleep, the tendency of leaves to seek the light, the action of gravitation, and so on, are all modifications of this one movement of circumnutation, adaptations of what seems a primitive innate motion, to suit a great variety of circumstances. The tiny rootlet or radicle emerging from the seed, gyrates as far as it can in its earthy home, ever tending downwards, but seeking out invariably the path of least resistance, and the soil from which it can extract the greatest moisture and nourishment. The embryo leaf-bearing stem, in the same way, oscillates upwards to the light, and when it spreads out its two first leaflets, these also begin their career of oscillation in the open air. And so with every leaf and petiole and other part as it comes forth, until every detail of the growing plant is in a state of constant elliptical motion. Here is Mr. Darwin's graphic account of the phenomenon:—

"Our seedling now throws up a stem, bearing leaves and often branches, all of which, when young, are constantly circumnutating. If we look for instance at a great acacia tree, we may feel assured that every one of the innumerable growing shoots is constantly describing small ellipses, as is each petiole, sub-petiole, and leaflet. The latter, as well as ordinary leaves, generally move up and down in nearly the same vertical plane, so that they describe very narrow ellipses. The flower peduncles are likewise continually circumnutating. If we could look beneath the ground, and our eyes had the power of a microscope, we should see the tip of each rootlet endeavouring to sweep small ellipses or circles as far as the pressure of the surrounding earth permitted. All this astonishing amount of movement has been going on year after year, since the time when, as a seedling, the tree first emerged from the ground."

Mr. Darwin's experiments were made on plants belonging to the most diversified classes, so that he is justified in concluding that the varied movements he noticed in these are common to nearly all plants. Among the special kinds of movements investigated by him are those to which plants are subject under the influence of light and those which are peculiar to the leaves of certain plants on the withdrawal of light and the approach of night. The tendency of plants to seek the stronger light is well-known, and Mr Darwin made many experiments in reference to this characteristic. Even the very smallest amount of light has an influence on most plants, though in many experiments it was found that after bending towards a strong light, a feebler light failed to unbend them in an opposite direction. In the case of seedling plants—such as the bean, say—Mr. Darwin found that the sensitiveness to light dwells in the tip of the stem and that if that were cut off from the source of light the lower part of the stem refused to expand to its influence. In the root, also, it is the tips of the radicle and the subsidiary roots that are the sensitive "feelers, so to speak," and if these tips are cut off, the remaining parts are practically motionless. Indeed so important is the function of the tip of the radicle, and so sensitive is it to the slightest touch or pressure, and so marked is the influence it transmits to the rest of the radicle, that Mr. Darwin likens it to the brain of the lower forms of animal life. With regard to the sleep of plants, Mr Darwin records a long series of observations in the volume before us. The conclusion he comes to is that it is not the mere absence of light that leads to these leaves assuming a vertical position at night either by rising up or drooping down. "The [illegible] sence of light or its absence cannot be supposed to be the direct cause of the movements, for these are wonderfully diversified even with the leaflets of the same leaf although all have, of course, been similarly exposed. The movements depend on innate causes and are of an adaptive nature. The alternatives of light and darkness merely give notice to the leaves that the period has arrived for them to move in a certain manner. We may infer from the fact of several plants not sleeping unless they have been well illuminated during the day, that it is not the actual decrease of light in the evening, but the contrast between the amount at this hour, and during the early part of the day, which excites the leaves to modify their ordinary mode of circumnutation." The object gained by all the varied positions assumed at night is, Mr Darwin tells us, the protection of the upper surfaces of the leaves from radiation, often combined with the mutual protection of the several parts by their close approximation. The so-called diurnal sleep of some plants, he finds, is merely a twisting of the leaves to avoid receiving the glare and heat of the sun on the upper surfaces, to which it would be injurious.

But whatever may be the object or the special nature of the various motions to which the different parts of the plants are subject, Mr Darwin comes to the conclusion from his long and varied series of experiments, that they are all adaptations to suit special circumstances of the one primitive motion which he has called circumnutation—one more proof of the great law of natural selection and the tendency of all living things to adapt themselves to their surroundings. It would take much more space than we can spare to give anything like an adequate idea of the varied subjects treated of under the apparently simple title of this work. Mr Darwin here shows no falling off in that marvellous power of observation and induction which has marked all his previous works, and we hope he will still be long spared to exercise a power which has led to a revolution in the methods of science and changed the whole aspect of modern thought and research.—*[illegible] M. G[illegible]*

MR. THOMAS BOLAS, ON INDIA-RUBBER.

INDIA-RUBBER or caoutchouc possesses properties so widely different from those of most other substances, that it became an object of very great interest as soon as it made its appearance in the civilised world and its industrial importance has rapidly increased as the knowledge of its remarkable characters, and manifold applicability has become more extended. At the present time, caoutchouc holds such an important position with regard to the economy of modern arts manufactures that were it suddenly to be withdrawn from circulation many minor industries would in consequence cease to exist, while numerous large and important branches of handicraft would languish until arrangements could be made to adapt their operations to the altered circumstances. It is, however, during the last forty years that India-rubber has enjoyed its greatest triumph as an industrial agent, that is to say since the art of vulcanisation was discovered and perfected by the labours of Charles Goodyear, Thomas Hancock, and others.

The earliest rumour of the existence of caoutchouc reached Europe 500 years ago, the first visit of Columbus to Hayti having brought to light the fact that the natives of this island were in the habit of making playing balls of an elastic gum. Nothing more appears to have been heard of India-rubber until Torquemada, rather over 2[illegible]0 years ago, described the Mexican Indians as not only making playing balls of India-rubber, but also as fabricating helmets, shoes, waterproof fabrics, and other articles of elastic gum. This writer gives some details as to the collection of the juice and the making of various articles from it, thus giving us the first view of the India-rubber manufacture as a branch of industry. We do not hear however of samples of India-rubber reaching Europe until long after this and little more appears to have been learned regarding the substance until the celebrated French naturalist, La Condamine, made a communication to the Academy of Sciences at Paris concerning caoutchouc, he having had ample opportunities of studying the subject in Para. In the memoir in question, La Condamine gives very detailed particulars regarding the Para India-rubber tree, the collection and treatment of the juice, and the methods made use of by the natives for the production of various articles of caoutchouc. He tells us that the substance in question was used for making torches, these being only an inch and a half in diameter by two feet long, and yet burning for 12 hours. Again we hear of the use of India-rubber for the making of playing balls and it appears, that the natives were in the habit of using enemas or injection bottles made of caoutchouc.

Soon after La Condamine's communication to the Academy of Sciences, samples of India-rubber frequently reached Europe, and scientific men began to make investigations regarding this remarkable body. Between 17[illegible]0 and 1770, we find Fresneau and Macquer studying the subject, and the last-named investigator made tubes and other articles of caoutchouc by dissolving it in ether and coating moulds with the solution, so that a solid skin of caoutchouc should remain adherent to the mould, on the evaporation of the solvent.

From this time until the end of the eighteenth century, the India-rubber industry may be considered to have been undergoing its period of gestation, and to have been born with the dawn of the present century. Among the first of the important patents regarding the utilisation of the caoutchouc, is that granted in 1823 to Charles Macintosh, for dissolving the substance in coal oil or coal naptha, and the use of this solution as a waterproofing agent.

About the same time, elastic webbing was first made with threads, cut from the raw-rubber and other minor applications of caoutchouc to the industrial arts were adopted from time to time, until the great discovery of vulcanisation inaugurated a new epoch in this branch of industry rendering it possible to so far alter caoutchouc, as to make it capable of resisting, to a great extent, the action of the heat on the one hand, and cold on the other.

The milky sap of many plants contain caoutchouc, suspended in the form of minute transparent globules, these being frequently as small as 1-20,000 to 1-80,000 of an inch in diameter; but comparatively few plants contain sufficient caoutchouc to render them important sources of this body.

The trees which yield the largest supply of the best quality of caoutchouc consist of various species of Heveas which flourish in northern districts of South America especially in the province of Para, some portions of the banks of the Amazon being crowded to an extraordinary extent with Heveas. The abundance of the India rubber trees in Para may be judged of by the fact that this province alone exported 7,840 tons of caoutchouc in the year 1876; more than half of this being sent to Liverpool.

Among the Heveas most productive of caoutchouc may be mentioned the *Hevea brasiliensis*, which flourishes in Para, and yields some of the finest caoutchouc, and often attains a height of 60 to 70 feet, with a diameter of nearly three feet, the *Hevea guianensis*, a similarly magnificent tree, is likewise abundantly productive of caoutchouc, and the *Hevea spruceana*, a smaller tree, which grows almost exclusively in the province of Para.

The operation of collecting the juice is as follows:—A series of cuts being made through the bark of the tree, either shells or clay vessels are attached to receive the exuding milky sap, and when sufficient of this has been collected, the operation of drying it is performed in the following manner. A kind of wooden—bat thinly covered over with clay, is dipped into a pail filled with the juice, and the bat, thus coated is held over a fire, fed with certain wild nuts which, in burning, give off abundance of aromatic smoke. As soon as the first layer of juice has become indurated this bat is again dipped, and the drying operation is repeated, layer after layer being thus dried on the bat, until a thickness of nearly an inch is attained. A knife-cut is now made in the bottle or biscuit of caoutchouc this is opened so that it can be removed from the wooden bat, and exposed to the air to become still further indurated. Para caoutchouc, prepared in this manner has a fragrant aromatic odour.

The residues of juice left in the various vessels employed, the scrapings of the incisions together with other materials which the ingenious native thinks he can shuffle off on the unsuspecting merchant as caoutchouc, are made into balls and sold as "negro head." The negro head rubber is frequently made into crude representations of animals, and several specimens of this kind of native art have reached this country.

The milky juice of the Para rubber trees, has approximately the following composition:—

Caoutchouc	...	32
Albuminous, extractive, and saline matters	..	12
Water	...	56
		100

As a rubber producing tree *Ficus elastica* stands next in importance to the Heveas. The *Ficus elastica* grows abundantly in India and the East Indian Islands—one district in Assam, thirty miles long by eight miles wide being said to contain 43,000 trees, many of them attaining a height of a hundred feet. This tree also grows freely in Madagascar, and it is well known to us as a green house plant.

The juice of the *Ficus elastica* contains a little less caoutchouc than that of the American trees, the proportion very often falling as low as ten per cent of the juice.

A vine-like plant, the *Urceola elastica*, which grows abundantly in Madagascar, Borneo, Singapore, Sumatra, Penang, and other places, yields a considerable amount of caoutchouc of very good quality. Africa yields a considerable quantity of caoutchouc generally soft and of inferior quality. It is believed to be yielded by various species of *Landolphia*, *Sicus*, and *Totuoj kleu*.

The commercial value of the various qualities of rubber may be estimated, to a certain extent by calculating the loss which the raw material undergoes during the operation of washing, and also by noticing how the various samples are softened by a long continued gentle heat.

Caoutchouc is nearly colourless and when in thin layers, tolerably transparent. Like very many other substances, it contains nothing but carbon and hydrogen, but its properties differ very widely from those of other hydro carbons almost identical in composition. It has been found to contain in one hundred parts, 12·8 of hydrogen and 87·2 of carbon. Caoutchouc, as might be supposed, burns very readily, and leaves no residue. It is soft and very imperfectly elastic, in the true sense of the term, that is to say it does not return to its old dimensions after having been considerably stretched.

As regards the stretching of India-rubber, there is a point at which it requires a greatly increased force to stretch it, and at this point it seems to become fibrous in texture. India-rubber has valuable electrical properties it being an admirable insulator, and having a great tendency to become electric by friction.

Freshly cut surfaces of India-rubber cohere very strongly when brought into contact.

Either French chalk or soapy water is of constant use in the rubber factories, to prevent the adhesion of new surfaces of caoutchouc to other substances or to each other.

BAT'S GUANO.

MERELY to adopt any improvement in agriculture may be considered indicative of a fair amount of intelligence, for the rustic mind is, all the world over, averse to novelties or improvements; and the mind of the Indian rustic is, to say the very least, no exception to the rule. The ryots of Chennur, therefore, on the banks of the Pennar river, a little to the north of Cuddapah, deserve some credit for adopting the use of bat manure, which is said to have doubled the produce of their paddy-fields. But from a paper contributed in 1878, by Dr. Voelcker, Consulting Chemist to the Royal Agricultural Society of England, to the journal of that Society, —for a perusal of which we are indebted to the kindness of a gentleman whose attention was attracted by a letter we published last week,—we learn that "Bats' Guano" is found in Arkansas and Texas, in the south of Spain, in Jamaica, on several islands belonging to the group of the Bahamas, and on several East Indian Islands.

"Bats' guano consists of the more or less decomposed dung of bats, and of their dead bodies, mixed with variable proportions of earthy matter. It varies in colour from light brown to dark brown, and generally smells but faintly of ammonia. Some samples are light, powdery, dry, and full of fragments of the wings of insects; others are heavy, earthy in appearance, and quite void of smell."

"This fertilizer is found in caves inhabited by innumerable bats, attracted to the neighbourhood of caves by swarms of insects, which infest certain swampy districts in semi tropical countries and which afford abundant food to the winged mammals. The most extensive accumulations of bats' guano appear to have been found in numerous rocky caves in Texas and Arkansas. Some of the caves yield comparatively little guano, others many hundreds of tons, and from 15,000 to 20,000 tons are reported to have been taken from a single cave in Texas. The number of bats frequenting the caves amounts to millions, and when they issue forth, they darken the air as if a great volume of smoke were pouring out from the opening. Caves covering miles of ground and inhabited by innumerable bats, are also found in Arkansas, and there can be no doubt that the caves in Texas and Arkansas contain large stores of bats' dung of sufficiently good quality to be usefully employed for agricultural purposes."

The results of chemical analyses were very various—so various that we can neither quote nor summarize them. The quality of bat guano seems to depend partly on the kinds of insects that form the food of the bats, and partly on the character of the caves which they frequent. Caves with rocky sides and floors probably supply better guano than caves whose sides and floors are earthy. Whatever be the cause the character and market-value of bats guano are very variable. 'Bats' guano includes manures, some of which contain as much as 10 per cent of ammonia, and others only 1 per cent and even less, and which differ in value from £3 per ton and even less, to £11 a ton and upwards. Some kinds that contain very little ammonia derive what value they possess from the proportion of phosphates that they contain.

Bat manure is found in Penang, and is there known by the name of "Type water." It is said to be adulterated by Chinese dealers; and the only specimen analysed by Dr Voelcker was very poor in ammonia, but rich in phosphates and salts of potash containing 33 per cent of phosphate of lime and 6 per cent of alkaline salts, including nearly $2\frac{1}{2}$ per cent of potash. Ceylon where, "including the frugivorous section, about sixteen species of bats have been identified, ought to contain abundance of bats' guano. Sir J. Emerson Tennent writes:—" The multitude of bats is one of the features of the evening landscape. They abound in every cave and subterranean passage, in the tunnels on the high ways, in the galleries of the fortifications in the roofs of the bungalows, and the ruins of every temple and building. At sunset they are seen issuing from their diurnal retreats to roam through the twilight in search of crepuscular insects, and as night approaches, and the lights in the rooms attract the night flying *lepidoptera* the bats sweep round the dinner table, and carry off their tiny prey, within the glitter of the lamps."

The idea of bat farming was thrown out by our correspondent. The guano hitherto in use in agriculture is deposited by troglodyte or cave-dwelling bats, which are also insectivorous. The essentials to the culture of these creatures would be meat to eat and caves to dwell in, or instead of caves, tunnels would answer but the locality chosen for them must abound in insects, such as humid or swampy tracts of land containing forest, or at least scrub or jungle trees. These abound on the Western Coast of India and may be found on the Coromandel coast. In the Western Coast, the need of a manure is hardly felt, for the soil is fertile, and fish manure is used. Yet the planters have introduced the use of bone manure, and this might be greatly extended by the distribution of a few bones outside the caves of the bats which they largely in skins. To return however, to our bats, if it be found that they have a taste for mango fruits or the fruit of the mango, to others besides agricultur ists. What must be there are in India must be eaten up by birds, and the dep osits of the soil with away by the rains. Bats' caves would preserve the fertilizing matter for the husbandman. There is a class of bats known as flying foxes. Though their teeth and habits shew that they feed on insects, yet they are mainly frugivorous, and dwell in trees hanging from their branches. But it is doubtful whether their deposits are of much value as manure. The culture of these creatures would not be difficult if it were worth attempting, and this could easily be ascertained by Mr Robertson and a chemical analyst.—*Madras Times*.

PERUVIAN GUANO STATISTICS.

IT is roughly estimated that the nitrate beds of Peru contain about 60 millions of tons. Those of Bolivia, thus far known, are, although large, inferior in extent to the neighbouring ones in Peru. In Northern Chili some 3,000 tons per annum are exported from deposits already reported. It is not improbable that extensive nitrate deposits may yet be found in Argentine Patagonia, able to compete with those of Peru. In 1878 the estimated tonnage of the southern deposits of guano was as follows:—

	Tons.
Huanillas	1,000,000
Point Lobos	200,000
Pabellon De Pica	350,000
Chipanabay	250,000
Add for the Lobos Islands	600,000
Total	2,400,000

Other deposits of great extent have been reported, but their cubic contents and market value are doubtful. The average annual consumption of Peruvian guano during the ten years from 1869 to 1878 inclusive, was about 345,000 tons. The consumption of nitrate by the North Atlantic nations is shown by the following table of Peruvian shipments:—

	Tons.		Tons.
1866	99,440	1873	284,715
1867	115,925	1874	255,783
1868	86,659	1875	326,869
1869	113,957	1876	320,491
1870	133,790	1877	213,940
1871	163,903	1878	250,000
1872	200,943		

—*South American Journal*.

ARTIFICIAL MANURES.

A GREAT deal of useful practical information has been written on this subject; also a lot of theoretical humbug, based on popular fallacies. In some of the communications I am sorry to notice an undercurrent of envy, or, at all events, ill feeling, towards scientific men, such as Dr. J. B. Lawes, Dr. A. P. Aitken, and Mr. Jamieson, all of whom have laboured earnestly to elucidate the question of the economical use of artificial manures—a question which I am sorry to say receives even yet too little attention from the agriculturist, take an average all over the country. I honestly believe that not less than one-third of all the artificial manures used are misapplied; and yet farmers are to be found who will write, speak, and sneer at those who are labouring hard to save their money.

The value of the results conducted by the scientific gentlemen I have just named can hardly be over-estimated, as forming a general guide to the economical use of artificial manures, but with variety of soils and climates, under different conditions of cropping and previous manuring, considerable variation both of quantity and proportion of constituents of an artificial manure are necessary to grow full crops, therefore the results of the experiments to which I have alluded are only applicable in their entirety to the immediate districts in which they have been carried out, or to similar soils under similar conditions, and are only useful otherwise in a general way as scientific facts.

Soils in an ordinary condition of fertility generally possess, to some extent, every plant food constituent necessary for the growth of the ordinary crops of the rotation. But some of the most necessary constituents may be present in very small proportion, whilst others may be there in superabundance; and as most practical farmers are, or ought to be, aware, the bulk of a crop does not depend on the presence in the soil of a single plant food constituent, but on all the necessary constituents being there in proper proportion. In fact whilst the bulk of a crop depends on all the essential ingredients being there in the right proportion, an excess of any one of them may, and very often does, prove injurious instead of beneficial to the plant. The manure applied, therefore, ought to aim at supplying any deficiency of these constituents, and the one most suitable for doing so will most undoubtedly give the best and most economical results.

Analysis to certain extent may assist the farmer in forming an idea of the deficiencies of his soil, but cannot always be relied on as a correct guide, and may often be misleading, as it very frequently occurs that plant-food is present in considerable quantity in the soil, and yet not in a condition to be available for being absorbed by the plant. Thoroughly reliable results can only be had by practical test in the field, and as these only apply to soils under similar conditions, &c., as already stated, they should be repeated in every district.

In reference to the ground phosphate question, I can positively affirm, from personal experience in the field, that it is both a valuable and economical fertilizer for the turnip crop; this year having given better results than superphosphate on several farms in central Forfarshire. I will quote an example on one of these farms, with a light, sharp soil. Crop, yellow turnips, natural produce of the soil, 185 cwts per acre of bulbs; addition of 2½ cwt of finely ground tribasic phosphate produced 429 cwts at a cost of 19*s.* 6*d.* per acre. The further addition of 1 cwt of pure (kelp) sulphate of potash, at a cost of 10*s.*, further increased the production to 533 cwt per acre. The still further addition of 1 cwt sulph. of ammonia, at a cost of 19*s.* 6*d.* raised the produced to 580 cwt per acre. The total weight of the triple plot was 29 tons per acre of roots and 92 cwt per acre of shaws, at a total cost of 49*s.* an acre.

The corresponding plots treated with superphosphate (same weight of phosphate) gave, on an average of three plots, 68 cwt less of roots, and 16 cwt less of shaws, at a increased cost of 1*s* an acre, being additional cost of super over the ground phosphates. On some of the other farms, where the soils were heavier, the results were more nearly equal.

I never had the opportunity of testing soluble against insoluble phosphates on heavy clays, but would readily believe from my experience on medium soils, that heavy clays would give much worse results with ground phosphates than medium soils, while light sharp soils would give much better results. I am far from saying that the saving to be effected by the use of ground over soluble phosphates is to be a panacea for the existing distress; but on soils suited for its use, it is likely to be a considerable saving in the manure bill, if ground down to an impalpable powder, which alone constitutes its principal value, its source being a very secondary consideration to its mechanical state of division.

Applying *rough ground* phosphates at the rate of 10, 15, or 20 cwts per acre, as some of your correspondents seem to imply they have done, and expect miraculous returns from the application, is simply absurd. As a matter of fact this rough mechanical state of division of insoluble manures generally receives far too little attention. I had this very clearly proved during the past season on one of the farms to which I have alluded. The tenant applied a well-balanced mixture of nitrogen, potash, and phosphates, at a cost of 6*s.* an acre. This manure, generally speaking, would have been said to have been in a fair state of division, but was very rough as compared with that used on the triple plots to which I have already referred.

The result was a crop no better than ground phosphate alone, and 6 or 7 tons worse than the triple plot, at a cost of 49*s* per acre. I ascribe the bad results mainly to bad state of division, and also to the combination of some of the manurial ingredients, the nitrogen in the one mixture being mainly from raw bone, while in the other it was a soluble salt. The potash was from kainit in the one, and from kelp sulphate in the other.

In reference to potash the results I have obtained from kelp or seaweed sulphate, as compared with muriates and chlorides, or mixtures of them, as are frequently found in foreign sulphates or refuse of factories. I find I have more profit to use the kelp sulphate in preference to the others, even with a difference in cost of 20 to 25 per cent. As may naturally be supposed, this difference in price is apt to entice dishonest vendors to offer the one for the other.

I can quite understand what your correspondent "B" wrote the other week in regard to [illegible] that should be much more largely used for the growth of turnips and potatoes.' I have frequently advocated this in your columns during the past few years. I do not mean to say that it will apply to every district, but I find in this district farmers are becoming gradually alive to its importance as a fertiliser for the crops, and last year there would be 20 tons used for 1 ton used five years ago; the increasing demand for this salt is the best evidence of the results produced by its use. I believe many districts do not require it, but that can easily be known by test in the field. Central Forfarshire is certainly not one of these, as potash in a soluble condition is present in a very small proportion in the natural composition of the soils.

Instead of each individual farmer giving his isolated experience of this manure or that manure, farmers ought to combine in each district, and conduct experiments with manures for their own guidance. I am quite convinced that much might be learned in regard to the economical use of manures by following out this system, and that reliable results might always be had on which the whole district might rely, by having several duplicates here and there over it.

The expense of conducting these experiments properly is very considerable, but unity is strength, and I am quite certain it would both repay labour and expense a hundred-fold. It would, to say the least of it, be more in unison with this age of progress than snarling and snapping at every one who has the moral courage to emerge from the old beaten track in the manuring of his crops.—THOMAS LAWSON in *N. B. Agriculturist.*

PLANTS AND FROSTY WEATHER.

SOME observations made at Giessen last winter by Herr Hoffmann throw light on the way in which plants are injured in time of hard frost. The great advantage of a hilly position was then apparent; the plants so situated took little or no harm, while quite near, in the valley, there was extensive injury. The injury, too, decreased in proportion to elevation above the valley. Some tender fruit trees placed in specially favourable circumstances on the low ground withstood the lowest temperature (23 deg. R.) Still more instructive was the fact that one and the same bush—*e.g.* of *buxus* or *thuja*—was killed in its foliage on the south side, while on the north side it remained green. The author infers that it is not a particular degree of cold (determinate for each plant species) that kills a plant, but the amount of quick thawing. This sudden variation of temperature was in the cases considered some degrees less for the plants in a high situation and for the shady sides of the half-killed shrubs. It is immaterial (Herr Hoffmann says) whether the thawing be caused by a warm wind and at once or daily repeated by the sun. On December 23 at Giessen, in the valley, the air temperature was raised (by a south-west storm with rain) from *minus* 17 deg. in the night, to *plus* 3 deg. at mid-day. On the hills the thawing wind acted with the same high temperature, but the previous cold was less. The effect of thawing by the sun could be observed on pear trees in the middle of December, long before the thawing weather came, they were killed by the daily variation of temperature of over 20 deg from the night *minimum* to the day *maximum.* Herr Hoffmann also considers that when plants are thoroughly frozen the killing takes place as surely whether the temperature of the plant be raised—*e.g.*, 20 deg.—from *minus* 17 deg. to *plus* 3 deg., or from *minus* 10 deg. to *plus* 10 deg. With each degree of less variation the injury is proportionally less, and for each species the fatal amplitude of variation is special and determinate.

BULANDSHAHR FAIR—1881.

THE annual Government Horse Show and District Fair of Bulandshahr was held from the 22nd to the 26th February, under the management of the Collector, Mr. Growse. We take the following account of the fair from the *Pioneer*:—The fair is yearly increasing in importance, and the one just over was the most successful yet known. A considerably larger number of horses and mules were brought for exhibition than in the previous year, and being of good quality met with a ready sale at remunerative prices. The District Show, properly speaking, comprises an exhibition of cattle, agricultural produce and implements, and manufactures. The show of cattle was small, the wholesome rule having been enforced that prize winners of previous years should not again be allowed to compete. Some handsome bulls were exhibited and a few cows and buffaloes, sheep, goats, fowls, and pigeons. In produce there was the excellent white wheat of the Meerut division, oats (which are commonly grown in the same part of the country) pulses, fibers, dye-stuffs, and a good though rather short stapled cotton. Amongst the implements were several kinds of adapted ploughs exhibited by Mr. Martin, Mr Crawley, Mr. Gavin Jones, and the Department of Agriculture, which also brought forward an adapted winnower, which should in time obtain a ready sale. An essay might be written on the comparative merits of the native and the adapted English ploughs, and of deep and shallow ploughing; but a stricter test and more searching examination is required than was here possible before any decided opinion can be arrived at. Amongst the manufactures were specimens of carving from Khurja, Saharanpur, and Bijnor, painted woodwork from Muttra, satins and pottery from Azimgarh, carpets, durries, lacquer work, and odds and ends of curiosities which native gentlemen delight in collecting.

The influence of such shows and gatherings cannot be over estimated; they are the best if not the only means by which the Government can work out the improvement of the yet unlettered millions, socially, agriculturally, and [illegible]. Whether sufficient use is yet made of them in this direction may be doubted; more might be done by a carefully worked system of supervision. But so far as it goes, that of the Bulandshahr district is the best of any of the district shows or fairs in these provinces.

AGRI-HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday the 17th February, 1881.

W. H. COGSWELL, ESQ., *President, in the Chair.*

THE proceedings of the annual meeting were read and confirmed,

The following gentlemen were elected ordinary Members :—

Messrs. C. Duke, W. Martin, T. J. Kallonas, and Bhupendra Bahadoor Sing, Rajah of Kuntil.

Honorary Member.—Mr. T. Lewis Bernays, V.P., of the Queensland Acclimatisation Society.

The names of the following gentlemen were submitted as desirous of joining the Society :—

Major the Hon'ble E. Baring, R.A , C.S.I.,—proposed by the President, seconded by Mr. G. L. Kemp.

H. H. Shiwaja Rao Holkar, first Prince of Indore,—proposed by the President, seconded by Rajah S. A. Ghosal, Bahadoor.

C. E. Fendall, Esq., Forest Department, Phillour,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Baboo Lalit Mohun Rays, Zemindar of Chakdigrah,—proposed by Mr. F. Wyer, C.S., seconded by Baboo P. C. Mittra.

Edward Poppè, Esq., Calcutta,—proposed by Mr. W. H. Cogswell, seconded by Mr. J. W. O'Keefe.

R. Williamson, Esq., Messrs. Finlay Muir & Co.,—proposed by Mr. Cogswell, seconded by Mr. W H. Pigott.

Baboo Hem Chunder Gossain, Serampore,—proposed by Baboo Joykissen Mokerjee, seconded by Baboo P. C. Mittra.

The General Manager—Indian Glenrock Gold Mining Company, Devala,—proposed by Mr. S. Jenings, seconded by the Secretary.

Re-joined.—Thos. Hindmarsh, Esq., Kanchraparra. F Schiller, Esq., Calcutta, and the Hon'ble Mr. Justice Cunningham,

CONTRIBUTIONS.

Seeds of Cypress and Cryptomeria. From the Superintendent Botanic Garden, Saharunpore.

A small assortment of seeds from Botanic Garden at Trinidad. From the Director.

A healthy plane of *Cyclamen Persicum.* From T. M. Francis, Esq.

A plant of *Magnolia grandiflora.* From C. Nickels, Esq.

Seed of *Cassia magnifolio* and of a good species of *Musa.* From L. A. Bernays, Esq.

ANNUAL FLOWER SHOW.

The report of the Judges (Dr. G. King, Messrs. G. L. Kemp, W. Pigott, and Baboo P. C. Ghose) on the Show of Flowers held in the Society's Garden, on the 3rd February, was submitted—

. . . .

The Council reported that the usual annual show of vegetables and fruits could not be held last mouth in consequence of the lower basement of the Town Hall being occupied, and there being no other covered space of sufficient size, in a centrical position suitable for the purpose.

POTATOES FROM MELBOURNE.

The Secretary mentioned that having obtained a small consignment of potatoes from Melbourne (32 maunds) in tolerably good condition for planting out, he had lost no time in transferring the whole, at prime cost, to Messrs. Lloyd & Co., who had immediately despatched them to their Tea Gardens at Darjeeling, and promised to communicate the result in due course.

MANILLA HEMP.

Submitted the following circular from Surgeon-General Edward Balfour on the subject of the Manilla Hemp plant:—

Mr. Liotard, of the Agricultural Department of the Government of India, has this year (1880) reported on the materials in India, suitable for the manufacture of paper. Several of the fibre-yielding plants are mentioned by him and; amongst others, various species of the genus *Musa*, of the plantain or banana tribe, many of which have been grown in the East Indies from the most remote times. At pages 54 to 58 he describes the introduction, in February 1858, of the Manila hemp plant, direct from the Phillipines, into the Madras districts, by Colonel (now Sir George) Balfour, Nevertheless the Import Trade Returns of the United Kingdom show a large and continually increasing delivery of hemp from the Phillipine Islands now averaging yearly about 20,000 tons, valued about half a million of sterling. I have ascertained from the London Produce Brokers through Dr. Birdwood of the India Office, that this important article is the true Manilla hemp from the *Musa textilis*, that the bulk of it is delivered in London, where it is made up into cordage and ropes for ships, especially for yachts' running rigging, being very light, strong, and clean, and also for clothes lines. But there is no doubt that the Manilla hemp plant, *Musa textilis*; grown as well in British India as other species of the plantain or banana genus, and that British India could, in a couple of years, supply the London market with all that it could take of Manilla hemp fibre. The prospect of benefiting British India by creating an export trade from it of the extent and value above indicated, might well incite to considerable efforts to attain success. In 1861 to 1863 the Madras Revenue Board made continuous efforts to secure the naturalisation of the plants which Colonel Balfour had introduced ; but their efforts seem to have been effectual only in the Wynaad, from which, by 1877, the Conservator of Forests replied that the Phillipine variety had been introduced on several of the coffee estates, where it grows remarkably well, and no doubt is felt there as to the value of its fibre. The attention of the Boards and Commissioners of Revenue, and of the Agri-Horticultural Societies might be re-directed to this plant.

Year.		Cwt.		£
1877	..	332,304	..	458,069
1878	..	421,160	..	551,856
1879	..	337,657	..	434,037

The Secretary stated that *Musa textilis* was grown for several years in the old garden of the Society, but it did not progress satisfactorily, and the cultivation was eventually abandoned.

MUNJEET.

Read a letter from Messrs. J. Perrin of Berhampore seeking information regarding the article Munjeet. "Can any one of the Society"—writes Mr. Perrin—"give me some information regarding a plant called Munjeet (vern. Munjista); It is much used by native dyers as a substitute for madder, and like the latter gives fast colours. It is usually imported from Assam or Bhootan, I am told, but so irregularly that at times (it is the case now) it is impossible to procure in Calcutta or elsewhere. Perhaps you or some Members of of the Society might know whether the plant could be cultivated in Lower Bengal. If the attention of the tea planters of Assam, Darjeeling, or of the Hill Stations was called to the usefulness and mercantile value of the plant, they might introduce it in their garden. I hear it is now exported from Calcutta."

The Secretary submitted a full memorandum on the subject which he had sent to Mr. Perrin, who thankfully acknowledges it, and "the most interesting and useful information it contains. We use here Munjeet regularly for silk printing, but as it is imported very irregularly from up-country, we remained months without being able to procure some ; hence my wish to inquire whether it could not be introduced in the plains, but I see it is out of the question."

Agreed that this memorandum be published in the Number of the Journal now in the press.

OPIUM CULTIVATION IN THE HIMALAYA.

Submitted the following remarks from Captain J. F. Pogson on this subject :—

British India, with its varied fertile soils and climate is capable of producing sufficient opium of all kinds to supply Europe, Asia, Africa, Australia, and all America,

The demand for first class opium for medicinal purposes increase daily ; and, though the Himalaya cultivators are able to produce it, no effort is made to throw this most valuable description of opium into the London market. The bunneahs have the entire poppy cultivation and opium trade in their hands, and the practical result is their enrichment and the hopeless impoverishment of the cultivators.

I will give an example on the large scale, In the British Himalayan province of Kishteewar, miles and miles of land are annually placed under poppy culture, The very large quantity of first class opium which results is sent, or smuggled into China, *viâ* Ladak and Thibet ; and thus a leak of perhaps not less than fifty lakhs of rupees is steadily taking place in neglected and unknown portions of opium-producing British territory.

The Thibet and Hindoostan road, begins at Kalka, and the tracing ends at *Shipkee* on the Chinese Frontier. A road, such as it is, connects *Kishteewar* with the valley of the Sutledge in Kanawur, (Upper Bussahir) and so join the Thibet road line. Now if a regiment of Pionéers were sent to open out and improve the existing road, and another half regiment of Pioneers were sent to open the road to *Shipkee* so as to fit it for mule traffic, the opium of *Kishteewar*, produced under the superintendence of an opium Agent (B.C.S.) could be sent to *Shipkee* and a regular frontier trade in opium and merchandise established between British India, *viâ* Simla and China. Of course every inducement and facility should be offered to Thibetian and Chinese traders to visit Simla ; and, as it is perfectly legitimate for the Government of India to convert an illicit intra-Himalayan opium trade with Thibet and China into a legitimate traffic, all parties concerned would be benefited, and the Government especially so.

The *Kishteewar* poppy cultivation would be taken out of the bunneeah's hands and all the zemindars released from their thraldom. The production of first class medicinal opium for export to Europe and America would speedily follow ; and as such opium should be sold at a Government Opium Mart to be established at Umritsur, the representatives of London firms would purchase, readily and largely, an opium rich in morphia and other valuable medicinal alkaloids extant in superior opium but deficient, or entirely absent, in the opiums of Bengal and Behar,

I maintain that it is quite possible for the Indian Opium Revenue to be increased to twelve millions sterling from its present figure, leaving Malwa opium duty out of the calculation. But to secure such results, action, and not useless and prolonged correspondence should be the course selected for adoption.

Letters were read—

1. From Major S.S. Jacob ex-Engineer Jeypore, enclosing a letter to his address from Dr. Schwenfurth of Cairo, asking for certain seeds, and offering to reciprocate.

The Secretary mentioned he had been able to meet this requisition partially, through the kind assistance of Dr. King.

2. From the Director, Department of Agriculture, N.-W. P., applying for a certain quantity of American Cotton seed. Application put in hand.

3. From the Manager, Ceylon Company, "Limited," acknowledging receipt, in excellent condition, of a quantity of *Ficus elastica* plants.

4. From Dr. Geo. Henderson, Rawul Pindi, suggests the distribution by the Society of seeds of *Pinus longifolia* throughout India. The tree thrives well—" remarks Dr. Henderson" in most parts of India, down as far as Purneah, and I think it has succeeded about Calcutta. The only difficulty about raising the trees is that they take about two years to attain a height of one foot, and if the top is injured, their growth is greatly retarded. There is no tree in India more worthy of cultivation, whether for shade, ornament, fuel, or timber, and it thrives from Peshawur and Calcutta. I would suggest that you call the attention of Railway officials to it ; they might grow it all along their lines and at Railway Stations." (Application for seeds made to Superintendent Botanical Garden, Saharunpore.)

5. From the Conservator of Forest, Central Provinces, applying for a small quantity of indigo seed. (In course of compliance through the kind assistance of Messrs. W. Moran & Co.).

6. From the Director, Department of Agriculture, North-Western Provinces, applying for information in respect to judging the merits of ploughs and their working, in anticipation of experimental ploughings which are about to be made in certain stations. (Complied with through the kind assistance of Dr, Lynch.).

7. From Capt. J. F. Pogson, returning thanks for his election as an Honorary Member.

8. From L. A. Bernays, Esq., notifying his resignation of the office of V. P. of the Queensland Acclimatisation Society, and expressing his willingness notwithstanding, to continue to render any aid in his power to the Society. Mr. Bernays has been most kind for some years past as his contributions to the garden will shew, and his offers are thankfully accepted.

9. From Capt. Pogson, respecting the introduction of certain food grains and economic plants into the Himalaya. (Transferred for journal now in the press.)

10. From the Secretary, British Indian Association, acknowledging receipt of one hundred copies of extract from the Society's Annual Report, and promising to distribute them.

11. From Messrs. Sutton & Sons, Reading, in reply to complaint of the non-germination of many of the flower seeds supplied last year. The following extract of their letter :—

"We exceedingly regret to hear that you have unsatisfactory reports about some of the flower seeds.

We are quite at a loss to account for it, and should be greatly obliged to you if you could give us every possible information on the subject.

We have kept particulars of every sort of seeds sent, and can trace each one to the grower.

We never took more pains than we did last year in the execution of the order. In fact as our foreign trade is rapidly increasing we are extending our facilities and have a special staff now always engaged in the work. Every lot of seed sent you was proved to germinate well just before it was packed and that it should have gone off growth so soon afterwards is inexplicable to us.

We can only suppose that the disastrous harvest of 1879 has something to do with it; and that though the seeds grew well enough for the first six months after they were gathered, yet that we had not sufficient sun to thoroughly mature them and enable them to retain their growth until they were sown in India full 12 months afterwards.

Any way we can assure you that we esteem it such an honor to supply your Society, that it is with the greatest possible regret we learn that we have not been successful this season as in previous years."

For the above communications and contributions the best thanks of the Society were accorded.

MINERALOGY.

A COMPANY is being formed locally for the discovery of gold in the Bombay Presidency. The precious metal is supposed to exist in the Southern Mahratta country.

THE Lahore paper says that the Palamow Railway and Coal Field scheme is all but sanctioned by the Supreme Government.

SAYS the *Madras Times* :—Arvenghaut, of Brewery fame, it is reported, contains gold. This valley, as our readers know, debouches into the Coonoor ravine, and has always been reckoned admirably adapted for a tea or cinchona estate. Mr. Withers has discovered gold on the Brewery ground, and it is believed that an offer for the premises of Rs. 60,000 was refused.

IN our last issue we stated that the Japanese Government had indented for a large amount of mining machinery from San Francisco to develope the gold mines on the Island of Sado. We now learn that—

To a small extent, these mines have been worked by machinery for the last ten years, altogether at a loss from a financial point of view. The main shaft is sunk to a depth of 600ft., and two of the mines are connected by a gallery 3,000ft. in length. The ore contains from 50 to 2,000 yen worth of gold per ton (one yen equals 4s. 3d.) During the last year the amount of ore reduced was 6,428 tons, yielding 2,195 oz. of gold, and 91,743 oz. of silver, at an expenditure of 85 per cent.

THE *Siam Advertiser* mentions that reports were current in Bangkok that gold has been discovered in one of the northern provinces of Siam, and that a rich specimen was recently brought to Bangkok. The great mineral wealth of the country has long been known, although, like the diamond deposits of Borneo, the locality where it has been found to exist is systematically concealed, and hence these mineral resources are likely to remain undeveloped for many years to come.

IN his annual report of the Department of Mines, New South Wales, Mr. Thomas Richards of Sydney says, that the falling off in the yield of gold in the colony is due to causes other than exhaustion. The principal causes, probably, are the small number of persons now engaged in gold mining; the want of means or enterprise to carry on extensive exploration; the gradual exhaustion of such of the deposits within the older gold fields as are within the reach of the miner unaided by capital; the want of capital, appliances, and skill to work systematically and economically those deposits which cannot be profitably worked without their aid.

GOLD-MINING is an industry that is attracting great attention in Tasmania. At a small township in the vicinity of a paying gold field, which a short time ago was a wild jungle, land for building allotment has been sold at £820 per acre. A recent quartz crushing at the Royal Tasman Reef in the Mount Cameron country, hitherto known as a mining district which no one suspected contained even the colour of gold, yielded over 20 ounces of gold to the ton; and several other valuable reefs have been discovered in the neighbourhood.

IT is common to consider the quantity of gold in the world to be large. But there is only £7,000,000,000 worth, which is about half pure gold and half silver. The annual production is about £100,000,000 worth, and the production has decreased 44 per cent during the past thirty years. The production of silver, however, has increased 100 per cent, and now equals that of gold. One-third of the gold goes to wear-and-tear, one-third goes into circulation, and one-third into arts and manufactures. All the gold in the world would make a pile only 25 feet wide, 45 feet long, and 25 feet high.

PETROLEUM IN ARAKAN.

THE report on Revenue Administration for British Burmah 1879-80 has just been published, and contains some interesting information regarding the earth-oil trade of Arakan. The Borongo Oil Refining Company, Limited, seem to be the largest workers with suitable machinery. They have as yet only disposed of small parcels of the crude oil in Calcutta, Rangoon and Chittagong, and they experience powerful opposition from the holders of the King of Burmah's oil monopoly, who always have a large stock on hand which they sell dear or cheap according to there being any other oil in the market. As yet it is too early to speculate on the success or otherwise of the Company, but with a proper refinery at work, if they only get a sufficient supply of the crude oil, they should be able to undersell any imported article. Several oil wells are worked by Arakanese in a rude fashion in the Akyab district. In one instance an Arakanese who said he had paid Rs. 700 for a well, acknowledged to having made a profit on its working of Rs. 2,000 in the space of one year. Many of these wells, imperfectly sunk as they are, yield from 5 to 6 maunds of crude oil a day. The oil obtained in the Akyab district wells differs considerably from the Borongo oil which is the colour of brown sherry. The Akyab wells produce a greenish grey oil said to be much richer in lubricating qualities, and for that reason sought after for various manufactures. It is said to be used extensively in some process of jute manufacture, and the attention of some firms in Calcutta and Chittagong has been directed to it, whilst the Commissariat Department have also given extensive orders for it.

FORESTRY.

ON the 21st January last, Sir Richard Temple at the Society of Arts read a paper on Forest Conservancy in India. Sir Richard said that in this country about 60,000 square miles of land were in charge of the Forest Department, and that in a short time the area would extend to 100,000 square miles in Southern India and Burmah. The meeting was also addressed by Dr. Cleghorn, Sir Joseph Fayrer, Sir William Robinson, and others. Dr. Cleghorn, it may be remembered, about twenty-five or thirty years ago had charge of the Forest Department in the Madras Presidency. It was he who impressed upon the consideration of the Government the great necessity for carrying out an effective system of forest conservancy which has now grown into a large and important department. We shall endeavour to give a *resumé* of Sir Richard's paper in our next number.

IT is stated by the Famine Commissioners in their Report, that only about 24,000 square miles out of the 1,472,857 square miles of forests contained in British India, are as yet absolutely protected from injury, and devoted strictly to legitimate forest uses under special legislation. As to the Madras Presidency they say :—"It is much to be regretted that the introduction of a Forest law has been so long deferred in Madras, and we trust that measures for protecting the existing forest tracts from denudation, and for obtaining power to reserve suitable areas for pasture, which may be so important in their relation to future seasons of drought, will speedily be undertaken in Madras with the same energy and judgment which are being displayed elsewhere."

Two German philosophers have discovered that the trunks of trees undergo daily changes in diameter. From early morning till early afternoon, there is a regular diminution till the minimum is reached, and the maximum diameter is attained at twilight. Then succeeds a diminution till an increase is noted at dawn—an

increase more marked than at twilight. The variations are found to be inverse to the temperature, the maximum of the one corresponding with the minimum of the other, and so on.

THE CAMPHOR FORESTS OF SUMATRA.

THE *Straits Times* has the following interesting description (translated from the Batavia *Dagblad*) of the trade, especially in camphor, between Baros (W. Sumatra) and Singapore, written by a correspondent at the former places.

" The Chinese here are doing a good business in benzoin, gutta, rattans, and camphor, which are brought down in great quantities by the independent Battaks from their forest clad mountain, and which are, to this day, mostly exported to Singapore without there being any bother about customs export duties; buffalo hides, in which, however, the transactions are few, being the only article subject to an export duty. The Battaks bring the three first named valuable articles in plaited rattan baskets, which they carry slung from the extremities of a bamboo laid on the shoulder. As return freight they bring away from this, much salt and other necessaries. The appearance of the Battaks I saw here was not particularly pleasant, and they excited my antipathy, especially from the circumstances that actually, though to a limited extent, they are cannibals. The camphor of Baros is renowned throughout all Netherlands India, and has given its name (Kapur Baros) to all sorts of this article of trade. It distinguishes itself by its peculiar strength and a relatively trifling amount of volatility. Under similar conditions a given quantity of Baros camphor loses by evaporation only a fourth part of its weight, in the same time that as large a piece of Japan camphor wholly evaporates. Hence the former is an article in great demand, and brings high prices. Not unfrequently Baros camphor is sold at Singapore for 10,000 guilders per picul. Especially amongst the wealthy Chinese there, it is greatly in demand for embalming the bodies of their relations whom they intend to send to China for burial in their native land. It is found in small crystallised pieces and thin layers amongst the fibres of the camphor wood, and is usually offered for sale in that condition after removing the coarser woody articles and other foreign matter. Trees containing a very considerable quantity of this costly product are comparatively rare. Most of the camphor trees contain it in such a thinly distributed condition that it can be only extracted by boiling, as is the case with the Japan description. The Battaks are very skilful in finding out trees abounding in camphor, and dislike the slow boiling process. They, too, desire greatly to earn as much money as they can in the shortest possible time, in order, afterwards, to enjoy a longer rest. In Sumatra, camphor wood is not only used for making the boxes by which many persons who have returned to Europe are recognised there, when travelling, as being from the East Indies, and according to which are determined the prices they have to pay at lodging houses, &c.; but also as timber. That people are not sparing with it, is apparent from the fact that the great bridge over the Batang Taro river, now under construction, is wholly made of this wood. Although not particularly hard, it is of great use for building purposes, because many species of insects, the white ant being the most dreaded, which in these districts manage to destroy all other kinds of wood with wonderful rapidity, leave the camphor wood untouched. The smell of camphor is plainly perceptible in the chips which fall off on preparing the wood, and even in the leaves though not very strong when rubbed small.

It is a pity, however, that the natives living in the midst of this bountiful gift of Nature are using it up so carelessly, that, if they are not in time brought under control, an end will soon come to this productiveness. At present, the dense forests of Battak Land still contain hundreds of thousands of camphor trees, but the Battak cuts away recklessly, without a thought of the future, and without planting fresh camphor trees. In the same way an end will soon come to the present large stock of gutta in the Sumatran forests. What is found most abundantly in these districts to the East of Baros and Singkel, is the valuable benzoin, that fragrant gum which is utilised for incense and other scents. I saw astonishing quantities of it in the Chinese warehouses at Baros. In hundreds of cases this article is shipped to Singapore—that centre of the trade of the Far East. The benzoin is bought, unprepared, from the Battaks, usually at 1·40 guilder per catty. The scent of this gum is very agreeable, and it is a pleasure to stay in the store-houses, where it is sorted and then carefully packed after being plentifully sprinkled with water. Remarkably enough, the Battaks take great care that other benzoin trees shall rise up to replace those cut down. For in fact, they have nothing else to do than to burn the stumps and scatter the seeds in the ground. The planting of gutta and camphor trees appears to require more trouble and care,—more at least than is compatible with human labour and duty in the opinion of the Battaks."

GARDEN.

THE coming mango season in Bengal, it is expected, will be one of great plenty. Up to the present time the mango groves all along the railway line from Rajmahal to Howrah give fair promise of an an abundant crop.

THE vintage of France for 1880 was an unsatisfactory one, and the effects of the vine disease are still being severely felt. The yield last year was 2,000,000 hectolitres below the average of the last ten years. The imports in consequence have risen very rapidly. For the first eleven months of 1880 they reached 6,400,000 hectolitres. Prior to 1878 they had never amounted to 1,000,000.

THE Frenchmen who believe in the possibility of converting sunshine into mechanical power, are continuing their experiments in Algeria. They are adapting the solar boiler to the distillation of alcohol from Barbary figs. Of course there will be no expense for fuel; the figs cost next to nothing; the refuse serves as food for cattle; and alcohol will be produced at the rate of two hundred litres a day. Much advantage is anticipated; for at present Algeria imports thirty thousand hectolitres of alcohol.

THERE are 400 orange groves in the neighbourhood of Jaffna, which are irrigated, the machines for the purpose working day and night for seven months in the year. The expense of working and watering an orchard is £40 per annum, and 5,000 people are employed on the 400 gardens in the picking and packing alone of oranges. Could the cost of irrigation be cheapened, the number of gardens would probably be doubled in a short time.

AZALEA MOLLIS.

EVERY year confirms the opinion we gave in these papers some years ago that this would prove an invaluable plant for winter flowering by means of forcing. It is now annually imported from the Continental nurseries for forcing by thousands. It is especially useful for conservatory decoration, being less useful for cutflower purposes, owing to its liability to fall soon after being cut, except the flowers be gummed immediately. The beautiful tints of colour, every one of them soft and pleasing, form fine accompanying contrasts to the higher coloured hyacinths, rhododendrons, scarlet pelargoniums, and Ghent and Indian Azaleas, with which they are usually associated in the conservatory in winter time. The same plants may be forced year after year successfully, if carefully managed and cultivated during the growing season which succeeds the flowering season. They are generally ruined for want of the necessary care and protection during the cold months of winter and spring that follow after the forcing period. When flowering is over, they should be placed in a light and comparatively airy position. If necessary, also, they should be shifted into large sized pots at this time; but they may be grown well in comparatively small pots, as one of seven or eight inches diameter is capable of accommodating a plant carrying forty or fifty heads of flower. They should undergo a gradual hardening process in May, and be placed out of doors in June in a sunny spot, where they will enjoy shelter from strong winds. Keep them well supplied with water till their leaves begin to change colour, when it should be gradually withheld to prevent any inducement to premature growth, which in forced plants is very liable to occur if autumn is prolonged and warm. The better to prevent this, they should be placed behind a wall or hedge facing north. Throughout the growing period they should be treated to mild liquid manure three times a week.—*N. B. Agriculturist.*

THE ORIGIN OF THE TOMATO.

MANY Americans think that the luscious tomato had its origin in this country because it is so freely used here, and that it has become quite recently an article of food. The origin of the vegetable, or fruit, as some claim that it is, is not positively ascertained, though there is reason to believe that it was first found in South America, and that it was cultivated centuries ago in Mexico and Peru. Several varieties were known in England towards the close of the sixteenth century, and Gerard, the surgeon and botanist, speaks of it, we think, in his "History of Plants," having himself introduced it into the Kingdom as an exotic. Dodens, the Netherland herbalist, mentions the tomato as early as 1583 as a vegetable to be eaten with pepper, salt, and oil. It belongs to the nightshade family, and was used in cooking by the Malays more than a century-and-a-half since. It is extensively raised in Southern Italy, and employed there as an accompaniment to nearly every dish, particularly to macaroni. But neither there nor anywhere else in Europe is it commonly eaten, as it is here, separately and in quantities. In England it is a sparingly produced, requiring a hotbed in spring, and in consequence is high-priced. The Italians formerly called it golden apple, and now call it love apple, as it was once designated in this country. The appearance of the tomato on the table has greatly increased in Europe in the last few years; but in no land is it a regular dish—much as it is used for sauce abroad—as in the United States where it is also pickled, preserved, and confected.—*American Paper.*

CHENOPODIUM A SUBSTITUTE FOR ASPARAGUS.

THIS old English vegetable has gone out of cultivation very much during the past half century, though it is still grown by a few gardeners at home, by whom it is generally known under the name of Mercury, the best variety being that named by botanists "*Agathophytum Bonus Henricus*" or good King Henry Mercury. Its virtues as an esculent vegetable delicacy seem to be best acknowledged by the farmers in Lincolnshire, nearly all of whom have a corner devoted to its culture. It is said to be as good as Asparagus, though not quite so large in growth: but it is much earlier, being ready to cut from a month to six weeks before that vegetable. It is questionable if every one would be prepared to pronounce the flavour as good as that of Asparagus, but still it is very nice. When ready to cut, the shoots are about the size round of the little finger, and should be cut under-ground in much the same manner as Asparagus. The skin is sometimes tough, in which case it

has to be peeled off from the bottom upwards, and it is then washed and tied up in bundles. It is usually boiled in plenty of water with a good handful of salt in it, and when boiled tender it is served up simply, or upon toast, or with melted butter; or with the gravy of meat. The ground should be trenched two feet deep, and have a good lot of manure mixed with it. The plants which are perennial must be raised from seed and planted out in May to July in rows eighteen inches apart and one foot between the plants. The first cutting of shoots may be made in August or September of the second year, but the plants must not be dealt with too severely, but after that the bed will become very thick, and will then yield a great quantity of shoots. They will grow much better in the cooler districts of the hills, where the beds can be formed on the drier portions of the rich alluvial swamps. During the growing time the bed should be watered with liquid manure if possible. The leaves make a very good substitute for spinach. Several of the varieties of *Chenopodium* are cultivated for food and some roots are burned for soda, as for instance *C. maritima*, *C. anthelminticum* produces a flower spike from which the worm seed oil so much used in the United States as a vermifuge. *C. quinoa* is indigenous to the Pacific slopes of the Andes, and it is largely cultivated in Peru and Chili for its seeds which are much used as an article of food. The seeds are albuminous, and when boiled make a kind of gruel which being flavoured with Chili pepper is considered to be very nice by the inhabitants of those countries, though to Europeans it is very disagreeable. This plant bears great quantities of seed.—*Adelaide Observer.*

OPERATIONS FOR MARCH.

I.

IN HILL STATIONS.

THE FLOWER GARDEN.—Prune Roses. Sow grass seeds for lawns. Fork, rake, and dig beds, borders and shrubberies. Complete pruning of Clematis, Bignonias, Jasmines, and Creepers, and give the garden a neat appearance. Plant Hardy Gladoli. Sow Flos Adonis, Calandrinia, Calliopsis, Campanula, Centauria, Chrysanthemum, Clarkia, Collinsia. Convolvulus-minor, Erysimum, Larkspur, Linum, Amaranthus, Lupins, Œnothera, Poppies. Saponaria, Sweet-peas, Venus' Looking-glass, Veronica, Virginia Stock, Viscaria, Pentemon, Foxglove, China Aster, but half-hardy annuals are perhaps better left till the following month. Pot off all bedding plants and keep them close for a week or more. Increase Dahlias by cuttings, this is the best month for it. Place Carnations in blooming pots.

THE VEGETABLE GARDEN.—Most of the principal crops must be got in now. Manure, trench, and dig soil deep. Devise a plan of how your garden is to be laid out and economise space. It is a little too early for Celery. Jerusalem Artichokes should be planted now, and Globe Artichokes should have their offsets taken off. Sow Carrots, Cabbages, Cauliflowers, Brocoli, Radishes, and Peas. French Beans should be shown at the end of this month.

II.

IN THE PLAINS.

THE FLOWER GARDEN.—Gradually let Dahlias and Oxalis die down by withholding water. If Gloxinias, Richardia, and Lilium have done flowering, withhold water and let them die down, and leave them as they are in the pots. Cut back shrubs that have done flowering, and take up Verbenas in pots to protect from severe weather and rain which will fall in May.

THE VEGETABLE GARDEN.—Onions, if perfectly dry may be taken up now, if not then next month. Carrot and Beet may be taken up now and stored in sand, or it may be deferred to next month.

In the North-West, Cucumbers and Squash may be sown now. Top dress Asparagus beds. Dry the leaves of pot-herbs and store them in stoppered bottles.—*Indian Amateur Gardener.*

TEA.

THE exports of Indian tea to Great Britain during January last, were 4,900,555lbs, against 3,485,754lbs, in January 1880. The London deliveries during January last, were 4,100,000lbs., against 3,300,000lbs, in January 1880, while the stock held had on the 31st of January increased by 2,700,000lbs.

THE total quantity of tea shipped to America from Japan last year was 83,000,000lbs. As a rule the quantity shipped in former years has averaged 65,000,000, so that either too much has been exported or the demand has considerably increased. Again, until this season the export of China tea to America has always exceeded that of Japan, but the reverse has been the case this season.

THE Japanese tea merchants are endeavouring to secure the American market for their tea. We read in the *Overland China Mail* that a number of Kobe merchants have formed a Company for the export of tea to the United States, and to despatch agents there to carry on an extensive business in that country. The question of combinations to defeat the object of all sales by auction is attracting the serious attention of auctioneers and the public generally in Yokohama.

WE learn, says a Rangoon paper, that the exhibits of tea at the Melbourne exhibition sent from Akyab last year obtained a high place among the various specimens of tea sent from India. It is a pity some of the Karen Hill tea was not also sent; for the few pounds of it we have tasted, has given us a high opinion of its future prospects. Even now when the curing of this tea has been effected by a comparative amateur its flavour is a fine one; but with the opening of the Toungoo Railway when we may expect cultivation to be so extended as to induce planters to employ skilled labour, imported from the tea districts of India, we think that the rich virgin soil of the Karen Hills will yield an article which may vie with any of our Indian teas in aroma or otherwise.

IT is an undeniable fact, that between the time of tea being grown in China or India, and retailed in England, some five or six large intermediate profits are made on the article. The consequence is, the fine qualities are enhanced to such high prices as render them unsaleable, and inferior or second crop teas have thus to be retailed, showing in many cases an aggregate increase on the original cost of the tea to the grower of fully 100 per cent. To rectify this, and to give the benefit of wholesale prices to retail purchasers, a Tea Agency has been started close to Mincing-lane for the purpose of buying only the choicest kinds first hand, and selling them, first hand. It is declared by the promoters of the Agency that they are enabled to supply tea of intrinsic value fully 10*d.* per lb. cheaper than inferior kinds usually retailed at more money.

THE following figures relating to the supply of Indian tea, will, says the *Home and Colonial Mail*, perhaps, prove of interest to our readers, as the forecast shown of a probable stock of only $13\frac{3}{4}$ million lbs on the 30th June next, may not improbably be realized :—

	1880 Season.		1879 Season.
	1st July to 31st December.		
Imports	28,143,000	...	20,088,000
Deliveries	22,150,000	...	16,849,000
Increase of Imports over Deliveries ...	5,993,000	...	8,839,000
Present Stock		...	20,223,000
Estimated Imports to 30th June 1881		...	16,000,000
			36,223,000
Deliveries at say 3,750,000 per mensem		...	22,500,000
Probable Stock 30th June ...		...	13,723,000

THE consumption of teas, has been as follows, in lbs, per head of the home population :—

	China.	India.	Total.
	lbs.	lbs.	lbs.
1860 ...	2·622 ...	·038 ...	2·660
1865 ...	3·163 ...	·097 ...	3·260
1870 ...	3·396 ...	·443 ...	3·839
1875 ...	3·728 ...	·712 ...	4·440
1878 ...	3·533 ...	1·087 ...	4·620

The average increase in consumption of Indian tea amounted to about $1\frac{3}{4}$ million lbs per annum. It will be observed too, that while the consumption of Indian teas has steadily increased during the last eighteen years, that of China tea has not increased since 1873, when it stood at 3·531. It reached its highest point in 1875, when it was 3·728, since which year it has steadily declined. The turning point in Indian teas having thus been reached, it behoves all concerned to make an effort to keep up, and even improve the quality that it may retain and extend the position it has secured.

Now that it is in contemplation to try to open up trade in Indian tea with America, it may be of interest to our readers to learn that during the year ending 31st December 1880, the number of packages of tea distributed in America was 232,647. The figures showing the deliveries of tea in the United States for the past twelve months are as under :—

Greens.	Japans.	Oolongs.	Congous.	Total.
16,667,000	35,949,000	14,079,000	4,511,000	71,206,000

In 1879 the figures were as under :—

17,326,000	33,380,000	19,321,000	4,157,000	74,184,000

There has thus been a falling off in the consumption of tea in America on the whole, although the trade in Japans shows an increase of 2,569,000lbs. The demand is noticeably for the better grades in all kinds.

IT appears that during the years 1878-80 no less than 5,42,433lbs (over 7,030 maunds) of China tea, valued at Rs. 2,82,000 were imported into Calcutta. The previous year the quantity of China tea imported was 437,588lbs; so that while the Indian tea exports increased, the imports from the "Flowery Land" have shewn an upward tendency. It is difficult to account for this, but probably one of the most important reasons is the high prices charged for Indian tea by the Calcutta retail dealers. We have a retail adver-

tisement before us from one of these establishments, in which it is announced that Pekoe Souchong can be obtained at Re. 1-8 per lb and Souchong at Re. 1-2. Considering that at the public wholesale auctions Pekoe Souchong has never realised as much as Re. 1 per lb this season, it appears to us that the retail tea trade in Calcutta if a limited one, is certainly most remunerative to the seller on every transaction in this article. The China tea imported was worth on an average a little over 1½ lb for the rupee. Calcutta retail dealers ought to be able to sell a very good average Indian Pekoe Souchong at this rate and net a fair profit.

At the present time, when there is such a remarkable outburst of private and personal energy in the endeavour to popularise the use of Indian tea among the English people, it is worth while to notice an accusation made against the Indian leaf which has become common in middle-class circles. It is asserted that a "gummy, gaseous-looking coat of film" settles and floats on the top of an infusion of Indian tea, most visible when the liquor cools. Those whose prejudice is easily alarmed profess apprehension of the wholesomeness of this appearance, although a good many professional tasters declare in favor of the quality of the teas which produce it, and value them at the best rates. When a solution of Indian tea is allowed to become absolutely cold, "a thin layer of dull, whity-brownish matter, more dense than the liquor itself," is formed at the top of the vessel, and changes to a darker colour the longer it is left to stand. It disappears on the re-application of heat. Hence it is supposed to be a vegetable gum existing in the tea. Experts in China tea aver that this fault in Indian tea is due to the method of curing the leaf. In India, it is alleged, teas are only partially "fired." The young leaves, full of moisture, not being heated above a certain temperature, are left with minute particles which contain the offending gum. The China tea, on the other hand, is dried as much as possible without positively injuring the leaf, and every trace of limpness is removed, leaving the leaf crisp and brittle. As the "cloudiness" to which reference is made unquestionably hinders the popular use of Indian tea, the matter is well worth attention on the part of growers and curers.

TESTING TEA LEAVES.

How to Tell Pure Tea.

Take a sample of tea and place in a saucer; pour over it hot water, and in a short time the leaves will unfold and spread themselves out, so that their form can be readily seen. Take a piece of glass and place it on the top of a sheet of white paper; then take the tea leaves you wish to examine: and carefully lay them on the glass, so that a leaf or portion of a leaf shall be fully spread out. You are now ready to make your examination of the leaves. But we will first state that the genuine tea leaf is oblong, or broad lance-shaped, considerably longer than wide, with the edges saw toothed or serrated. The veins are simple, that is, do not branch, and run towards the side of the leaf, where they form a characteristic series of loops, especially in the older leaves. First examine the whole leaf as to size and form. Look carefully along the edges of the leaf for the notches or serrations, and note if they are deep or faint, close together or far apart, and if they extend to the base of the leaf. As to the surface of the leaf, observe whether it is smooth or downy; notice the veins closely, whether they are single or branched, and if the series of loops at the edges can be seen. Let us suppose we have made our examination of a leaf and have the following notes: Leaf large and rather broad, oblong and tapers to the base; the edge of the leaf is strongly serrated, and the notches rather close together, and do not extend to the base; the surface of the leaf is smooth: the veins are large and simple, and form a series of loops along the edges. From these facts we know the leaves are genuine tea leaves, but the leaf was an old one when picked and not very valuable. The older the leaf, the plainer become the above marks. Now, if your tea is largely composed of such leaves, or parts of such leaves, it shows the tea was a late picking, and of inferior grade. The presence of the tea stems is also a sign of inferiority. But if your leaf under examination was a young leaf of the genuine tea, it would appear long and narrow, the edges but slightly serrated, the surface would be downy and the veins would be faint, and the loops not yet formed. As the age of the leaf increases it widens, the notches become deeper, the down begins to disappear, the veins become more distinct, and gradually forming the loops. We can thus tell something of the age of the leaf by these various marks. In making an examination of a sample of tea, a large number of leaves should be examined to give a correct estimation of its value, for the tea may be mixed and contain leaves of various ages, and the proportion of these would determine its worth. If you find a leaf broader than long, it is not a tea leaf; or if heart-shaped at the base, or the edges smooth and veins distinct, or the veins branched, or the edges of the leaf deeply cut, it is fair to suppose they are leaves added for the purpose of adulteration. Much difficulty will be had in making these examinations, on account of the amount of the broken leaves present, the foreign leaves being purposely broken so as to avoid being detected.

QUANTITY AND QUALITY.

The subject of Quantity *vs.* Quality has recently occupied considerable attention in connexion with "tea" literature, and a general idea of the opinion widely prevalent on the subject, may be gathered from the following sentence, taken from a correspondent's letter to our tea contemporary. "There are no two opinions on the matter, you must, by adopting one, sacrifice the other, and that is an established fact." We are not prepared to agree with him that planters must elect which they will have—quantity or quality, as we hold they can have both. Of course, it may be true, to a certain extent, that the heavy plucking which necessarily accompanies a demand for quantity, results in a lower average price or value all round; but at the same time, we do not see why the manufacture of the finer qualities should, in any sense, be affected by the larger quantity of coarse leaf made. Suppose the gardens, otherwise much alike, to be working under different orders from head-quarters, one manager is instructed to attend to quantity, the other to quality. The former has accordingly tendered an estimate for six maunds per acre, while the latter calculates on four maunds. Now, we imagine that the two maunds of excess to be made by the former will consist almost wholly of coarse leaf. By the term "coarse leaf," we mean, of course, comparatively coarse leaf. The remaining four maunds should be as good as the outturn of the other garden. It is true that more money will be spent in manufacturing the extra two maunds, but that is a simple question of profit and loss, and the proprietors must decide whether it will pay to incur the extra expense of manufacturing this low class tea. A garden which goes in for quality only, will require a certain establishment of labour, and if quantity is wanted as well, that establishment must be increased. This granted, we cannot understand why the same attention should not be given to a "quantity and quality" estimate, as to a purely "quality" one. This is where planters frequently err. In considering this question they mistake general average for particular quality, class. Roughly speaking then, a garden working for quality only, might, let us say, produce one maund fine, two maunds medium, and one maund low class teas per acre, while one looking for both quantity and quality would perhaps make one maund fine, two and a half to three maunds medium, and two to two and a half maunds low, class teas per acre, and there exists no good reason why the fine and medium teas of the latter garden should not stand comparison with the corresponding classes of the former. The difference between good and bad tea—irrespective of class—is entirely a question of careful manipulation and factory superintendence, and if a manager finds that his bushes will stand a heavy plucking, there is no reason, so far as consideration of quality is concerned, that he should not pluck heavily. This heavy plucking, of course, pre-supposes good cultivation, and, this latter being given to the garden, we hold it to be impossible to overpluck. By a vigorous plucking we do not imperil the life of the plant, or interfere with its healthy growth, to a greater extent than may be compensated by good cultivation and generous treatment generally. If all the leaves of a bush were fit for tea-making then we might be tempted to overdo the work. It is true that the young and rapidly growing shoots alone are those we want, and that those are doubtless the very ones which the plant can least spare: but, after all, the proportion taken is so little compared to that left, that it must be difficult, if not impossible, to overpluck a bush so as to injure its health or leaf-producing character. An acre, in round numbers, contains 2,500 bushes, and if six maunds per acre be made, 24 maunds of leaf will be required, or about 12½ ounces per bush. One of the lessons we are being taught by the present crisis through which the tea industry is passing is this, that we must work our gardens properly, and must make a much larger quantity of tea for the same outlay. The quantity that an acre can produce has long been a moot point, but, knowing that over a thousand pounds have been made from an acre, we think that planters should aim at a yield of ten maunds as an average. This would certainly entail a considerably enhanced outlay for labour, &c., but, until our gardens yield something like this, we shall not be able to show good dividends. From the official returns published by the Government, we find that the present average is not over 200lbs., or just one-fourth of what we have indicated as an object to aim at. Even if five maunds per acre were attained as an average, the tea industry would be beyond the reach of loss. Under such an improved condition of affairs, a very large proportion of cheap and low class teas would be placed on the market; but that need not give us much concern, as properly worked, there is an unlimited market in India for almost any quantity of cheap tea. To secure this market, we must unbend from our lofty ideas, and offer the masses tea in infinitesimally small quantities. A large business, as we lately pointed out, is at present done in this way in India with China teas, and we must place our cheap tea before the public, made up in one and two ounce packets, when an almost entirely new market would be opened up for us. With this large production, our teas should not cost more than five or six annas per lb. laid down in Calcutta and at this cost price, and with a market in India for cheap teas, our finer classes would secure such a position in Europe that the tea industry would be established on a firmer basis than it has ever been hitherto.

COFFEE.

The coffee crop of the season of 1880-81 has been most disappointing says the Ootacamund paper. Estates estimated to yield 60 or 70 tons gave only 4 and 5 tons, while others have absolutely no crop at all. It is a mystery what became of the fine show of blossom on some Estates early in the year. Perhaps the season of 1881-82 will compensate for the serious deficiency of this year.

The *Rangoon Gazette* says :—

Tea is not the only article which will succeed in India and Burmah; we have coffee thriving well in many a gentleman's garden here, one party having to our knowledge kept himself supplied for about a fortnight with the produce of a few coffee shrubs in his compound. As all varieties seem to thrive even in the heart of Rangoon, they should yield large crops on the Karen and Arakan Hills; in fact in any place where there is high ground. We are glad, therefore, to hear that a gentleman of Akyab has undertaken the cultivation of Mocha coffee, and we hope every encouragement may be afforded to him.

In the latest published official report (September) from the Amboyna residency, it is stated that coffee cultivation is extending there, more than 200,000 coffee plants having been set in the ground in one month in a single district. The Rajahs of Lesser Ceram have also given permission to introduce this cultivation there. In the islands of Ceram Nusa, and Haruku, the coffee trees looked well and were bearing heavily.

Mr. C. Anderson, of Muzzerabad, has written a pamphlet on fungoid disease, of which the *Madras Mail* says :—

The chief purport of it is to show that potash, magnesia, and ammonia in the form of sulphates, check and destroy Hemileia in coffee, the author says, he has used in his experiments, with excellent results, $\frac{1}{4}$ to $\frac{1}{3}$ potash, $\frac{1}{4}$ to $\frac{1}{6}$ magnesia, and $\frac{1}{3}$ to $\frac{1}{3}$ ammonia. The conclusions that he has arrived at by research and experiments, include the following :—That the cessation of growth

which precedes an attack of leaf disease, is caused by a want of ammonia and other valuable food constituents in an available form. That lime exerts a marvellous effect in setting free all the alkalies, and in converting nitrogen into ammonia: that potash, magnesia, and lime are required for the production of coffee, and are therefore removed for the soil: that certain forms of potash and magnesia (especially those combined with sulphur) are inimical to the growth of fungi. He concludes that sulphates of soda, magnesia, and ammonia, should be used immediately before the occurrence of disease: and lime should be employed early in the season, to sweeten the soil and set free its resources. He also recommends that phospho-nitrogenous manures, combined with either forms of postash, be applied to sustain and invigorate the trees.

COFFEE in the shell is being exported from Java to Holland in increasing quantities. The first trial shipment of it was made by a planter in the Pekalongan residency five years ago. After finding a ready sale in Holland in the first and second years, the coffee being sold in the shell and then roasted and retailed, it became unsaleable in the third year, owing to the unpleasant taste given by the shell to the coffee. The owners, having large quantities of the article on hand, were compelled to shell the coffee in Amsterdam, and after several trials with different mills, they have organised a shelling establishment there, which has worked satisfactorily during the last three years.

THE "coffee" that is being made out of dried dates threatens to become a formidable rival to the bean that grows on the coffee bush. The shares of the Date Coffee Company have gone to nearly 300 per cent premium, with every prospect of advancing higher. The immediate cause of this has been the sale of the French patent for £50,000 and ten founder's shares of £1 each, which will be the property of the Date Coffee Company, and will be entitled to receive half of any dividend which the French Company may make after the latter company have paid their shareholders 50 per cent. Similar arrangements for a like sum are being made in Germany, Austria, Hungary, and the United States, and £20,000 has been offered for the Russian patent. The date coffee can be produced at the cost estimated in the original prospectus, and the demand for it in England is so great that it can be sold at a price which leaves more than the profit upon which the calculations were based.

THE following remarks on the current coffee crop in Ceylon are extracted from the Colombo *Times*:—

It has become evident from the figures shewn by ships' manifests homewards, and by the railway traffic returns, that the shipments of coffee for the current season will be the smallest on record for very many years. It is thought probable that the exports of our staple may not be more than was shipped thirty years ago, when the figures stood at about four hundred thousand cwts; and as we know that in the districts around Kandy as well as in Dimbulla, Dickoya, &c., coffee stores are nearly all empty, leaving only the crops from Uva and Uda Pussellawa to come forward, it seems probable that this unfavourable view may be realised. It is remarkable, too, how much the native coffee crop has fallen off in quantity as well as in quality,—far more in proportion even than that of plantation, accounting for much of the existing distress amongst the native population of the interior and the consequent depression of trade in the native districts.

Those who at a distance may read our statements regarding the immediate prospects of the coffee crops, should remember that ample reasons for our present short shipments are to be found in the very unfavourable blossoming season in the early months of last year, and that, apart from this and the passing effects of leaf disease, we are warranted in saying, especially in looking at the present condition of the coffee districts, that there is nothing in these facts to lead to a desponding view of the coffee enterprise at large. Competent authorities gave it as their opinion last year that, had we been favoured with seasonable weather, similar to that which gave us the large crops of previous years, Ceylon would have exported a very handsome crop—sufficient to have restored confidence to capitalists and mortgagees.

PROFESSOR STEVENSON MACADAM ON LEAF DISEASE.

ANALYTICAL LABORATORY, SURGEON'S HALL, EDINBURGH,
20th November 1880.

W. M. FRASER, ESQ., of Bunchrew.

DEAR SIR,—I beg to report to you that I have carefully considered the whole question of the coffee leaf-disease, and have studied the various scientific documents and papers which have been published on the subject, especially the communication of Messrs. Morris and Ward on the Natural History and Botanical bearings of the disease. I have also made myself acquainted with the general literature of the subject as published from time to time in the *Ceylon Observer*, and have an intimate knowledge of the chemical wants of plants, including the coffee plant, for their healthy and vigorus sustenance and growth. I have likewise analysed various soils from coffee plantations in Ceylon and know the chemical constitution and properties of such. With these data before me, I will endeavour to express a chemical opinion as to the measures which may be followed in alleviating, and, if possible, in stamping out the coffee leaf-disease. At the same time, I wish it to be regarded, that my scientific opinion at present must be taken as the first stage of the inquiry as to remedial measures, and that when more knowledge as to the life history of the *Hemileia vastatrix* has been obtained, the chemical precautions and treatment may require to be modified, extended, or directed into new channels. That further progress in the chemical part of the investigation may be anticipated is no more a reason why the chemical bearings of the question may not be discussed now in the light we at present possess, than that the botanical aspects of the question should be delayed until the full physiological and pathological history of the disease should be ready to be written. In either department, a partial contribution may be of great value in indicating the knowledge of the time and the steps which may be taken in the future of the inquiry.

There can be no doubt that the fungoid organism known as the *Hemileia vastatrix* attacks the coffee plant from without; that finding its way into the leaves, it developes there a filamentous, tubular, and branched mycelium which ramifies through the passages between the leaf cells; that thereafter the branched tubular filaments are protruded through the stomata or epidermal outlets of the leaves, and that finally deep yellow or orange coloured spores or *granules* are developed in clusters in the leaves and produce the yellow granular powder popularly know as "rust." The practical effect of the disease is that the plant is called upon to elaborate nutriment in the sap of the leaf for the growth of the disease, over and above its ordinary work of providing for the sustenance of the coffee plant itself; that the life sap is sucked out of the leaf by the fungus; that the leaf becomes sapless, thin, and emaciated, and prematurely fades, dies, and drops off the tree; and that the coffee plant thus bereft of its natural nourishers and supporters—the leaves—becomes weakened, loses vitality, and fails to bring to maturity or ripen a great part of its seed.

The remedial measures which may be followed for the abatement and probable extirpation of the disease, must, in my opinion, be directed to two main channels:—First, the more thorough sustenance of the coffee plant by the liberal use of fertilising agents, and, second, the destruction of the diseased leaves and spores, as well as the prunings of the trees, by the employment of chemical agents.

The necessity for the first mode of treatment, *viz.*, the more thorough sustenance of the coffee plant itself, may be observed in various ways. The average quality of the soil in Ceylon exhibits rather a deficiency in fertilising ingredients, and comparatively little attention has yet been directed to the systematic use of manurial substances, not only to keep up the loss of fertilising power abstracted each year by the coffee plant, but to supply what the soil has not naturally been provided with, or may have lost during previous years of cropping. It must be remembered that the coffee tree is a greedy feeder and ought to be supplied with stimulating and invigorating food from the soil. When scantily provided with fertilising elements, the coffee plant cannot thrive well, and its vitality must be correspondingly reduced, leading to a lessening of the power to bring the blossom, fruit, and seed to maturity, and to a want of stamina to resist the encroachment of any parasitic fungoid growth such as the *Hemileia vastatrix*. There can be no doubt that, in an impoverished condition, both plants and animals are less likely to throw off the influence of disease spores and germs, and, when attacked by such, to tide over and rally from the effects of the disease. I am therefore of opinion, that if greater attention were directed to enrich the soil with manurial substances, and thus put it within the reach of the coffee plants to obtain therefrom a bountiful supply of the food which ministers to its healthy sustenance and growth, the plant would naturally acquire more healthy vigour and will more successfully resist the ravages of the *Hemeleia*.

In the enrichment of the soil ordinary cattle manure will be of service where it can be obtained in quantity, but alongside of that, there should also be employed a more condensed and stimulating fertilizer, containing soluble and insoluble phosphates, ammonia and potash salts. An excellent mixture for this purpose would be made by compounding:—

6 cwt of dissolved bones,	making one ton in all.
4 cwt of Peruvian guano,	
6 cwt of kainit,	
4 cwt of nitrate of soda.	

This mixture will yield nitrogen equal to ammonia 7 per cent, soluble phosphates, 9 per cent, insoluble phosphates, 8 per cent, and potash 8 per cent. The ingredients for the above manure would require to be imported, as, though bones may be had in Ceylon, yet the acid required for their treatment would be difficult of transport, and hence the dissolved bones, which have already been treated with acid, would be more readily carried from place to place. If the whole mixture were made up in this country, the cost would be about £9 per ton, and considering that our manure manufacturers are in possession of first-class machinery for dissolving, incorporating, and disintegrating the manure, there should be no difficulty in obtaining the mixture in the best form for application to the soil.

If it be desired to compound the manurial mixture in Ceylon from materials which can be obtained there, such as nitrate of potash, finely ground bones, and pulverised oil cake, I would recommend the following proportions:—

4 cwt of nitrate of potash	making one ton in all.
7 cwt of fine bone meal	
9 cwt of pulverised cake	

This manurial mixture will give about 7 per cent of nitrogen-ammonia, 20 per cent of phosphate, and 8 per cent of potash; and though not quite so active or immediate in its effects as a fertilizer as the previous mixture containing dissolved bones, yet it will be more lasting in its manurial power.

Either of the manurial mixtures should be applied to the land bearing the coffee plants at the rate of 10 cwt to the acre, and it would be beneficial to divide the manure into two parts of 5 cwt each per acre, and apply one-half in October immediately after the rains, and the remaining half in April immediately after the blossom showers. The coffee plant would thus have a more regular benefit from the manurial constituents and the excessive rain would not wash the ingredients out of the soil. At both periods of application, the manure should be incorporated with the surface soil, by hoeing, or otherwise, in order that the rootlets of the coffee tree may speedily be enriched thereby.

The second part of the inquiry, *viz.*, the chemical treatment of the diseased leaves and spores and the pruning of the trees, may be best carried out at the plants themselves; for though the removal of many of the leaves and the prunings to a short distance might enable the mass to be more actively got rid of by burning or the incorporation

with *much* quick lime, yet such would still leave the soil around the coffee plants impregnated with the spores or "rust" detached from the leaves, necessitating the separate treatment of the soil, and more over would rob the soil of the benefit of the manurial ingredients obtainable from the leaves and prunings. I would, therefore, advise that the whole be dealt with at the plants themselves. The leaves and pruning can be changed from a diseased, decaying, and dangerous state to a fertilizing and profitable one by the liberal use of quicklime, which will destroy the vegetable issue of the leaves, spores, &c., and yield products which will enrich and fertilize the soil. In employing lime, it should be used when freshly slaked, and before exposure to the atmosphere has enabled the carbonic acid of the air to neutralize the causticity of the lime, as, when carbonated, the lime becomes more of the nature of chalk than of hot lime, and has practically no burning or decomposing action upon the vegetable tissue. The incorporation of decaying leaves, &c., with the lime, and thereafter with the soil, will chemically destroy the vitality of the spores and mycelium of the disease, and at the same time supply fertilizing ingredients to the soil for the benefit of the coffee plants.

Whilst diseased leaves and prunings may be regarded as the more dangerous propagators of the disease, I am of opinion that the stems of the coffee trees should not be neglected. It may be a question whether the filamentous mycelium of the disease attaches itself to, or covers, the stems and branches; but considering the possibility of such being the case, and that the spores in the ground may thus affect the plants, I would advise that the stems and main branches be brushed over with either a solution of carbolic acid and water, or a solution of yellow sulphide of calcium. The carbolic acid treatment would be the more effectual, and may be carried out by mixing one part of the crude carbolic acid with nine parts of water in the cold, and thereafter the mixture may be applied with a soft brush to the stem and main branches of the coffee tree. This should be done before blossoming, and will destroy any spores or mycelium of the *Hemileia vastatrix* which may be attached to the stem or branches. At the same time, a little of the vapour of carbolic acid will be given off which will be useful in influencing any spores or germs in other parts of the tree. If the yellow sulphide of calcium is used, it should be prepared by boiling 5lbs of caustic lime and 5lbs of flowers of sulphur in 100lbs or 10 gallons of water, and allowing the whole to settle when the clear yellow sulphide of calcium can be poured off and be used in brushing over the stem and main branches. I do not regard the sulphide of calcium so good a material as the carbolic acid, either in its power of dealing with the mischief where it is applied, or in its tendency by rising in vapour to influence other parts of the plant.

When once the disease has attacked the plant, I am of opinion that the only practical process of combating the spread of the parasite would be by dusting finely divided flowers of sulphur over the leaves; but such a process would be necessarily expensive in material and in application. The burning of sulphur is not to be thought of, as the flames produced, *viz.*, the sulphurous acid gas, are very deadly to plant life, and will destroy the whole of the leaves, whether affected by disease or not.

In conclusion, I may state that I have no doubt that atmospheric influences, such as relative moisture or dryness of one season with another, or of the locality or district with another, will more or less affect the spread of, and the virulence of, the attacks of the *Hemileia vastatrix*; but I feel sure that climatic differences and variations are of secondary importance to the thorough nourishment of the coffee plants with high class fertilizing materials, combined with the chemical destruction of the diseased parts of plants with quick-lime. The enrichment of the soil will impart increased activity to the coffee tree, and will do more for stamping out the disease than any special measures for dealing directly with the parasite.—Yours sincerely

STEVENSON MACADAM, Ph. D, &c.,
Lecturer on Chemistry.

MR. SCHROTTKY'S LECTURE.

THE following is the lecture delivered at a meeting of planters and merchants at the Chamber of Commerce, Colombo, last month, by Mr. Schrottky on his new methods of coping with coffee leaf disease:—

GENTLEMEN,—It is necessary and consistent with the object of this meeting to take you back to the middle of the year 1879, and to review shortly the leading features of the campaign against *Hemelcia vastatrix*, guided, and I think, considering he was essentially a botanist, ably by Mr. D. Morris, the then Assistant Director of the local Botanical Gardens, a campaign which came to an abrupt and untimely end almost as soon as his guidance was withdrawn. As you will remember, it was directed against the destruction of the fungoid filaments which though not apparent to the naked eye, are found on the stem, branches, and leaves of the coffee tree, and which Mr. Morris believed to form the first cycle of the generations of this fungus. The first phase of the disease as known to the planters is the apperance on the coffee leaf of palish discolourations in, to the eye generally, well defined, more or less circular spots and patches indicating where the mycelium of the fungus is feeding in the intercellular tissue of the leaf. Under ordinary circumstances, these disease spots produce, within ten days of their first distinct appearance, orange-coloured papillate, or more properly called *uredo-spores*. The difficulty that was experienced in destroying the fungus, once it had entered into the tissue of the leaf made Mr. Morris's discovery (for such it was then believed to be) of the utmost importance. The tender and delicate filaments which he directly connected with the pin spots could of course, easily be dealt with. It introduced an entirely new phase of the subject of how to battle against the fungus and the bearings he had were fully and generally understood. I directed at the time the chief agricultural paper of India and, I threw whatever weight my opinion could give unreservedly into the scale, in favour of Mr. Morris's proposed treatment by the application of sulphur. And how could one do otherwise? In January 1879, Mr. Morris published his life history of the *Hemileia*, detailing the connection between the filaments and the diseased spots; his observations were made under the superintendence of Dr. Thwaites, well versed in the use of the microscope than whom no one had better opportunities of knowing the different phases of this disease, and who as far as we know, then entirely agreed with Mr. Morris's conclusions. Authorities on mycology in Europe took no steps to point out, what they must have known then, to be a vital error in the life history of this fungus. What wonder then I say that in June 1879, we were prepared to back up Mr. Morris through thick and thin? but alas! there never was a better illustration of the saying that *hominis est errare*. The more or less accidental dipping of the filaments into the stomata of the leaf led to the error; for an error it was. The network of fungoid filaments that can be observed on the different parts of the coffee tree has no genetic connection with the fungus. No doubt Mr. Morris must take his share of the blame that can be attached to a man who makes a false discovery, but by far the greater share is borne by others, chiefly by the mycological authorities at home. Had his account of the Life History been correct, his remedy would have been the best possible. And he no doubt was greatly misled by mere appearances. For over six months extensive experiments were carried on, under his direction, by planters of considerable knowledge and experience who thought they could see a benefit from the treatment. And there doubtless must have been a benefit. It could not have been due to the destruction of the filaments by which Mr. Morris tested the success of the treatment, nor could it have been due to its effect on the spots and spores of the *Hemileia*, for as far as I can gather information, they were only injuriously affected by the sulphur and lime treatment, when it was overdone, and then the leaf was killed as well.

But there can be no doubt that the treatment resulted in the death of millions of the more delicate *Teleuto* and *Aecidium* spores and their structures, which with the *uredo-spores* or orange rust, form the cycle of generations of this fungus as well as of all others belonging to the same family. And to this effect may reasonably be attributed the benefit which was observed on several estates. As after events showed there was an element of danger in the sulphur and lime treatment, which did much to create what was almost a panic and to stop all further experiments. Some months after sulphuring a certain field of coffee, this very field had an attack of leaf disease worse than the surrounding untreated fields. I think this can be accounted for. The sulphurous acid gas generated by the application, passes very quickly into a higher state of oxidation and becomes then the familiar sulphuric acid. The coffee plant would become charged with a certain excess of sulphuric acid, giving probably a slight sour tendency to the sap. Some observations that were made immediately after sulphur treatment add force to this. It was found that the blossom set, and fruit ripened, in a greater ratio on the treated than on the untreated area. Now some experiments have been made to show the influence of the different inorganic elements of plant food upon the various phases of vegetable life, and it was found that in the absence of sulphuric acid, plants can grow normal and upright, but they won't fruit. The analogy will at once strike you. The sulphuric acid, resulting from the treatment, aided in the setting the blossom and the ripening of fruit, but it must have imparted a sour tendency to the sap, however slight, that may have been. And that was evidently sufficient to establish *more congenial* conditions for the germination and development of the fungus, in that particular field, than the fungus found outside of it. For most fungoid growth delight in sourness. Now I don't think there can be any doubt that Mr Morris would have found out all those weak points of the treatment, had he remained, and the failure might have served as a great stimulus to new exertions; and he said distinctly that an appreciable benefit would only result, if large areas were operated upon, and infection from without carefully guarded against. I am going into all these details, not merely because I, in common with others, have supported Mr. Morris at the time, and want to justify myself, but because these details are not out of place, and are closely connected with my experiments, as you will presently see.

Mr. Morris closed his experiments in July 1879, and in his final report to Government dated the 9th of that month, he says: "When the disease has entered the leaves and is *feeding* on their tissues, there is no specific known which can effectually kill it without at the same time destroying the leaves themselves," and continues to the effect that he therefore attacked the delicate filaments which he believed to be the outward and first stage in the life history of *Hemileia vastatrix*, and he gives proof that the task he was set to had been accomplished by the sulphur treatment. You will see presently the vital difference between Mr. Morris's experiment and my own.

When I seettled down at Dotel Oya with the determination to see whether really no specific could be found against this disease, I soon recognised that unless something could be found that accomplished what Mr. Morris said he could not do, *viz.*, kill the fungus *after* it had entered the intercellular tissue of the coffee leaves without destroying the leaves themselves; I repeat, unless this could be accomplished I recognized that it would be useless at the present stage of the disease and its universal diffusion, to battle against it in any other form.

What makes this fungus so formidable and so injurious in the form it appears on the coffee leaf, *is the fact* that the orange spores (the *uredo-spores*) are capable of reproducing themselves without the necessity of passing through the cycle of generations, which is carried on by the *Teleuto-spore* (produced by the same mycelium which previously bears the *Uredo-spores.*) That is to say, each rust-patch is capable of reproducing itself indefinitely by the constant germination and reproduction of the *Uredo-spores*, just as if the eggs of the *Lepidoptera* produced two kinds of caterpillars, one kind of which could constantly and in the short period of a few days, reproduce itself without having to go through the tedious cycle of chrysalis, butterfly, and egg, again, which cycle is carried on by the other kind. You can well imagine, what a pest such a caterpillar would become, if not stamped out in time. But this peculiarity is exactly what makes *Hemileia vastatrix* so formidable. But for the *uredo-spore*, the coffee planter could laugh at the *Teleuto-spore*, the *Aecidia*, *Spermagoria* and other structures forming the ordinary cycle of this kind of fungus.

It was therefore the destruction of that form of the fungus which bears the Uredo-spore to which I devoted my attention, or in other words, the destruction of the so-called pin-spot. If I could, I argued, destroy these pin-spots, without destroying the leaf, or prevent them from fruiting, there would be thought a 'chance' of battling with it successfully. Just as you can argue that if you can prevent an annual weed from seeding a hundred fold, you destroy, by so much, the chance of it troubling you again.

Now we come to the point of this meeting. How far have my experiments resulted successfully in destroying the disease spots and preventing them from fruiting?

Let us turn to the experiments at Dotel Oya carried on under the superintendence of Mr. James Blackett. I may state here that I went to Dotel Oya, so to speak, empty-handed. I did not know whether it would be possible to find a specific, and my hope was so little, that with the exception, of Mr. Blackett, only Messrs. W. C. Leechman and J. Ferguson knew that I was going up for the purpose of experiments, nor would I consent to have it made public in any way, so improbable did I deem it, that I should succeed where so many other and better men had failed. I had no predi-

lection for any particular chemical, or particular mode of applying it, but I was prepared and took with me the means so as to leave nothing that had the 'slightest' chance of proving a cheap specific, untried.

All sorts of 'topical' application were tried, to see how far the disease could externally be dealt with, and two chemicals sulphate of soda and carbolic acid, applied to the leaves in diluted solutions as a spray shewed a fair degree of success, 50 to 60 per cent of the pin-spots and spores however escaped apparently scot-free, and this would have been quite sufficient to carry on the disease.

Experiments were likewise made, calculated to create artificially, differences of condition of the sap of the coffee tree by the diffusion through their system of different chemicals suited for the purpose. Repeated trials had conclusively proved that this could not be done through the medium of the rootlets, the peculiar food-selective properties of which completely defeated the attempt to physic the trees through the soil, and I adopt therefore a novel plan of inducing absorption of different substances in the sap of the plant through the cambium of the stem, by a method which I have called "Inoculation" being satisfied that a certain absorption did take place in all but very thickly barked trees.

I was led to this, believing that a peculiar condition of the coffee tree is necessary, in addition to certain climatic circumstances, to fully develope *Hemileia vastatrix* in its last cycle. Where this condition is absent, the disease seems not to be able to get any permanent hold of the tree which generally succeeds after a little struggle in shaking it off. This opinion is strengthened by the well-known fact that not only districts, but fields, and individual trees remain comparatively unaffected amidst the most virulent ravages of the pest.

Eight different chemicals were tried and their absorption into the cambium of the stem assured by the means referred to. We adopted a basis of comparison by selecting and marking a few leaves of each trees, which showed distinctly the presence of the fungus in the pin-spot-stage, as well as defined diseased patches, but on which no 'rust' or orange spores had as yet been formed or were externally visible. We had eight different batches of trees, each batch inoculated with a certain chemical, and as I said a few leaves of each tree were marked, that showed the disease in well defined and healthy pin-spots, and there was also a ninth batch of trees that were not treated in any way, and the diseased leaves of which formed of course the principal basis of comparison. The marked leaves were carefully watched every day as to the advancement the disease made, and weather being favourable the orange spores gradually made their appearance on the diseased leaves of most of the batches of coffee experimented upon. The results were closed on the tenth day after treament and examined closely by Mr. Blackett, Mr. Drummond, and myself, and we found that out of the eight experiments made, two had given peculiar and startling results. For while the disease on the marked leaves of the untreated trees had fruited to the extent of 83 per cent, and while in the case of six experiments of trees inoculated with different chemicals, they had fruited in a percentage varying from 58 to 88 per cent—the marked diseased leaves of trees, on the other hand that were inoculated by carbonate of potash and carbolic acid, shewed no such development of the fungus. Not one of the marked pin-spots had fruited if we disregard one leaf that showed on one pin-spot a few discolored and shrunken spores, and not only had these disease spores not fruited, but the spores themselves were turning brownish and seemed to be dying off. These results were startling, but they could not be mistaken.

To tell you the truth, gentlemen the results were such that neither Mr. Blacket nor I had the moral courage to publish them. The coffee planting community had almost made up its mind that nothing could be done against this pest, and we felt that, if we published these results, standing by themselves, we would only be laughed at for our pains. We therefore, decided to defer publication until support could be obtained by operations on a large scale.

Messrs. G. & W. Leechman (your thanks, gentlemen, are due to them) were public spirited enough to place at my disposal a few acres each on their estates near Kadugannawa. There the treatment was tried on a larger scale, and the results amply bore out our experiments at Dotel Oya. In Mr. Thom's report of the result of the treatment taken on the 10th day following the application you will find that, while on the treated area the disease spots of the marked leaves had fruited only to the extent of 11 per cent, and that in a sparing manner, a few isolated pale coloured spots only being visible on each of the disease spots—the disease spots on the marked leaves of the adjoining non-treated area on the countrary had not only in every case thrown out rich orange clusters of spores, but additional pin-spores and already developed disease patches were observed that were not on those leaves when we marked them. This shewed that on the non-treated area the disease had not only developed from the pin-spot stage and fruited, but had increased and spread at the ratio of nearly 300 per cent. The majority of the pin-spots on the treated area had commenced to turn brown and could be said to be dying off.

Still, this did not satisfy me. I knew scepticism to be so strong, that nothing but overwhelming evidence in favour of a specific would assure anything like attention from the coffee-planter. We repeated, therefore, the experiments at Moragalla, at Fairyland, at Rosneath, at Pallekelly, and at Peradenia estate; in every case with the same or similar favourable results wich have been detailed in report by the superintendents of those estates. These have all been published, and I need not weary you with a recapitulation.

Now gentlemen, I claim nothing for myself. You may lay weight upon what I have said or done, or you may not, as you please, but, gentlemen, I claim respect for the reports of the Superintendents of these estates. They are the affidavits of men, good and true, who have taken trouble to further a good cause and who put down, not what they thought, ' but, what they saw.' The evidence I have laid before you and the public in these reports consists of facts, not opinions.

It may not be unnecessary to specially draw your attention to the experiments at Roseneath and Fairyland. Messrs. Dewar and Pyper are planters of experience whom, I think, it would be difficult to induce to put their names to any statement of what they saw, if they did not see it. Mr. Ward was present the day the experiment was instituted, and was shown the basis of comparisons we would judge results by. He was asked if he had any other way to propose by which results could be judged, which I would gladly have adopted in perference to mine. But he was understood to say that he thought the test was a pretty fair one. The results were examined at Fairyland by Dr. Thwaites, Messrs. Dewar, Pyper, and Anderson. Every marked leaf was handed to Dr. Thwaites and Mr Pyper, I believe, put down only what Dr. Thwaites said. Let me read you the result as reported by Messrs. Dewar and Pyper, of the experimental Fairyland estate :—

"In no single instance" had any of the pin-spots on the treated area thrown out any spores. The pin-spots themselves had turned brown and were pronounced to have been injuriously acted upon,

"The pin-spots on the marked leaves on the untreated area, on the country, had 'in nearly every case' thrown out spores, a few only had not done so."

What need I say more: Planters that are not satisfied with such evidence, will never be satisfied. Attempts have been made to discredit the results by sundry suggestions, and lastly statements have been made that have more or less reached me. It has been said that absorption through the cambium was against the laws of vegetable physiology. I said it was not and have thrown down my gauntlet. It has not been taken up yet. Another, said whether in concord or discord with established laws, he did not believe that chemicals could get into the cambium of a living tree. I shall be most happy to convince that gentleman by what he can see with his own eyes.

I have heard of two gentlemen who inspected the *modus operandi* of the inoculation and the results. So well were they satisfied the chemical I employ gets into the cambium, that two days afterwards it was currently reported that three acres of inoculated coffee were breathing their last.

And then we have seen opinions published something like this "I had a little faith in Mr. Schrottky's process, but I thought he did it very differently. His *modus operandi* does not fall in with my idea, I have lost therefore all faith. How some of the witnesses could have seen the results they reported, goodness only knows."

I think we may disregard all those opinions. They cannot shake or alter the results which have been seen and attested.

I think, gentlemen, we may say now, on the basis of these results, that we have found a specific which will stille the fungus in the pin-spot stage and prevent it from fruiting, a specific that will kill the fungus without destroying the leaves themselves. But that is not enough. The most important work has still to be done, namely to show that the riddance of this pest to a greater, or less extent, will benefit the pocket of the planter.

This has still to be shown. Both "inoculation" and "vaporisation" have given satisfactory results. The latter has much to recommend it if it can be repeated as often as necessary and at a moderate cost. Three applications which I have every reason to believe will carry on an estate through the period of an attack of the disease, will, in the aggregate, in labor and chemicals, not cost more than Rs. 10 or 12. It is quite possible that the 'inoculation' may benefit the plant to such an extent that the greater cost of it would not stand in its way, but some time must elapse before I can decide upon this point.

The practical issues involved are illustrated by a simple *simile* or example.

What is commonly called 'White Weed' is I believe a pernicious plant difficult to eradicate, once it has got hold of a coffee estate.

Imagine now an estate that is simply covered with it to the injury of the bearing qualities of the coffee, and that up to this time you had known no method or means of pulling it out. An economical method is shown to you now, and means are given to enable you to pull the weed out, and you are recommended to do so before it had time to fruit. You try this method and means say over a few acres. Yes, sure enough; you find it can be done. You stille the weed you find in that area and prevent it from seedling. Will you be surprised now if you look at the same area again in a month's time or so and find the weed again there, almost as bad as ever? Believe me, gentlemen, the coffee leaf-disease is nothing but a weed which you have allowed to grow unchecked over your estates. It pays you to keep your estates clean of the ordinary weeds, and it will likewise pay you to keep your estate clean of this weed. You have now the means to do so.

But you must be prepared for most disheartening work. As fast as the fungus will be killed, so fast almost will it re-appear, but assuredly there will and must come a time when the planter will be able to sit down draw a deep breath of relief and say—" the battle is mine."

COFFEE PLANTING IN SARAWAK.

THE following paragraphs are taken from a recent issue of the *Sarawak Gazette* :—

It is with great interest that the coffee planting commenced only within the last two years in Johore, must be watched by all countries in the vicinity of Singapore. Sarawak is in the same latitude as Johore, and the rainfall cannot be very different. Perhaps in the neighbourhood of Kuching it is somewhat more abundant, but in the other parts of the territory it is probable less. The height of mountains are about the same, though in this country there are few which reached 5,000 feet, a height which the lands in Johore equal. Temperature and rainfall being the same, it is natural to suppose that if coffee is a success in Johore, it will also be a success in Sarawak, and also in North Borneo and other parts. The only trial of a coffee plantation of any size made in Sarawak was on the side of a mountain at about 800 feet elevation (the peak of the mountain being 3,000 feet) in light friable soil of sandstone formation. There were 140,000 plants put in from the best Ceylon seed, sown in nurseries on the mountain, some in shade and some in the open, and some in partial shade. The young plants were especially fine and strong, and many threw out blossom, and some fruited at 18 months' growth. This of course gave good promise, but when they had arrived at 3 years old and a plentiful crop was expected, it was found that although the trees seemed sound enough and were continually throwing out blossom, that there was little or no result to speak of, the trees after a short time became weakened. Some were pruned by an experienced Coffee Planter in Ceylon, but after expectation for some years and a large outlay, the garden was abandoned as a complete failure. There may of course have been mistakes committed in the choice of a site for the culture or in the method of treatment, though the garden had the benefit of superintendence from experienced planters. The downfall of rain and want of more defined seasons seemed the great drawbacks.

Coffee planting in Java is done principally by natives and forms part of the Government revenue, but so far as we have heard Europeans have not embarked on this culture as they have in sugar and other plantations. In the other islands in the Archipelago where it is grown, it is mostly native coffee. The success of this will much depend on the decision as to whether under altered circumstances it is advisable to adopt the Ceylon system of pruning. Again we repeat the plantations in Johore will form a valuable precedent for the guidance of future capitalists who wish to embark in coffee plantations in these latitudes.

CINCHONA.

THE Java process of "shaving" the bark has been tried on a number of *succirubra* trees on the Darjeeling Tea and Cinchona Estate. So far, the trees do not appear to have suffered in the least from being stripped off their bark.

WE learn that Mr. Gammie of the Government Gardens at Sikhim has so successfully developed his mode of manufacturing "sulphate of quinine" from the ordinary red and crown barks, that the Government of India contemplate the erection of a laboratory in which a large supply of his preparation can be turned out.

A CROP of 150,000lbs of dry bark has already been despatched to the Secretary of State from the Government Cinchona Plantations on the Neilgherries. A further shipment of about 50,000lbs is expected to be made shortly. The current season's crops was estimated at 180,000lbs, and will very likely be exceeded by 20,000lbs. At six rupees per pound, which is the average price realized, the season's crops will clear a sum of Rs. 1,200,000.

THE importance of the supply of Peruvian Bark now obtainable from India is shown in the following figures :—

SUPPLY OF PERUVIAN BARK TO THE LONDON MARKET.

	1879 80.
	lbs.
Colombia	6,002,330
India and Ceylon	1,172,060
South America (except Colombia)	959,030
Jamaica, about	21,740
Besides Java, for the Amsterdam market ...	70 088

Few important industries have been built up with such rapidity as this. The results of the sales of bark from the Government Cinchona Plantations on the Nilgiri Hills have been so successful that by " 1880 the whole capital account had been paid off with interest, and the plantations began to yield a clear annual profit."

THE necessary plant for manufacturing quinine is, says the *Ceylon Observer*, of the most inexpensive character—

All that is required being wooden tubs, calico filters, acid and caustic soda. The extent of the outturn of febrifuge since the work was begun in 1875—has been 1,940 lbs in 1876,—3,750 lbs in 1877—5,612lbs in 1878, and 7,007 lbs in the following year. The cost of production is given as three rupees per pound, and the prime cost of the bark and interest on capital is five pence per pound, consequently the cost of raw material sufficient to produce one pound of the febrifuge is twelve shillings and five pence, and adding manufacturing charges, we have eighteen shillings and five pence as the total cost per pound, or not much more than a shilling an ounce. Assuming these calculations to be correct, the Indian Government could make good profit by selling their febrifuge at a rupee an ounce. In the event of a profit being allowed private growers who may in time to come find it to their interest to sell on the spot at a shilling a pound, the febrifuge could be produced so as to a yield a fair profit if sold at two shilling and six pence an ounce, a figure which would undoubtedly command a large demand for it, in Ceylon alone. The yearly consumption of quinine in the Government hospitals and dispensaries must be considerable, and no doubt if a febrifuge equally efficacious could be had on the spot for two shillings and sixpence, the consumption would be much greater.

JAMAICA *vs.* INDIA.

THAT rising industry of Southern India, the cultivation of cinchona, is threatened, it appears, by a formidable rival. A few years ago it entered the mind of the Jamaica Government that some good might come of experimenting with the plant at various elevations. Seedlings were accordingly obtained from South America, and the Director of public garden and plantations took the work in hand with that zeal and energy which go so far to insure success. And unquestionable success has Mr. Morris achieved, although the industry still is, of course, merely in the embryonic stage. According to the showing of an official report in the *Government Gazette*, Jamaica exported last year close on 80,000lbs weight of bark, which realised nearly £5,500 in England, when put up to auction. But what was even more satisfactory was the fact that the Jamaica produce commanded higher prices than any of its older rivals at the last sale in the year. The greater portion of the South American parcels were bought in, because the prices on offer would not have allowed any profit. The highest price of those sold was 4s. 2d. per lb for good Carthagena bark, a description which has heretofore received great favour. Passing on to the Ceylon samples, we find it recorded that "Fine Quill" bark from that colony commanded 7s. 4d. per lb, and " Root Bark" 6s. 4d., against 7s. 11d. and 6s. 10d. respectively, for the same qualities from Jamaica. These quotations were for what is called " Crown or Grey Bark," but not less advantage rested with Jamaica in "Red Bark," and "Twig" sorts. It thus appears that the West Indies have already more than equalled the East in the quality of their cinchona, both going far ahead of South America, except in comparison with certain special brands of exceptional excellence. But it must not be imagined that the whole of Jamaica could be turned to this purpose. Cinchona will not grow there at all at a less elevation than 2,500 feet about sea-level, and from that up to 4,000 feet, only ' Red Bark" plants will thrive. After the latter height is passed, this variety at once begins to languish, but, odd to say, " Crown Bark" then commences to flourish, and continues to do so up to the highest altitude of the Blue Mountain range. The question is, therefore, how much land of the required sort will be found available? Southern India will not be gratified to learn that, in the opinion of Mr. Morris, " vast tracts of land lying hitherto uncultivated on the northern slopes of the Blue Mountain range will ultimately prove suitable for cinchona." Nor is this merely theory, the conditions of the area here mentioned, seem to be such as would render failure well nigh impossible. A rich, friable soil, a sloping situation so as to insure natural drainage below ground, and a moist, equable temperature are the chief requirements of the cinchona planter, and all of these exist in perfection on the beautiful Blue Mountain range. Good drainge is all-important, it seems; the moment the roots of the plant strike down into a sub-soil, which has a habit of collecting moisture, it surely sickens and withers away. This peculiarity is found in the whole cinchona tribe, and any planter who does not make his account with it, will be pretty sure to have it brought to his knowledge in an unpleasant fashion. But when the site selected for a plantation is on a natural slope, the sub-soil is almost invariable well drained, and this is why cinchona is generally cultivated on ground of that description. Have we none of it in the Himalayas? Enough to grow cinchona, if good drainage were the only requirement for success, to supply the whole world. But it would be only here and there, we fear, that the "rich friable soil," and the "moist, equable temperature" would also be found. Our mountain ranges, however, are so vast, both in superficies and in altitude, that one would be disposed to credit them with the possession, in one part or another of all qualities necessary for the production of good cinchona. It might be as well to prosecute inqury on this head. Few who are personally acquainted with the Himalayas will be found to affirm that we have as yet even tapped their potentialities of wealth. They form a sealed book, which British enterprise will assuredly open sooner or later, and perhaps one of the first pages will be the that to which beautiful but "played out" Jamaica, directs our attention. With every sort of climate, soil, and situation, with plenty of labour, either on the spot or close at hand, with ample facilities for making decent roads, the vast mountain ranges of North-Western India will some day prove a veritable Tom Tiddler's land, greatly to the enrichment of our home country. Perhaps the time has not yet arrived for promoting a "Himalaya Developement Company," on the London Stock Exchange, although far more speculative enterprises are now greatly in favour with the confiding British public. But if the Government out here were to do what Lord Lytton did for the Wynaad, by setting on foot official inquiry into the concealed resources of the Himalayas, and then publishing the results in the *Gazette*, we feel assured the way would be at once made smooth for the introduction of a flood of British capital and enterprise into our magnificent mountains—*Civil and Military Gazette.*

GROWTH OF THE CINCHONA INDUSTRY IN INDIA.

THIS new trade is of great promise, both as regards export and the benefits to the people which the use of the bark produced in India is already causing. The exports of the bark for the past four years are as follows :—

	Quantity.	Value.
	lb.	£.
1875-76 ..	26,992 ...	2,570
1876-77 ...	72,452 ...	6,413
1877-78 ...	286,944 ...	39,635
1878-79 ...	227,179 ...	28,196
1879-80 ...	459,286 ...	66,071

The cinchona tree was introduced a good many years ago from Peru, and its cultivation in the Nilgiris and near Darjeeling was persevered in until it has now taken firm root and become thoroughly established. In the Government cinchona plantations near Darjeeling in 1879, there were 2,174 acres under cultivation, containing a total number of nearly five million plants, cuttings, and seedlings, of which upwards of four millions were permanent plants, a great proportion of them large trees. In the Nilgiri plantations there were nearly 1,100,000 plants, and in Burmah close on 100,000 more. The bark produced on the Darjeeling plantation is converted on the into into an alkaloid, possessing much of the efficacy of sulphate of quinine, which is sold at the rate of Re. 20 the pound : the price of imported quinine averaging Rs. 90, or four and-a-half times the price of the alkaloid. The plantations have produced about 1½ million pounds of bark since their commencement ; and last year 9,424 pounds of alkaloid were manufactured for issue to Government hospitals and dispensaries, and for sale to the public, by whom it is eagerly bought. The factory is now able to produce sulphate of quinine, and proposals for its manufacture are at present under consideration. This cheap and efficient substitute for the costly imported quinine has already proved of the greatest benefit, especially in the epidemic of fever, which in the autumn of 1879, swept over the greater part of the North-Western Provinces and Punjab, prostrating for months a very large percentage of the population, and causing lamentable mortality. The variety of cinchona chiefly grown at Darjeeling is C. *succirubra*; but efforts are now being concentrated on the propagation of C. *calisaya*, a more valuable kind producing a larger proportion of alkaloid.

In the Nilgiri plantations the manufacture of the bark has been discontinued for the present, and it is exported for sale in England. The example of Government was followed by private individuals, both in Darjeeling and in the Nilgiris. In Darjeeling there were 1,800 acres under private cultivation at the end of 1879, with about 1½ million plants. All the bark produced on the private plantations is sent to England for sale.—*J. E. O'Coner.*

SERICULTURE.

SILK IN BENGAL.

UNDER the title of "A few words on the present state and future prospects of sericulture in Bengal," Mr. J. A. H. Louis has published an interesting work which is calculated to revive the flagging interest in the silk-trade of this country. The steady decline of the silk manufacture for several years past has been the cause of serious loss to those classes of the rural population who had previously found a source of remunerative employment in that industry. Considering the growing demand for silk quite out of proportion to the available supply, we think that no effort should be spared to set on foot again an industry, which acquired for Bengal a celebrity, forming a no inconsiderable attraction to foreign commerce in the years, before it became the "apple of discord" to the commercial nations of Europe. In a statement of the quantity and value of silk exported from Bengal during the years 1870-1878, Mr. Louis gives the following statistics of raw silk:—

	lbs.	Value £	Value per lb. Shillings.
1870	2,591,701	1,561,512	12·04
1871	2,280,159	1,351,816	11·85
1872	1,987,867	1,130,709	11·37
1873	2,373,989	1,305,487	10·99
1874	2,392,230	1,225,599	10·25
1875	1,730,769	796,676	9·21
1876	1,417,313	452,370	6·38
1877	1,568,490	835,748	10 65
1878	1,658,005	750,439	9·06

It will be seen that the exports have fallen off during those nine years by about 35 per cent, while their total value has diminished to less than a half—their comparative value in the two years 1870 and 1878 being in the proportion of 12·04 and 9·06, or a difference of nearly 25 per cent. It has been generally supposed that, in consequence of the unremunerativeness of the industry, the silk turned out by the Indian cultivator is of an inferior quality. Such may, to some extent, be the case; but Mr. Louis is of a different opinion and holds that the chief cause is to be traced to the decline in the quality of the worms. It is believed that they are now liable to a disease which injuriously affects the value of their produce. The worms die out in immense numbers, and such as survive only spin an inferior silk, and reproduce a sickly breed. This disease is attributed to the enervating nature of the climate which is almost irremediable. Mr. Louis strongly recommends the continual introduction of silk worms' eggs from such countries as are free from diseases, and quotes the experience of France and Italy in proof that the most scientifically contrived remedies will be but partially successful. In France experiments, with a view to the prevention and cure of the diseases of the silkworm have been tried with but a certain amount of success; but Italy adopted the simple remedy of importing eggs from Japan annually. The produce of silk in Italy, which in 1850 amounted to 3,460,000 kilos., had fallen in 1864 to 1½ million kilos. By the introduction of a new and healthy variety of eggs, the manufacture has been restored, and during the last eight years the average produce has been close on 3½ million kilos. The same remedy is recommended for Bengal, and in view of the peculiar helplessness of the Indian silk maker, the establishment of Government nurseries is strongly advocated, as well as the introduction of stores on hill stations for the preservation of the eggs until the proper season for hatching arrives. If these simple recommendations are attended to, it is more than probable that a flourishing and profitable industry will soon be firmly re-established not only in Bengal, but in other parts of India, where the climatic conditions and the tastes of the people have made sericulture a local industry. The rearing of silk-worms and the manufacturing of silk are peculiarly adapted to the habits of the natives of India and in the absence of private enterprise, the Government might well help in reviving an industry which under favorable conditions might contribute to the material welfare of the masses. In the Dehra Doon an English firm has already made arrangements for developing the indigenous industry, and it is probable that they will reap the fruit of their enterprise.

THE NATIVE SILKS OF ASSAM.

THE native silks of Assam, known as "Eria" and "Muga," are the produce respectively of "Attacus Ricini" and "Antheræa Assama," and "Antheræa Mesankooria."

The *Eria* worm is so called from the local name of the castor-oil plant (*Ricinus communis*), on which it is almost exclusively fed. It is reared entirely indoors. The duration of its life varies with the season; with the summer, it is shorter, and the product is both better and more abundant. At this season, 20 to 24 days elapse from the date of its birth to the time when it begins its cocoon, 15 days later the moth is produced, in three days the eggs are laid, and in five more they are hatched, making the total duration of a breed 43 days. In winter, his life extends to nearly two months. Seven breeds are reckoned upon annually. For breeding, the natives select cocoons from among those which begin to be formed in the largest number on the same day. Those containing males are recognised by more pointed ends. On the second or third day after the cocoons have begun to be formed, they are put into a closed basket, and hung up in the house, out of reach of vermin and insects. Twenty-four hours after the moths have been produced, the females are tied to long reeds or canes, 20 to 25 to each, and these are suspended in the house. The eggs laid during the first three days alone are kept; they are tied up in a piece of cloth, and hung from the roof till a few begin to hatch; these eggs are white, and resemble turnip-seed in size. When a few of the worms are hatched, the cloths are put on small bamboo platters, and here they are fed with tender leaves. After the second moulting, the worms are removed to feed on bunches of leaves, suspended a little above the ground, and a mat is spread beneath to catch those which fall. When they have ceased feeding, they are placed in baskets filled with dry leaves, amongst which they form their cocoons. In four days, the latter are complete. A selection having been made for the next breed, the remainder are exposed to the sun for two to three days, to destroy the vitality of the chrysalis. The cocoons are next generally put into water containing potash (wood-ashes), over a slow fire; when removed, the water is gently squeezed out. At other times, they are massed together for some days with "amrita" (? *Carica papaya*), or "madhu" fruit. The object is the same in either case, *viz.*, to facilitate the drawing of the silk. The cocoons thus treated are taken one by one, and the silk is placed within the thumb of the left hand, whilst the right is employed in drawing out the silk. Any inequalities that may exist are reduced by rubbing them down between the thumb and finger; the same process serves for joining on new cocoons. The thread is allowed to accumulate in quantities of about half-a-pound; these are afterwards exposed to the sun, or placed near a fire, till dry, when they are wound up into skeins. The silk is then ready for the weaver. It is the coarser of the two kinds, and none of it ever finds its way into Bengal.

The *Muga* moth is found wild in the jungle, but all the silk produced by it is from domesticated worms. They are reared on trees in the open air. There are generally five breeds in a year, *viz.*, January to February, May to June, July to August, September to October, and November. The first and last yield the best crops as regards both quantity and quality. Constant watching of the trees is necessary. By day, crows and other birds pounce upon the worms and devour them. By night, bats, owls, and rats are very destructive. Numbers of the caterpillars are destroyed in the more advanced stages by the sting of wasps, and by the ichneumon insect, which deposits its eggs in the bodies of the worms. The latter thrive best in dry weather, but a very hot sunny day at the moulting time proves fatal to many. Indeed, at this period, rain is considered very favourable and even thunderstorms are not injurious, as they are to the mulberry worm. Continual heavy rains do mischief by sweeping the worms off the trees, but showers, however violent, cause no great damage, the worms generally taking shelter under the leaves with perfect safety. During moulting, the worms remain on the branches, but when about beginning to spin, they come down the trunk. Bunches of fresh plaintain leaves are tied round the trunks at some height from the ground, in order to arrest their progress. The worms are then collected in baskets which are put under bunches of dry leaves suspended from the roof of the house. They crawl up into these, and there form their cocoons. The total duration of a breed varies from 60 to 70 days; the period is thus divided:—4 moultings, 20 days; from fourth moulting to beginning of cocoon, 10 days; in the cocoon, 20 days; as a moth, 6 days; hatching of the eggs, 10 days; total 66 days. Chrysalis not being easily killed by exposure to the sun, a number of cocoons are placed upon bamboo stages, and covered with leaves, whilst a quantity of dry grass is ignited below them, and in a short time destroys them. The cocoons are then boiled for about an hour in water containing potash (the ashes of mustard and other plants). When taken out, they are laid between folds of cloth. The floss is removed by hand, and the cocoons are thrown into hot water. The instrument used for winding off the silk is the roughest imaginable. A thick bamboo, about 3 ft. long, is split in two, and the pieces are driven equally into the ground about 2 ft. apart, over the interior projection of one of the knots is laid a stick, to which is fixed, a little on one side, a round piece of plank, about 1 ft. in diameter. The rotary motion is given by jerking this axle, on which the thread rolls itself. In front of the vessel holding the cocoons, a stick is placed horizontally for the thread to travel upon. Two persons are employed—one attends to the cocoons; the other jerks the axle with the right hand, and with the same hand directs the thread up the left forearm, so that it is twisted in coming down again towards the hand, while the left hand conducts the thread over the axle. The Assamese consider it a good annual return if an acre of trees support 50,000 cocoons, yielding upwards of 24lbs of silk. It must be very profitable, as 1,000 cocoons are reckoned to afford 6 to 8½ oz of silk thread, selling at 10s. to 12s. a pound. The labour and expense of maintaining a plantation of the trees is very trifling.

Two kinds of silk are distinguished by the natives as the production of the *Muga* worm—*Muga* and *Mujankuri*,—their difference being attributed to the trees on which the worms are fed; but naturalists have determined a specific difference in the worms themselves, calling the former "Antheræa Assama," and the latter "Antheræa Mezankooria." The *muga* worms feed chiefly on the "Sum" tree "(? Artocarpus chaplasha; Tetranthera lanciolata); mujankuri, from those fed on the "Adakur" tree "Tetranthera quadrifolia". The latter is whiter and better than the former. Some of the silk thread produced in Sibsagar sells for as much as 35s a pound. Lakhimpur in 1871, exported 11¼ tons of *Muga* silk thread, valued at £6,099.

The reader may refer to the *Journal of the Society of Arts*, May 9th 1879, for further information on Indian wild silks.—C. G. WARNFORD LOCK.

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

CONTENTS:

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

CORRESPONDENCE.

ABOUT PAPER FIBRES.

Sir,—As Mr. Liotard's Memorandum, "Materials in India suitable for the manufacture of Paper" is the latest Text-book on this subject, therefore no doubt likely to be much referred to, it may be well to direct attention to get another class of fibres or fibrous products mentioned in several of the district reports in that publication.

At pp 5, 11, 14, and 15, the palms are specified as being useful for paper material ; their leaves, the leaf-stalks or mid-ribs, and even the coarse harsh fibre covering the fruit or nut.

Now the palms are a very large family comprising nearly 600 species, the date, the cocoa-nut, the areca-nut are named in the reports, but many other varieties abound in India, collection therefore no doubt could be made at little cost, but I have not yet seen the leaf of any palm that could be utilised for such purpose ; always be it understood fitted for English or European requirements, and the fibre therefrom producible at a cost that will allow of its competing favorably with existing material, the fact being that the leaves and leaf-stalks of nearly all the palms are hard, horny, and silicious, the ultimate fibre therefore can only be produced from them by costly treatment of high pressure boiling with strong caustic alkali together with considerable mechanical manipulation :—The yield of available fibre would be very low, and that fibre harsh. difficult to bleach and unsuitable for our English papers.

To quote a familiar example, the dwarf palm, which abounds on the Mediterranean littoral of Spain and Africa, the *Chamærops humilis*, the freight being low has been imported again and again, but found fitted only for inferior grades of paper.

The screw pine, *Pandanus utilis* or *Borassus flabelliformis* has tempted many experimentalists, probably seeing the abundant crop of leaves it produces, but these again are valueless, except perhaps for the commonest papers, the bulk of the sugar imported from the Mauritius comes in bags made from their leaves.

One reporter recommends probably the most unsuitable material of all, *viz.*, the leaves of the Prickly pear, the *Opuntia dillenii* or *O vulgaris* ; an ordinary deal plank would be more amenable for paper material, and the fibre threfrom superior and produced more cheaply.

I am tempted here to quote the remark of the celebrated D. Abernethy to his dyspeptic patient who was fond of cucumber. "Peel it carefully, slice it thin, dress it with plenty of oil, vinegar, pepper, and salt, and then—throw it out of window" so with regard to this class of fibres and their value for the purpose in view, *viz.*, paper material even after a costly system of treatment, they won't digest, that is won't sell, and I would caution intending pioneers to transmit only a few cwts for experiment before incurring much expenditure.

To sum up : What are paper-makers *régime*, is a soft, silky, cottony, or flaxy fibre capable of being finely divided, or split up, and felting well from the divisibility of its fibres when reduced to pulp by the ordinary processes of paper-making.

In point of fact, the paper-maker if he could procure them in sufficient abundance, and at reasonable cost, would infinitely prefer rags to any other material, and it is only their daily increasing cost and scarcity which has induced the use and demand for other material.

By rags I mean the cast-off, worn, or partially worn out clothing, or other fabrics made from vegetable (not animal) fibres such as cotton, flax, hemp, jute, &c., &c., and failing these, a raw or partially prepared fibre assimilating as near as may be to rags in character is the desideratum. In another letter I will endeavour to explain technically, that is practically, why rags are preferred to ordinary raw fibres unless such fibres are offered in a condition presenting similar or nearly similar characteristics.

THOS. ROUTLEDGE.

Claxheugh, Sunderland, 3rd March 1881.

THE CROTON OIL PLANT.

TO THE EDITOR.

SIR,—I see from a letter to the *Ceylon Observer* published in your issue of the 1st February, that it is actually proposed to introduce the cultivation of the croton oil plant in Ceylon.

I seize a spare moment to express a hope that no such step may be taken. I know the croton oil plant well. Two varieties of it, one of which, but I am not sure which, is the croton tiglium, grow in abundance in the Madras Presidency, where it is a noxious weed, very troublesome from its habit of sowing itself widely and from the difficulty of eradicating it. It is to some extent used as a hedge, because it grows so very freely from cuttings, but it is a very short-sighted policy to use it as such, for it never makes a good hedge, is not stiff enough to keep out trespass[illegible]nally spreads laterally till it fills the whole of the enclosure it was intended to fence; fortunately its roots do not extend deep into the ground, and it is easy to pull it up by the roots after rainfall. In the neighbourhood of Madras it is so abundant that it poisons much of the standing and running water. It is a well-known fact that water impregnated by this plant causes cattle disease, and it would probably cause diarrhœa in men. I don't think it would ever become a good shade tree even in the luxuriant climate of Ceylon. It is only an ugly, sprawling, overgrown shrub, seldom more than 7 feet high. As to the use of the product as an article of commerce, I can only hope that doctors are not going to use this deadly poison largely as a purgative. You see what Mr. Whyte says on that point. I should think no doctor would ever require to use such a dangerous and violent purgative many times in his practice.

C. D.

PLOUGHS AT THE LUCKNOW EXHIBITION.

(To the Editor of the Express.)

DEAR SIR,—On reading the article contained in your issue of the 4th February last, asking for a fair trial for my ploughs at the late exhibition, I felt myself bound to submit them to the test and sent 6 ploughs of all sizes to the committee. The first trial came off on the evening of the 9th instant, and although, I had previously suggested the watering of the ground to one of the members of the committee, the precaution was not adopted, and the result was that after two or three hours' labour the trial broke down; to the disgust of the spectators who came to see it, and caused the sarcasms, and bitter remarks of the native agriculturists who had never heard of such a proceeding—wherever I went I heard loud expressions of native opinion such as, "*Yeh hull ismeeluck mae naheen chullega*"—"*kaee sookee dhurtee jotat hai?*"

This morning a second attempt was made, and the ground being previously watered everything appeared promising, but on finding that bullocks of various sizes and strength were being used for each plough, I suggested that, as the draught was an important item, the sizes and condition of the cattle might be noted in each trial. This was at once over-ruled by the two European members of the sub-committee belonging to the Agricultural Department, the two native gentlemen being simply of the *jo hookum* class, and appeared perfectly ignorant of agriculture. I then went and appealed to one of the members of the committee who very indifferently suggested that the sub-committee be left to work on their own lines. As my plough had been repeatedly tried with success against those of the chief competitors both at Calcutta and Bolundshuhur, (where I am happy to say I obtained the first prize) I thought it was folly to submit my invention to the opinion of a jury who seemed to be oblivious of the *first* requisites of a plough intended for India, and was only too thankful to obtain permission to withdraw from the competition. There is no lack of ploughs in Europe and America, and it is the nature of the draught in this country which necessitates an alteration to suit the bullocks and the native habits, and I therefore cannot comprehend how this important consideration was lost sight of; and although a dynamometer was available on the spot, it was never used? The following points should in my humble opinion comprise all the conditions required of a plough to suit his country, and on these I am prepared to test my invention before a committee of *practical* agriculturists not personally interested in the matter.

1stly.—The object in view being to improve the native plough as it exists, the first point for consideration must be how far the modified implement resembles the plough in all its parts.

2ndly.—That it possesses the slightest difference in appearance to the native type, and is not an eye-sore to the ryot.

3rdly.—That it is within the power of the smallest bullocks; as. it is necessary to adapt the implement to the power available in this country.

4thly.—That the ploughman can hold the stilt with one hand and reach the bullock's tail with the other. This is a most important advantage in the ryot's estimation. All double handled ploughs, and those having the stilt placed at a wide angle, must be held to labor under this disadvantage.

5thly.—That the plough is light and from its form of construction can be easily carried on the ryots, shoulders.

6thly.—That the plough is durable, and in case of accident the injured part is easily repairable by any village carpenter or blacksmith. All ploughs with any cast iron parts must be held to disqualify it on this point.

7thly.—It must do more and better work than the country plough with the same power.

8thly.—It must be cheap and within the means of the ryots, the common country plough costs from Rs. 2 to 3.

9thly.—It must be so constructed as to make a furrow of any depth or width, according to the capacity of the bullocks, and turn the sod completely over, without this qualification the plough cannot be considered an improvement on the native plough.

LUCKNOW: 11*th March* 1881.

Yours faithfully,
W. MARTIN.

COCA.

(To the Editor of the Ceylon Times.)

SIR,—While everyone who has any "go" at all is watching with interest the "many" experiments with low country products now being tried in the plains or the lower districts of Ceylon, it is a good thing to look round us and see if we cannot fall upon a new product that will suit our hills, especially as many of them look badly in want of some produce or other to cover their nakedness. Now I do not see why we in the wetter high districts (Maskeliya for instance) should not try Coca. It makes one's mouth water to read that in Peru, Coca returns 40 per cent., that it yields 800 lbs. to the acre and is worth about 40 cent. (say 10d.) a lb. on the spot, &c., &c. It is described as a shrub from four to six feet high, growing luxuriantly at 5,000 feet on the warm and humid slopes of the Andes. The leaves are used by the Peruvian and Indian as a masticatory just as beetle is used here. No less than 8,000,000 people, it is said (like so many bipedal caterpillars) daily devour the leaf. The Coca leaf is firmly believed in as the only Medicine the Peruvian Indian knows, and he pays his 5 dollars for an arroba of 25lbs. cheerfully. The sowing should be commenced in May or June when the rain are on, and the seed should be sown in a nursery carefully sheltered by a thatched roof, the seed will germinate in a fortnight and should be carefully picked out and gradually hardened by removal of the shade above the beds, and planted the following May or June into the field. The plants are said to be more susceptible of work and in the Peru Mountains they are terraced on the steeper slopes while on the plains they are planted very much on the "Montclar system" that is each plant is enclosed by a mud wall. At eighteen months the plants will yield their first harvest, with plenty of rain a flush should be expected every forty days. The green leaves, called mata, are dried in the sun and packed in bags of 50 lbs. each. To give some idea of the large trade in Coca, this traffic yielded as long ago as 1795 £528,300. Seed can be purchased in Buenos Ayres.

PIONEER.

WELL IRRIGATION IN GUZERAT.

(To the Editor of the Times of India.)

SIR,—The rainfall (28 in. 70 cts.) during the past season was perhaps, all that could be desired by the uncomplaining meek-spirted cultivators of the Duskroee pergunnah in this collectorate. The harvest was, comparatively speaking a good one, and grain of every description and forage are very cheap. The agriculturist has, therefore, according to the vague notions of unreasonable thinkers and random writers, nothing whatever to complain about. Recent diligent inquiries made by me during my peregrinations convince me, and compel me to say, that preparations are not being made to any noticeable or remarkable extent, at wells in the boundaries of villages in the neighbourhood of Ahmedabad to sow and raise a second crop by irrigation. From the inquiries made by order of Government some time ago, it was painfully apparent that out of 878,804 acres of land under tillage, only 14.047 were twice cropped. Another lamentable fact that appears to me to demand the serious and timely consideration of Government is this. Many of the bullocks of different size that have hitherto been used from June to November to plough, sow, and harrow land, and to thresh corn are, with grain and forage

that can be ill-spread, now being taken as fast as possible by the poverty-striken ryots to the city into a falling market, and disposed of at ruinously low prices, to enable them to meet the first instalment of the revenue demand (due on the 20th instant), and the claims of inexorable usurers. In your issue of the 11th idem, you obliged me with space for my letter on "Well Irrigation in Gujerat." The question that now stares every deep-thinking observer in the face is this: Why are the *very few wells* that are in existence under our enlightened rule permitted to remain unused, when paying crops may be raised, cattle retained and fed, and general improvement effected in the present wretched condition of the agricultural classes? The reply is unquestionably simple enough, and is contained in part of a leading articles in the *Times of India* written *as long ago as the 19th of February* 1869: "The great objection to the well-system is its cost (not so much in the original cost as in the working it with the present ineffective mode of raising the water). The bullocks employed seldom last more than two or three years, and are worn out. The expense of well-irrigation is estimated at from forty to sixty rupees per acre per annum." It should be borne in mind that leather and raw hides are now fully forty per cent. dearer than they were some ten or eleven years ago, and as the water-bag or *koas* and ropes are invariably made thereof, they can at present only be purchased at nearly double the original cost. This unexpected and most extraordinary rise in the price of leather is undoubtedly attributable to unprecedented foreign demands, increase in local consumption, and to a decrease numerically in cattle from mortality or other causes. Recent satisfactory statistical information, collected and published by order of Government, has led to the discovery that in oxen alone there has, within a few years, been a decrease here from 156 254 to 149,192, and no praiseworthy efforts are I regret to say, being made either by Government as landlord, or the ryots as tenants, to improve matters in this respect. The circumscribed means of the latter necessarily preclude the possibility of any action of beneficial tendency being taken by them, and they are in consequence unhappy creatures of circumstances. It occurs to me that a grave question of considerable importance forces itself on the public mind, and must sooner or latter be confronted—*viz.*, what protective measures should Government as a morally responsible agent, take without loss of time to initate a system that will virtually reduce to a minimum the cost of raising water—a priceless gift of Nature—from deep wells, in order that the ryot may, with temporal advantage to himself, and the exigencies of the State, use it ordinarily, and in times of great emergency in sufficiently large quantities for irrigational purposes? The reply is by no means enigmatical, and will certainly be found in the following valuable lines of unheeded advice contained in the leading articles above referred to: "Few greater benefits could be conferred on the country than the introduction of an improved machine for lifting water. Such a machine must be cheap, simple, capable of being repaired by a village artisan, and of raising with a pair of bullocks, working on the level, twice as much water as a pair working on an inclined plane can raise with the bucket. Several machines for lifting water have, we believe, been recently invented, and we think Government should ascertain if any of them answer those conditions, and should then take measures for their general introduction."

A FRIEND OF GOVERNMENT AND THE RYOT.
Camp Ahmedabad, Jany. 22.

MR. OLIVER JONES ON COFFEE LEAF-DISEASE.

SIR,—On the 24th December 1879, I intimated by wire to the Editor, *Madras Mail*; the Secretary, Planters' Association, Ceylon, and the Secretary, Planters' Association, Calicut, that the true cause of coffee leaf-disease was discovered by me after careful investigation on the lower range of the Pulneys in the Periakulum taluq, Madura district. On the 19th of May 1880, my letter refusing the fungus theory as advocated by Mr. D. Morris, late of Ceylon, was published in the columns of the *Madras Mail*. Since then I have devoted the greater part of my leisure to further investigations of this very important and growing disease; particularly as it is of deep interest to the Ceylon Government, and to the planters of the colony and Southern India, and being confident that my views concerning this disease when perused will be received with pleasure, as thereby the crop-producing capabilities of the trees will be greatly enhanced, I have, after giving the subject my best consideration, resolved to publish in detail the true cause and best treatment that may be adopted not only to check and mitigate, but to cause an entire extirpation of a disease which has been very correctly denominated the planters' pest.

As introductory, permit me to state that the coffee tree belongs to the genus *coffeea*, of the order *Rubiaceæ*, and is exotic; as may be seen from the formation of its leaves, which if submitted to an examination are found to be made up chiefly of two portions, *a*, Fibrous, and *b*, Cellular. The fibrous is made up of the petiole, the midule, and the veins proceeding from it. The cellular tissue is made up of a number of bags or cells varying in shape, while both fibrous and cellular portions are beautifully invested in a delicate membrane called the cuticle, which is abundantly furnished with stomata or breathing pores. In coffee leaf-disease it will be seen on examination that it is the soft cellular tissue that is destroyed, so that the normal functions of respiration, digestion, and exhalation are interfered with, and that the nutritive products and special secretions fail to supply the materials for growth and development, and the natural result is that numbers die away, while others soon look sickly and unhealthy.

What, then, produces this morbid change; does it lie in the sap of the plant being filled with infusoria from peculiarities of soil and moisture or fungoid organisms having their birth and growth from decaying vegetable substances, or is it due to causes other than those enumerated? But as the true cause of coffee leaf-disease does not lie in the blood of the plant being saturated with the infusoria or fungoid organisms, the *cause rationale* must be elsewhere. Walk into your plantation while the air is cool and crisp and make with your own hands a collection of diseased leaves, from the so-called pin-spots, to those where the whole leaf presents the appearance of an irregular sheet of fine rust; do not agitate the branches, and do not roughly break off the leaves, but most carefully remove the leaves by making gentle pressure at the foot stock, and after you have done this, adjust your microscope and place one of the diseased leaves under it, and you will, I am confident, very quickly detect the true cause of coffee leaf-disease. Having once seen for yourself the primary cause of this mysterious and growing disease, you would then be able to explain the meaning of the much spoken of dark brown spots, the rust, and threads of would-be mycelium. But I have failed to instruct you as to what you are to look for. It is evident I am desirous of permitting you to grope hopelessly in the dark. But if you are a naturalist and have some knowledge of entomology, then darkness shall be dispelled and light flood your path of investigation and research. I look into my note book, and there learn that the true cause of this disease bears the following description. I note it is long and cylindrical, but yet very small, it is made of several segments of which the antennæ represents the head of the insect, and the next three armed as they are with legs, the chest, and the remainder the abdomen and anal segments. The head has a pair of strong yet microscopic mandibles, a moderate sized upper lip, and in the centre of the lower lip is placed the spinneret or silk spinning organ. The body is clothed with spines, which surround each ring of a segment, and that while browsing on the coffee leaf and as seen under the miscroscope, its interior is filled with a red fluid. So that the true cause of coffee leaf-disease is both ocular and tangible. It has a name and belongs to the family *Noctnœlatæ*. It is after all the little moth, measuring scarcely half an inch across the wings and belongs to the order *Lepidoptera*. It lives, grows, propagates, and enjoys its short life among the beautiful jasmine smelling flowers of the coffee trees. This then dispels the fungus theory. It explains: *a* that the orange sporanges are nothing more than the excreta or digested cellular tissue mixed with coloring matter; *b*. that the threads of would-be mycelium are simply bands of fine silk as spun by the silk spinning organ of the larvæ; and *c*. That the dark brown spots are the reticulated portions of the leaf destitute of its cellular tissue, which had been devoured by the larvæ.

The next item of importance that needs a few cursory remarks is as regards the difficulty that has been experienced by others in failing to discover the true cause of leaf-disease. It is doubtless due to the fact that the larvæ being clothed with rows of spine, the rust, or more correctly speaking the excreta of the larvæ, adhere to them and thus completely hide them from view, and *2ndly*, they have a great tendency as soon as touched of detaching themselves from the leaves on which they may have been feeding with amazing rapidity; for example (*a*) I ordered a coolie working on the estate to make me a collection of diseased leaves. He soon returned with a handful. I then carefully examined them and found but two larvæ in a total number of some 200 leaves. (*b*) I filled my tiffin box with a very large collection made by myself (but took the precaution as a necessary step to line the inside with a clean piece of calico) and after the lapse of 12 hours examined the leaves and with difficulty detected a few; the majority, if not the whole had left the diseased leaves and fastened themselves to the calico lining of the box. This, then, accounts briefly, why others have failed to discover the true yet very simple cause of coffee leaf-disease.

And now as regards the treatment. It holds threefold facts—

1. Curative in character.
2. Arrestative, tending to prevent the spread of the disease, and—
3. Preventative or prophylactic, tending to prevent the origination of the disease.

I. Curative. As soon as all diseased leaves have fallen off, they should be collected into heaps and burned. It is very necessary that this act be made imperative; in fact I would advise the Government to enact a law concerning the observance of rules that shall be binding on all coffee planters. Because at this period the larvæ have all passed into their pupæ state and are protected from wind and weather, being as they are encased in a flocculent covering made by the silk they spin, so that nothing would destroy them but fire.

II. Arrestative. This may be done by employing children to collect in the eggs, which are made up of successive layers encased or surmounted with the hair stripped from the female moth, and as a rule lie concealed on the undersurface of the leaves—particularly as the number of larvæ escap-

ing from a single nest are quite capable of infesting a dozen or more trees.

III. *Preventative.* Prophylactic, since coffee leaf disease is highly contagious, so that the disease is capable of propagating itself by a process of contiguity. It is necessary that diseased as well as healthy leaves and plants be thoroughly dusted with the medicine as given below. In every case coolies should be instructed and trained to cast the dust from their hands into the plants, from below upwards, so that the remedial agent may come in contact with the stomata or breathing pores which lie on the under surface of the leaves. It will be well that the dusting be done in the eve or in the morning before sunrise, as the rays of the sun have a tendency to dissipate the medicinal action of the medicine. It may be also used with much benefit soon after a shower of rain or a slight drizzle. It is recommended that no less than three applications be used in every case with an interval of two days between each application. If the weather is dry, 6lbs. of the medicine may be dissolved in 12 gallons of water, and the solution injected on the plants from below upwards as instructed in the dusting of the dry powder. The medicine should also be largely used in the nurseries, as the disease is often fostered and propagated from them to the main plantation. I would advise *a*, the dusting of the medicine on the plants soon after the flowering season, so that the moths may be prevented from depositing their eggs: *b*, it may be also used as soon as the leaves show the well marked pin-spots, as the powder is also very destructive to the larvæ.

Cocculus Indicus, deprived of its outer coat, 2lbs.

Camphor pulverised by means of a little spirit 1lb, aloes reduced to fine powder 3lbs, and pulverised chalk 6lbs. The *Cocculus Indicus* to be rubbed in a mortar with the chalk and then the aloes and lastly the camphor should be added. The medicine should be always used fresh; if not it has a tendency to deteriorate.—Yours faithfully,

OLIVER W. JONES,
Asst. Supdt., Medical School, Dindigul.

The Indian Agriculturist.

CALCUTTA, APRIL 1, 1881.

MR. BENSON'S TOUR.

We are much indebted to the courtesy of the various Secretariats for copies of the reports on agricultural and other cognate operations throughout India. At the same time we would point out one defect in connection with nearly all such documents; they are, as a rule, not issued for a very long period subsequent to the year to which they refer. As an instance in point, there is the "Report of a tour in the Cuddapah and North Arcot districts made in August 1879." This very interesting record only reached us a few days ago. Mr. Benson has written a very readable report of his tour, and he manages to compress much valuable information into the space of a few pages. The Cuddapah district is highly favored from an agricultural point of view, and it would seem by the report, that besides the natural advantages enjoyed by the rayats, a considerable amount of good work has been done by way of improving matters still more.

Manure is available in large quantities, and tanks and wells are plentifully scattered over the face of the country. High rents prevail, and we are told that Rs. 35 per acre have been paid. This is abnormally high, and from a consideration of the whole subject Mr. Benson draws the conclusion, that these high rents are the cause of the good farming which prevails. May it not be the other way, and may not the high farming for which the district has long been famous be the cause of the high rents. It is most probable that both hypothesis are true, and that the one reacts on the other. If the zemindars of India generally would only expend a little money in helping and encouraging their tenants, agriculture in the land would soon improve to such an extent that they would be repaid a hundred-fold for all their advances, and the condition of the rayat would advance in like proportion. It is impossible that rents can advance much higher than they are at present, owing to the impecuniosity of the rayats and to their indebtedness to the bunia. A very little help from the zemindars would relieve them from these burdens, and increased comfort and improved husbandry could not fail to follow, while for the zemindars enhanced value of land with higher rents would be a natural corollary.

The subject of weeds does not seem to be understood by the cultivators, as Mr. Benson reports the land as "extremely foul" in the irrigated lands, and of the lands unirrigated he says :—"The land under the crop (indigo) at the time of my visit was full of grass and generally dirty." Doubtless the comparatively high state of cultivation followed leads to a heavy growth of weed, but the rayat should not forget that his crop ought to get the sustenance filched from the soil by these weeds. They are, however, alive to the benefit to the soil of green manure, for we learn that they utilize the second growth of the indigo by ploughing it in.

One great advantage enjoyed by the cultivators is the abundance of wood fuel, which "prevents the use of *brathis*, so that the soil receives a good deal of what is removed from it by the crops raised." This is a strong argument for the planting of fuel reserves in the neighbourhood of every village.

Some very valuable hints are embodied in the report in connection with the value of canal irrigation of the "black cotton soil" of the district. This soil being deficient in the qualities necessary for thorough draining, does not benefit by irrigation as does a looser soil, the result being that the surface soil is liable to be "ruined by the presence of an excess of soluble salts." Irrigation from wells would seem to offer more advantages to such land, as with the necessity imposed upon the rayat of raising every gallon of water he required he would be less liable to flood his lands unnecessarily, and it is from this excess that the damage to clay soils arises. It is therefore a mistake, as Mr. Benson points out, to endeavour "to force water on the rayats." While referring to the generally high state of cultivation which prevailed in the district, he deprecates the mode of ploughing. He says :—

"It can thus be easily understood that the tillage usually performed is very little. A ploughing, which does not stir one-sixth of the surface soil to a depth of more than two or three inches, followed by a couple of scrapings of the surface is all the preparation the ryot of this neighbourhood usually makes for sowing his crops. In seasons of abundant rain this suffices, and the natural fertility of the land gives him crops which his labor has done but little to encourage. In seasons when the rain fails, the crops fail and he finds himself face to face with starvation; whereas in seasons of all but total absence of rain he should be able to raise fair crops on the soil he cultivates did he treat it well."

He goes on to tell us that this fact is well known to the cultivator, who now and again tries to plough deeper, but the want of the necessary cattle power presents an insuperable obstacle.

"Although the usual system of tillage is poor, the rayats are aware of the value of deep cultivation, as is shown by the use of a large plough yoked to several pairs of cattle; but the chief value of the work done by this implement is set on the effect it has in the destruction of hariali grass (*Cynodon dactylon*). The effects of the use of this implement are said to be observable for ten years, but the area annually operated on is very small; and the use of this description of implement is not at all universal. The crop usually taken immediately after the deep tillage is Bengal gram (*Cicer aristinum*). Did this practice prevail over the greater part of the black soil area, and were it regularly performed, there would be little danger of the locality suffering from a failure of crops, which, when it occurs, is most severely felt here, owing to the absence of roads for the transport of food-grain into the district."

The recent exhibition at Lucknow may tend to remove this difficulty as several improved ploughs were shown there, and when we receive the report, we may find that something has been done in this direction. To this shallow ploughing is attributed the failure to make cotton a profitable crop, the outturn in 1878 having averaged only 41lbs. of cleaned cotton per acre.

The objection urged by some to the introduction of wells for irrigation, that those latter draw their water from tanks by intercepting the percolations, is disposed of by Mr. Benson. He tell us that he has examined many wells in the neighbourhood of tanks, and he does not find larger supplies of water in them than is to be found in wells distant from tanks. He

also says, and with reason, that if these wells drew their supplies from tanks above their level they would always be overflowing while there was any water in the tanks, but he does not find this to be the case. He therefore concludes that "they can scarcely be said to draw more water from the tanks above them than that which naturally soaks slowly away by subsoil drainage."

We propose turning our attention to the subject of wells for irrigation at an early date. The quantity of manure used is about 10 loads per acre. This is equal to 3⅜ tons.

The quality of the cattle claims our attention next, and we are told that these are comparatively good. Mr. Benson has a few fitting remarks on the subject of improving the breed, and as applicable to all India we quote the following :—

"The injurious effects of the use of any bull as a sire are well known, and why, in order to prevent this in some measure, compulsory castration of all but well-developed animals might not be resorted to, it is difficult to see. The proceeding would not be a hardship to the people, whilst, as a general benefit to the country, it would be a very great advantage."

In considering the condition of the cultivation Mr. Benson comes to the conclusion that he is almost a hopeless subject, and winds up his remarks thus :—

"Causes and effects follow so slowly in agriculture, that the difficulty of following out the teaching of experiments is very great. If we add to these agencies the extreme poverty, he manifold superstitious and other influences affecting the rayat, it is difficult to reasonably expect that in the longest life of effort for agricultural improvement much can be effected in the modification of his present practices, unless pressure is brought to bear on the cultivators by their landlord—the State."

We do not quite agree with his conclusion, we do not believe "pressure" on the rayat will do any good. What he wants is help and encouragement. By all means, let us have a little gentle pressure, but let it be applied to the landlords. After suggesting a few improvements which he would introduce in the relation which exist between the Government and the rayat, or it may be the zemindar and the rayat, he concludes as follows :—

"The problem then reduces itself to the attraction of a greater amount of capital to the land, and to the inducement of natives of the higher classes to embark directly in a pursuit which has until now been looked upon as the proper employment for serfs. To induce attention to the honorable position which an agriculturist occupies, to foster an interest in his pursuits, to offer persons, who have had their attention turned to husbandry, an opportunity of acquiring the best possible knowledge of the science and practice of that art, and attempts to induce such attention, together with endeavours to scatter agricultural information broadcast throughout the country, are all objects which will bring Government a return, but from which it is hopeless to expect immediate results ; and, considering the position the active occupation of a farmer occupies at present in the estimation of the native community, can only be hoped to bring forth results if most carefully fostered and watched over by the State."

This mode of improving affairs seems a little too drastic, as it in fact amounts to improving the rayat off the face of the land altogether, and substituting in his place "natives of the higher classes." This might do were we dealing with an entirely new country, and were trying to regulate the class of immigrants we ought to encourage, but here we have the evil, *viz.*, the poor ignorant cultivator, and our duty is not to abolish him, but to try to improve his position. In effecting this there does not seem to us to be anything in the way, which is beyond the ordinary functional operation of good government. It is a mistake to look upon the cultivator as a man who may be got rid of by the introduction of a better class of native. He is not to be got rid of by any one within our reach. We cannot possibly do without him, and he is the most important factor in our census returns. The country might somehow pull along without the better class of native, but it cannot exist without the rayat. Hence the necessity of making an intelligent effort to improve him, as in doing so we lay the foundation of a better condition of national prosperity and offer more material guarantees for good government.

FERMENTATION.

THE keystone in the manufacturing of tea is fermentation. There are other stages in the course of manufacturing when the utmost care is necessary, in fact it may truly be said that such extreme care is necessary at every stage. But of fermentation it is peculiarly true. During the course of the afternoon the careful manager decides where he will pluck to-morrow, and as the leaf arrives at the factory, he sees it weighed and preparations made for withering. Having given his instructions on that score, he need give himself little further concern about it, as the ordinary intelligence of a factory sirdar is usually quite up to taking care of the leaf in this initial process, and so in fact he may act with regard to almost all the other processes through which the tea is passed from leaf to chest. We do not of course mean to imply that he can safely leave to natives all the responsibility of taking due care of the work in every process. What we mean is this. If he has a good native staff he can issue his orders, and if he can depend on the staff, his mind may be comparatively easy as to the general result, he, of course, casting his eye around to see that his instructions are being literally and intelligently carried out. It is not so, however, with the fermentation stage. This must be attended to personally, and if he be a conscientious manager, there is no man in the factory to whom he feels he can depute the responsibility of deciding the exact moment when to check fermentation by breaking up the balls. We are perfectly aware of the fact that a large number of managers are themselves unable so to decide with judgment, and such usually leave this to the head tea-maker. We also fear that there are some who perhaps knowing well how to attend to this, yet neglect either through indifference or laziness. To such, and we are convinced they constitute a small minority, we have of course nothing to say that would at all interest him. The conscientious manager, however, who takes an intelligent interest in his work will agree with us as to the extreme importance of this subject.

The object of fermentation is to soften the harsher qualities of the flavour, and if fermentation is prolonged unduly, the flavour is almost entirely annihilated, compelling the factory staff to fire the tea to the verge of burning in order to develop some flavour, which after all, is not that wanted. Where panning is practised, this fault may, to a certain extent, be modified, but where panning is tabooed, resource has to be had to the drying process to endeavour to recover some of the lost flavour. As we have said this is hopeless, *a* flavour can to a limited extent be imparted, but not *the* flavour. If on the other hand the fermentation is checked at too early a stage, the reverse is the result, the flavour is too strong, and like all imperfectly manufactured articles of the kind, gives evidence of the insufficient fermentation in a rough pungent liquor which may be liked by those whose palates have become satiated with continual tea tasting, or by that class who have no appreciation of delicacy in food or drink, but which does not tend towards making Indian teas more popular in England, and this it is we should all aim at. We have formerly spoken of the real object of making the rasping tea thus described, *viz* :—for the purpose of strengthening weak China teas, and will not enlarge on it here. The question that now remains for us to notice, having pointed out the difference between under and over fermented tea, is what then is the proper amount of fermentation to give the tea. When the leaf is made up into balls and laid aside for fermentation the colour of the leaf is green, with a more or less decayed look about it, and immediately these balls are formed, fermentation commences. How long then from this moment are the balls to stand undisturbed ? It is quite impossible to fix a time, because the degree of fermentation going on depends on so many things. The condition of the leaf, the manner in which it was withered, or rolled, and the condition of the atmosphere all affect it very materially and make it quite impossible to fix a time. There are, however, two ways of knowing, *viz.*, by smell and sight. The manager takes up a ball and having broken it in two, runs his nose into the fracture, and his sense of smell tells him when the proper degree of fermentation has been attained. It is of course impossible to describe this peculiar flavour in print, and a correct appreciation of it is only to be acquired after considerable experience and practice. The other mode is simple, but not quite so exact. When fermentation commences the green tint of the leaf gradually changes into a dull dark brown, and this does not

occur on every leaf. When, for instance, this brown tint has pretty well spread over the ball, it will be found mixed with the original green, and the moment the outside of the ball shows about half brown is about the proper time to stop the process, of course inside it will all be brown. Then the balls should be broken up and prepared for the next process. If this be done earlier, the outturn of a trial cup will be green, and if it be delayed, the outturn will be black. What is of course wanted is the almond brown of the broken, and to attain this standard the utmost care must be taken, that the fermentation is continued up to the proper point only. We are perfectly aware that many planters do not attach so much importance to this subject as we do, but we are convinced that on nothing, so much as on true fermentation, does the quality of the manufactured article consist.

THE LUCKNOW EXHIBITION.

WE have not yet received full details regarding this exhibition, and do not expect to do so in time to notice the show fully in this number ; we propose, however, to offer a few remarks in the meantime.

The local paper notices the very subordinate position which agricultural subjects have occupied during the progress of the meeting. Speaking on this subject the *Express* says :—

"In fact, produce and implements appear to have taken up quite a secondary position throughout the recent Exhibition, and the phrase is a misnomer and misleading. The exposition has been one of industrial art primarily, the cattle section coming next, followed by that of implements and machinery, and the staple products of the province lagging far behind. Believing, however, as we do, that these latter are of quite first importance in an agricultural connexion, we can only attribute the seeming neglect of them as due to the inexperience and haste which has characterized the promotion of the meeting and its adjuncts *ab initio*. This is a first attempt in a most important direction, however, and we may expect that the fruits of present experience will not be lost when the next Agricultural Meeting comes round."

This is of a piece with a good deal that has taken place in recent years in connection with agriculture. Another illustration of this was the *laissez faire* system under which the now defunct Agricultural Bureau was carried on. Agriculture in its true sense seemed the very last thing thought of, and hence the department was gradually dropped. This exhibition was originally intended to be an agricultural one principally, and now we learn from the local print that the subjects of implements and machinery, and the staple products of the province "lagged far behind". We are willing, however, to accept the excuse volunteered, that "inexperience and haste characterized the promotion of the meeting, and its adjuncts *ab initio*," and we cordially echo the hope that "we may expect that the fruits of present experience will not be lost when the next Agricultural Meeting comes round." Several samples of wheat, *dhan*, maize, and cotton are highly spoken of ; of the latter one raised by Kunwar Harnaun Singh was highly valued, and a strong hope is expressed that the cultivation of such a quality of cotton will be more generally encouraged by the Agricultural Department of the province.

A feeling of discontent is expressed at Mr. Martin's sample of American tobacco having only been awarded a second prize. It was grown from American seed and is described as incomparable for length of leaf and cure, and should certainly have had a first prize for a distinct quality. In fact, being the first grown in Oudh on an extensive scale it might well have been honored with a medal. In our opinion, another sample from native seed, but well cured, should have had the 2nd prize instead of the Biswa parcel, which seemed to us to be very black, hard, and fermented.

We are, of course, not competent to form an opinion on this point. Several other articles are mentioned as having been particularly good, but we prefer not to go into the subject until we have the complete report before us.

We cordially endorse the views expressed by our Lucknow contemporary on the importance of making every effort to improve our agricultural modes.

"Nothing will improve this country so much, or do more for the advancement of genuine agriculture, than the co-operation of the unemployed capital and intelligence of England. By means of these aids, the ignorant, exhausted, and apathetic people of India may be led to the higher position the wonderful resources of the country open out to them ; but which are practically unattainable unassisted by the capital, energy, and 'push' of civilised European nations. The Americans would, no doubt, very soon remodel and reorganize India,—in an agricultural connection especially,—as they have the knack of adapting themselves to the 'ways and means,' and the requirements of the land they enter on the possession of, and are not afraid of honest hard labour of every kind, whilst their freedom from extremely conservative habits of life leaves them open to adopt new views. India, left to itself, can make no advance in either agriculture or anything else. We consider that the Department of Agriculture and Commerce has most important functions to discharge. And, upon the breadth and comprehensiveness with which these duties are entered upon and discharged depends the future of the country, whether for weal or woe, in its most vital interests."

We think the committee have adhered too strictly to the letter of their instructions in excluding cattle other than for ploughing purposes. On this subject Mr. Fuller writes to the Secretary of the Agricultural Meeting :—

"A very large number of the bullocks exhibited were not plough cattle, but had been broken for use in carts and raths. No provision had been made for cattle of this description in the prize class, since they cannot properly be classed as 'agricultural.' The committee, however, having regard to the number and excellence of the exhibits, determined to create an extra class for them, and unawarded some prizes out of the large surplus which remained rewarded in the other classes."

Doubtless this is technically true, but carts and raths play a not unimportant part in the economy of agriculture, and we should have preferred to have found the animals suitable for such work coming in for a share in the prizes, and in the programme of the meeting.

There seems to have been rather a *fiasco* in connection with agricultural implements, especially ploughs. Several competitors, we are told, were prepared to enter the lists, but a very reasonable suggestion made by one of these gentlemen having been pooh-poohed two competitors are said to have withdrawn. Assuming the correctness of the report we do not see how they could have done otherwise. We have transferred Mr. Martin's letter to the *Express* to our correspondence columns.

We shall possibly return to this important subject when in possession of fuller information.

EDITORIAL NOTES.

IN redemption of our promise, we have pleasure in drawing attention on the lecture on "Forest Conservancy in India" delivered by Sir R. Temple. We do not consider Sir Richard an authority on the subject, in the same sense that an expert would be ; at the same time there is a considerable amount of sound sense in what he says.

THE report on the cotton production of the North-Western Provinces and Oudh during the year ending 31st March 1880, has only now come to hand.

It has long been a puzzle to us how cotton was still retained as an article of production. The outturn in India is so small, and the relative value of the produce to other crops so miserable that we have never been able to understand what object the cultivator has in continuing to grow it year after year. In these provinces no fewer than 1,270,121 acres were under this crop, the quantity of cleaned cotton produced being 8,29,601 maunds. The statistics for the past three years are as follows :—

	Acres.	Maunds.	lbs. per acre.
1877-78	735,635	255,193	28·4
1878-79	1,358,405	1,035,743	62·5
1879-80	1,270,121	829,601	53·5

During the last two years, the average price per maund was Rs. 15-13 5, and the average produce per acre 53 lbs., consequently an acre gave a gross outturn of Rs. 11-8-3.

The average outturn of differently cultivated land was as follows :—

	lbs. per acre.
Richly manured land	74·6
Ordinary " "	53·3
Poorly " "	44·3

Now we know that the average production in America is 300lbs. per acre, and notwithstanding the many acknowledged drawbacks in India, surely 53½ lbs. is too low.

THE Irrigation Report of the North-Western Provinces and Oudh for the *kharif* crop of 1880-81, points to a larger amount of work done than in the previous year, although it was not up to that of 1877-78. The following shows the area irrigated :—

1877-78	731,583	acres.
1878-79	660,026	"
1879-80	555,641	"
1880-81	700,139	"

So much depends on the state of the rainfall, that the quantity of and irrigated can never be safely predicated. This area was only 4·89 per cent. of the cultivated area. The cost to the occupier was as follows :—

1877 78	Rs.	2-56	per acre
1878-79	"	2-81	"
1879-80	"	3-14	"
1880-81	"	2-70	"

This charge only covers one crop ; so that we may assume five rupees as the annual cost of irrigating an acre. Surely it could be done cheaper by means of wells.

THE Superintendent has issued his report of the Botanical Gardens and Park on the Nilgiris for the year 1879-80. A great deal of useful work seems to have been done at comparatively little cost, the outlay on the part of Government having only been Rs. 6,260. Great success has followed the cultivation of the *Ceara* Rubber trees; the growth was marvellous, one tree having grown 14 feet in twelve months. Several medicinal plants have from time to time been tried, but with indifferent success ; the epecacuanha, peppermint, and rhubarb, being decided failures. It is thought that the climate is too severe for them, hence they are being removed to lower elevations for further experiment. *Taraxacum* and *digitalis* have succeeded beyond expectation. We had expected no less, as these plants grow well in the comparatively cold climate of Scotland. In order to show what is being done, we summarise the sales of the year :—

	No.	Value.		
Fruit Trees ...	464	144	2	0
Timber Trees ...	2127	214	4	5
Ornamental Trees	8151	1,080	2	0
Packets of Seeds ...	4395	862	12	10
Bouquets of Cut-flowers	252	140	8	0
Sundry Receipts ...	...	335	7	7
	Total value Rs.	2,777	4	10

A RECENT experiment in the Karwar Municipality with sorghum and Planter's Friend is not without interest.

The experiments were tried on small plots equal to the fortieth part of an acre, and the result was as follows, reduced to lb. per acre :—

	Green Fodder.	Cane.	Jaggery.	Seed.
From Mangalore acclimatised Sorghum	6,000	5 010	120	1,[illegible]0
From Saidapet Sorghum	6,000	5,32[illegible]	160	1,600
From Mangalore acclimatised Planter's Friend	11,200	10,480	390	1,3 0
From Saidapet Planter's Friend.	12,000	11,280	450	1,700

This is a very satisfactory outturn, and seems to point to the Planter's Friend as a very valuable plant.

THE Mysore Administration Report for 1879 80 contains much that supplies food for thought, and the first thing that strikes us is the fact that there are "3,511,828 acres of arable waste land unoccupied at the end of 1879-80." We are continually hearing that the land is suffering from over-population. We are afraid that want of capital is the prevailing want. The population of Mysore is 172 to the square mile, there is therefore ample room for many more people here. Much of the report is, as a matter of course, taken up with fiscal and judicial details, but our present concern is with the departments of "Production and Distribution." The very first paragraph under the head of "Agriculture" reveals to us a blot which seems to us to clog every effort we make in improving our methods of agriculture. It is this :—

"Since the closing of the Experimental Farm at Bangalore, 25 acres of the ground have been made over to the Superintendent of the Lal-Bagh for experimental cultivation. The outlay on this during the year was Rs. 458, the income Rs. 405. The Superintendent is to try and make the ground self-supporting as well as useful for experiment, and he almost attained that in his first year."

Here we are immediately brought face to face with the difficulty, "The Superintendent *is to try* and make the ground *self-supporting*." This of course chokes every effort at experiment, because no Superintendent will run the risk of losing the good opinion of his superiors in office, by experimenting, unless he knows he will succeed, at which stage experiment ceases. The very word "experimental" used to describe the farm, points to trials and risks. But acting on the instructions received, the Superintendent must have no "risks ;" he must experiment so that he may be certain to succeed.

Several new trees and plants were introduced at the Lal-Bagh, Bangalore, with more or less success, and the vanilla experiments were continued. We are told that they "are only now beginning to recover from the three years' drought which nearly killed them, and have borne a good crop." Such a valuable plant as the vanilla ought to be placed beyond the reach of injury from drought. We are pleased to learn that they are producing a crop, as we feared the elevation at Bangalore might have proved too cold for them. This plant will never, we fear, become a popular one with the natives, at least for a considerable time, as there is a difficulty in fertilizing the flowers, which operation, a very delicate one, has to be done by hand, owing to the absence in this country of the insect, which in the economy of Nature, ordinarily performs this office. The year's return of crops is thus favorably spoken of :—

"A very fair harvest was the general feature of the year ; the staple articles of food, rice and ragi, were not reaped in bumper crops as in the previous year of plenty, but the yield was good, and in some tracts horse-gram and ballar yielded beyond expectations. Diminished fall of rain in Kolar and Hassan taluks told to some extent on wet cultivation under tanks which failed to secure their usual storage of water."

The following are the figures regarding cultivation :—

	Square miles.	Percentage.
Cultivated	7,351	30
Culturable waste	5,487	22
Unculturable waste	11,906	48
Total	24,744	100

The statistical tables tell us that the people are not well supplied with agricultural implements, there being only 571,968 ploughs in the province. It follows that there is only one plough for every seven acres under cultivation. In the matter of carts they are even worse off, there being only one to every 55 acres. These are the little things that tell of prosperity or the reverse. The average rent of land varies from Rs. 1-11-4 per acre for oil seeds, to Rs. 7-1-5 for sugar-cane, and the value of labour from 2 to 10 annas per day for unskilled, and from 4 annas to one rupee for skilled. Upon the whole the report speaks of progress and general prosperity.

A MEMORIAL has been addressed to the Secretary of State for the Colonies by the Planters' Association in Ceylon in respect to the proposed introduction of the medical ordinance. The planters state that no special law is required to provide for the medical wants of the coolies, but that the extension of the Civil Medical Department will be sufficient to meet the wants of the laborers. They add that since the introduction of the coffee enterprise in Ceylon, that is from 1843 to 1880, no less than 2,700,000 coolies passed into Ceylon, and that the coolies are better provided for than in their own country. During the famine of 1877-78 about forty thousand

natives from Southern India found means of subsistence in Ceylon, and the benefits derived by the coolies were publicly acknowledged by the Collectors of the Southern districts. The memorialists maintain that the prosperity of Ceylon is to be chiefly attributed to the planting enterprise—that in 1859 the general revenue of Ceylon was £747,000 against £1,400,000 in 1880. The Civil Medical Department has increased from 39 surgeons and assistants to 74: the twelve hospitals in the colony have been increased to 27, and the annual expenditure on account of medical comforts increased from £18,000 to £61,000 in twenty years. The memorialists state that if the medical wants of the laborers are to be increased, they should be at the expense of the public revenues but not by the introduction of a special ordinance. They will provide for the medical wants of their coolies, but they see no reason why special taxation should be resorted to.

THE *Behar Herald* deprecates the extension of poppy cultivation that has been taking place in the Behar Agency during the past year. Our contemporary writes thus:—

We wonder why more lands are not brought under poppy cultivation in the Benares Agency, and the poppy cultivation in the Behar Agency thrown out altogether. The total quantity of land under cultivation in the Behar Agency during the past year was 4,15,280 beegahs, and the produce 41,268 maunds, *i. e.*, about 4 seers per beegah: In the Benares Agency, the total quantity of land cultivated with poppy was 3,95,820 beegahs, and the yield 56,937 maunds, *i. e.*, at the rate of 5½ seers per beegah. If this course be followed, more than one lakh of beegahs can be drawn out from poppy cultivation altogether, and utilized for the production of food-stuffs, without its telling in any way against the revenue now derived from opium. It is clear that lands in districts comprised in the Benares Agency yield more than the lands in the Behar Agency, and instead of bringing more lands under poppy cultivation in Behar, strenuous efforts should be made to increase the area of poppy cultivation in the North-West. As it is, even during the last year, it appears about 10,000 beegahs more have been brought under poppy cultivation in Behar. This is altogether a wrong course to pursue, and it is to be hoped that no more mischievous zeal should be spent in this direction.

SPEAKING of the results of a serious experiment at a recent ploughing match, Mr. Robertsion says:—

It will be observed that the country plough did not penetrate the ground to a greater depth than about 3 inches, while the improved ploughs, the draught of which was very little greater, worked the soil on the average to a depth of about 4½ inches. The section of the furrow made by a country plough is a triangle with the apex downwards, while that made by the improved plough is a rectangle. Assuming that the furrow of a country plough was 4 inches wide at the top and 2 inches at the bottom, in ploughing a mile the plough would move only about 12 cubic yards of earth, and this, be it remembered, is only stirred and loosened after the manner of a cultivator, and not raised and inverted. In an ordinary day's work, the country plough would probably travel 16 miles, loosening and stirring only about 196 cubic yards. The improved plough, working to the depth of 4½ inches, would turn a furrow 8 inches wide, the section of which would measure 36 square inches against 9 square inches, the area of the furrow section of the country plough; while in a mile the improved plough would turn over 49 cubic yards of earth, or in a day's work of 12 miles, 587 cubic yards; thus performing as much work as three country ploughs. In these calculations I have made an allowance for time wasted at the headlands. Ryots, therefore, whose holdings are above 50 acres in extent could readily obtain the means required for purchasing an improved plough or ploughs by selling one or more of the pairs of cattle, the services of which the adoption of the improved plough would enable the ryot to dispense with. The extra cost attending the employment of the improved plough, would be met by the lesser expenditure on labor and cattle-keep, from fewer laborers and cattle being required than when the holding is cultivated entirely by country ploughs."

A NATIVE gentleman who "has a large landed stake in the province (Oudh) and is altogether an intelligent representative of his class," writes to the Lucknow *Express* in reference to the recent Taluqdar's Agricultural Meeting in the Province. He thus depicts what he calls the "current ideas" of the educated native community as regards these meetings:—

Those natives who take a real interest in agriculture—that is an active part in its improvement, progress, and welfare—are, confessedly and unfortunately, but few; but those who do so, and are able to read English newspapers take the greatest interest in the accounts given therein of these meetings, and from which many, mentionable, have initiated, what has been brought home to their minds as a better system, if properly managed, for Indian agriculture. They also can appreciate the unity of purpose, and essentialities for which these meetings take place in England the way in which they are conducted, and the season in which they are held so as to cause as little inconvenience as possible to those most interested, and also afford a pleasant trip for holiday pleasure seekers. They know too that these Institutions have raised the status of farmers and of general agriculture in, as also the wealth of, the United Kingdom, and that, had they not been instituted, the husbandry and husbandmen, and the wealth of England and Scotland, would, in all probability, have been at this day in a somewhat similar state of poverty and exhaustion as their own wretched ryot and soil presents at the present moment. These few reflecting men also give much thought to the possibility (or improbability?) of their ever witnessing such a unity of purpose, even among the great Landlords and Raeses of India—for in this matter the ryot has not, nor can hope to have in this generation—any place—It is to these great men, in conjunction with the Government of her Imperial and most Gracious Majesty the Queen and Empress of India that such a desire can be fulfilled, but the way towards doing it, may not be according to the will or the liking of either. It is believed, however, that *the only* means which ever can, or will effect it is an equitable and permanent land-tax, long leases to tenants granted by, or under the protection of the Government, and no rack renting. When these things come to pass, poverty and wretchedness will fly before the march of improvement, and improvement would eventually bring about unity of purpose, and raise the status of the Indian farmer too. *Then*, an active interest will be felt *in all things* connected with agriculture, and agricultural meetings will be upheld, and be supported by the heart and desire of this country. But now!—what interest *can*—even the proprietory ryot, feel in or for these meetings? They now consider them to be "a tamasha" for the *Sahib logue* to enjoy themselves at, and for showing frippery tools or may be expensive machinery unsuited utterly for India—to Rajahs and other great men. If these and the Government combine at the present meeting and form resolutions which will hereafter establish equitable justice for the cultivators of the soil, assist them with genuine guidance in agricultural matters, and *feel an interest* in their being carried out, propound and demonstrate to them a better mode for cultivation than their own, an easier method to effect it and to relieve the heart-breaking toil—themselves and starving cattle undergo—to perform it. Then, we natives would gladly and joyously hail all advances made which would, when proven, add to the relief of our necessities, and prospective future welfare.

IN feeding our domestic animals, care should be taken that they receive enough of good wholesome food and no more. When this point is reached, the food of a healthy animal will be digested and assimilated with the blood, tissues and other parts of the system. If more than a sufficiency is given, the result will be a loss in two ways. First, the food is lost, because the animal will not have digested it. Second, the stomach being overloaded, the digestive organs will become more or less disarranged and disordered, and the animal will not be able to assimilate the food in the healthiest manner. As near to, but inside the limits of capacity for digestion, is the point to aim to arrive at in feeding for profit, and, other things equal, the animal will have a good appetite, good digestion and give the best returns for food consumed. This is a subject deserving more attention than it ordinarily receives.

IT may not be generally known, yet such is the fact, that fatting stock may be thriving and yet not gain in gross weight. For instance, cattle taken from grass, or other succulent food, and put upon feed of the best of grain and hay, or other dry forage, may, and frequently do, grow fat and lose in weight. The cause of this is, that grass is a less condensed food than grain, contains more water than the drier food, distends the stomach and intestines to a greater degree, and hence they contain more of weight, when full, than they do when concentrated food is given. An illustration of this was given a few days ago, in the Pittsburg (Pa.) *Stockman*, in reporting a case in which two car loads of cattle had been fed all the corn they could eat, during three months, and "had not gained a pound in gross weight in that time." The cattle, however, were evidently better fatted and an increase of $1 per hundred in the three months gave the feeder $18 per head advance on cost. This matter is well understood by shrewd speculators who arrange to

have their cattle taken from grass and fed by other parties at an agreed price per pound for the *increase* of weight. We have known of instances in which the feeders have lost largely, in one instance a tenant farmer lossing his entire crop, while the unscrupulous owner of the cattle made an enormous profit. The *Stockman's* report accounts for the cause of these losses.

SCINDIA'S Paper Mill has at last been completed under the supervision of Mr. Cowasjee Wookerjee, who selected and brought out from Europe the machinery with all the latest improvements. The mill turned out really excellent paper several hundred yards in length, on the occasion of its first trial, which took place on the 9th instant. Yesterday (Thursday) Scindia, who had not previously been near the mill, held a special durbar in order to inspect the sample rolls of paper, which is here manufactured from karbi and rags and is pronounced to be of a superior texture. His Highness was much pleased to ascertain that the first European industry established in his territory had so far proved a complete success. The mill is to be visited by Scindia in State probably next week. Great praise is due to Mr. Wookerjee for the untiring zeal and energy he has shown in connection with this scheme, from which considerable results may be expected. The mill, indeed, promises to be a great success, especially as skilled European engineers and workmen have been employed to carry on the work.

WHATEVER opinions men may hold as to the injurious effects of opium-smoking, and whatever may be thought of the past history of the Indian opium trade, it is now evident enough to practical men that the time has gone by for any useful agitation against the carrying on of that trade in the future. It is certain now that the Chinese would not want opium in abundance, even though not another ounce were allowed to leave the shores of India. The drug is now largely produced in China, and the industry seems to be steadily increasing. Persia is rapidly extending the cultivation and trade; and as both the Persian and the Chinese drug are much cheaper than the Indian, the danger of the future seems really to be that the Indian drug may be driven out of the field. The practical question for India is not whether we may rightly continue to send opium to China, but how we can adjust our revenue and expenditure so that we may not be made bankrupt by a falling off in the opium revenue, which, if not certain, is very far from being improbable.

THE *Pioneer* has the following as a possible cure for the vine disease. The *Evenément* of Paris declares that the vines are about to be avenged. It appears that a communication has been made to the Academy of Science, to the effect that there has been discovered in California, the all-productive, an insect which is the mortal enemy of the *Phylloxera*, and devours it with avidity. Savants have only to decide whether it is possible to acclimatize this crowning mercy in insect form; and it is said that the great reward of one hundred thousand francs awaits the successful zoologist who adds this new member to the fauna of France. This sum, or ten times its amount, would be a small price to pay for destroying the pest that for the past two years has been ravaging the vine-growing parts of France. In 1879 the outturn of the vintage was only 550 millions of gallons or about half the average produce of the ten preceding years, 1,075 millions of gallons. There has fortunately been an improvement in 1880, the outturn being 650 millions of gallons.

The money loss on the two years was about forty-five millions sterling.

THE Government Resolution appended to the report of the Irrigation Revenue Report of the N. W. P. for the year 1879-80 is short and to the point; so we may quote it without putting too serve a strain on the patience of the reader. It is as follows:—

The results summarised in the Chief Engineer's review are decidedly satisfactory. The year under consideration was one of unusually abundant and timely rainfall when, it might be supposed, canal irrigation would have been quite unnecessary; but not only did the canals pay 4½ per cent. on the total capital of 624¼ lakhs of rupees, invested in the irrigation works of the North-Western Provinces, but the steadily increasing area of sugar-cane, rice, indigo, and cotton point unmistakeably to the steadily increasing prosperity of the cultivating community dependent on the canals. As year by year the extension of light railways in these provinces afford a continually widening market for the valuable produce of the canal irrigated tracts, his Honour is convinced that the capital and wealth accumulated in them will assure the stability of the land revenue, and place it in a position independent of the fluctuations of the seasons. The revision of the agreement under which the financial responsibility for and general control of the canals in these provinces was in 1877 made over to the local Government has lately engaged the Lieutenant-Governor's serious attention, and his Honour is desirous of a re-arrangement of the terms then approved, admitting the responsibility of the province for interest at 4½ per cent. on all capital invested in canals in the province, whether classed as productive or agricultural works, and the claims of the Government of India to all land revenue and owner's rate due to the operation of State Irrigation Works, but asking in return that the very doubtful item of two lakhs (estimated net profits of these works in 1877), and the claim to half of any advantage gained by the province, shall be abandoned by the Government of India. His Honour's desire being to expend all available provincial funds on Provincial Light Railways, he would prefer that all canal capital should be supplied by the Imperial Government. The Lieutenant-Governor fully endorses the Chief Engineer's remarks regarding the good work done by the canal establishment, and is confident that its officers will maintain in the future the high reputation which they have earned in the past.

AN American contemporary thus advises the farmers as to seed:—"Now is a good time for farmers to be looking about them for selecting seed-corn—we mean those who have not taken time by the foretop and selected their seed corn in the fall, which all should have done. In some sections the crop of 1880 is reported 'light and chaffy.' All such corn is more or less deficient in vitality, and hence may not be fit for planting. Great care should be taken to secure seed that will be sure to grow when placed in the ground. We have known individual farmers to lose hundreds of dollars in a single season, by planting corn put in shocks or cribbed when imperfectly matured, which consequently became damaged to an extent that destroyed the vitality of the germs. Take good care, therefore, to have good sound seed, and have it selected early. Should there be any doubt about its growing, a good plan will be to have the seed all shelled and thoroughly mixed, then take a handful or so of the mass, plant it early as practicable and note the percentage that sprouts well. This will afford data by which to determine the number of grains to be placed in a hill, or dropped singly in the row, which we believe the better plan. By the way, when corn is planted in hills, farmers should drop exactly the same number of grains in each hill. By so doing, they may save a deal of labor often expended in thinning, or re-planting, or neglecting to replant, which is often done."

Much of this is applicable to India.

IT is astonishing that the cultivators of India should never have considered it a part of good farming to cultivate root and other crops purely for cattle feeding purposes. We give the results of a series of experiment at home, from which it will be seen that a crop of 30 tons (818 maunds) of turnips has been raised from an acre.

AT a recent meeting of a farmers' club in the United States, a member said:—Without food of good quality the best animals from purest strains deteriorate and become unshapely. Many years ago one of the first Durham bulls was introduced into this country. The food and care he received were so different from that to which he had been accustomed that his stock fell into disrepute. There must be increased care, and a better quality and abundance of food, to keep up the standard character of improved stock. Another:—'Believe in good feeding if you would have good stock. First, they must have grass. Young stock should be fed on bran and oats, which makes muscle. To fatten cattle corn is best, but for growing cattle oats are better. A member said, 'You can feed to fatten, for milk or for muscle. A milch cow should not be fed as you would a fattening steer. It is an admitted fact that corn will fatten, but it does not make milk. Bran is better for that purpose. The practice among dairy people of feeding slop encourages disease.' Another: 'For butter, yellow corn meal is better than anything else. It makes butter of better colour than white meal. In the vicinity of New York thousands of barrels of swill are fed to cows every day. It makes,

an immense quantity of milk, but does not add to the health of the animal or the quality of the butter.'

The following notes anent the preserving of posts and wood which we extract from the *Mechanic*, will prove of great value and interest to all planters. The method commonly in vogue is to simply char or tar the post, but unless we both char and tar the posts, the method is of no avail. For we read, "Should the poles only be charred, without the subsequent treatment with tar, the charcoal formation on the surface would only act as an absorber of the moisture, and, if anything, only hasten the decay. By applying a coating of tar without previously charring, the tar would only form a casing about the wood, nor would it penetrate to the depth which the absorbing properties of the charcoal surface would insure. Wood that is exposed to the action of water, or let nto the ground, should first be charred, and then before it has entirely cooled, be treated with tar till the wood is thoroughly impregnated. The acetic acid and oils contained in the tar are evaporated by the heat and only the resin left behind, which penetrates the pores of the wood, and forms an air-tight and waterproof envelope. It is important to impregnate the poles a little above the line of exposure, for here it is that the action of decay affects the wood first, and where the break always occurs when removed from the earth or strained in testing."

The "Big Gooseberry" is not one of the productions of Fiji, and newspapers are therefore defrauded of many a legitimate item. The island of Mago, has however, endeavoured to provide a substitute with very creditable success. On the occasion of the Wentworth's late visit, Mr. Ryder introduced to the notice of his visitors a bunch of ladies' finger bananas, on which were counted over eight hundred specimens of the fruit. He also produced a prodigious pineapple, measuring fifteen inches in length, twenty-two inches in girth, and weighing fifteen pounds. Queenslanders are requested to beat that if they can.—*Fiji Times.*

The rainfall out in Shasta, California, says an American Exchange is in proportion this year to the size of the "big trees" and other big things produced in that State, but its seven feet of rain is less than the average annual rainfall in Bergen, Sweden, only one-half that of Vera Cruz, and only one-third that of the lower slopes of the Himalayas on the eastern side. At Cherra Poonjee, India, more rain falls in each of three months in the year, but that record is hard to beat. Although it does not rain at all during November and December, and less than five inches in three other months, the fall during the year amounts to 608 inches, or over fifty feet.

Captain Pauli, her Majesty's Consul for Manilla, considering that the geography of the Philippine Islands, and especially their division into provinces, are but little known, has devoted the concluding part of his last report on the trade and commerce of these islands to a succinct sketch of the provinces, &c., illustrating his notes by an outline map. We content ourselves here with merely noting a few of the resources of some of these islands. The interior of the island of Mindoro, we are told, is not explored, but is supposed to contain much mineral wealth, coal, indeed, is known to exist. Its productions are very li mited, the only export being cedar, which is used for the manufacture of cigar boxes. Leyte, another island, is volcanic, and its soil is suitable for the production of hemp, of which one-third of the whole production of the Philippines is grown there. In Samnar hemp is grown, and is almost the only production of this island. In the earlier part of his report Consul Pauli gives some statistics respecting Manilla hem p, in regard to which he makes the following remarks :—

"The excellent qualities of this admirable fibre have excited much attention in other countries, and attempts have been made, and are still being made, to cultivate the plant elsewhere, but, it seems, as yet without success. A volcanic soil and peculiar condition of climate are necessary to its development, and only some districts of the Philippines are perfectly adapted to its growth. Its propagation from young shoots; and the difficulty of transporting them with success, together with the slowness of the process, has also been an obstacle. The Indian Government have applied for some seed; but that is very difficult to procure, as the plants are seldom permitted to bear, and seem to deteriorate in the process. The best authorities assert that it is most difficult to grow from seed. Nor would the extended cultivation of the plant be long remunerative, for the Philippine Islands even now nearly meet the demand, and a largely increased production would only tend to lower the price, which frequently leaves but little margin to the growers.

The *Journal of Applied Science* states that, in consequence of the dearth of grapes for wine-making in France, owing to the *phylloxera*, a large trade has sprung up in the import of dried raisins. In 1879 there were imported into France over 51,000,000 kilogrammes, and in the first six months of 1880, 48,000,000 kilos., so that in eighteen months 99,094,704 kilos of raisins were received from foreign countries. One kilogramme of raisins is sufficient in general for making three litres of wine, so that the total production from this source may be estimated at 2,972,841 hectolitres. The sale of wine made from these raisins at the average of twenty francs the hectolitre, represents the sum of 2,972,841 francs.

The trees which yield the largest supply of the best quality of caoutchouc, consist of various species of *hevea*, which flourish in the northern districts of South America, especially in the Province of Para, some portions of the valley of the Amazon being crowded to an extraordinary extent with *heveas*. The abundance of the India-rubber trees in Para may be judged of by the fact that this province alone exported seven thousand three hundred and forty tons of caoutchouc in the year 1877, more than half of this being sent to Liverpool.

The manufacture of cotton oil from the cotton seed, according to the *Times*, is becoming of importance in the United States, there being at the present time upwards of 41 oil mills, of which nine are in Mississippi, nine in Louisiana, eight in Tennessee, six in Texas, four in Arkansas, two in Missourie, two in Alabama, and one in Georgia. The annual quantity of seed converted into oil now amounts to about 410,000 tons, the yield being at the rate of some 35 gallons of oil to the ton of cotton material. Moreover, each ton leaves 750lbs. of oil cake of admirable fattening qualities. A great deal of the cotton oil is imported to Italy and other countries, where the olive oil is a staple; and, in point of fact, cotton oil is there superseding the olive oil, not only for utilitarian purposes, but also as an article of food. It is said, too, that the use of cotton oil in this way is gaining ground in some parts of the States. The following are the statistics of consumption :—

	Export. Gallons.	Home consumption. Gallons.
1876-7	1,316,000 ...	2,000,000
1877-8	1,457,000 ...	1,800,000
1878-9	5,750,000 ...	2,425,000

The cracking of new laid eggs is mentioned among the incidents of the late intense frost.

The news that paper has been manufactured from grass in England has led a correspondent of the Batavia *Handelsblad* of the 28th January to draw attention to the possibility of making paper from the *lallang* grass, which grows abundantly in Java. On this subject he says :—

"It need not be doubted that very good paper can be made of *lallang*, but it is a problem whether good *writing paper* can be manufactured from it. But it is more than probable and even certain that it can. The fibres of *lallang* at least favour this inference, for they are very fine and silky. The paper made of it will hence be fine and smooth, the qualities preferred in writing paper, especially the latter. Hitherto *lallang* is only used as house roofing, litter for horses, cows, and other domestic animals, and occasionally as fodder for buffaloes and cows in default of grass; and sometimes for manuring land either by itself or mixed with animal manure. In other respects, *lallang* is a product which cultivators would rather not see at all. Whoever shall make paper from it (its possibility is beyond doubt) will make useful, and productive an unimportant grass now covering lagre tracts in Java."

MISCELLANEOUS ITEMS.

New England has over two hundred and thirty farmers' clubs, with 72,000 active members, and library books to the number of 21,000; and in the United States, there are two thousand agricultural societies with 58,000 volumes in their libraries, and access to 300 different agricultural publications.

A New York paper informs us that the leaf of the betel works on the nervous system by calming it, which is proved by the fact that

Orientals, when suffering from headache or nervous pains in the face apply a leaf of betel smeared with cocoanut oil to the affected part, the pain subsiding thereupon. The same journal also says that it may promote digestion, although this has not been proved. What we have heard natives of the Philippines say is that the betel is nutritive, and hat by chewing it they can do without food for several hours longer between their meals."

AT Amsterdam a culture company with a capital of 6,000,000 of guilders and with agencies at Batavia, Samarang, and Surabaya, has been started with the object of bringing money into circulation in Java exclusively for planting purposes, and to provide planters with working capital at low interest. The company's business will be conducted on the principle of lending money rather to solvent persons, than on property.

WE read in the *Japan Weekly Mail* Mr. Mameshima, one of the Committee for Industry at Kamishima Mura in the province of Idzu (Japan), who has for years past given strict attention to agriculture, has lately invented a new method of making paper out of the willow tree; the quality is said to be excellent.

"THE *Locomotief* newspaper, assures us that Netherlands India is the richer by a novel export article. A great firm at Samarang, according to that journal has bought up a large quantity of *lidi* (the mid-rib of the cocoanut leaf, which is used here for making garden and stable brooms), for shipment to America. The object of so doing is said to be to make an experiment on a grand scale in using that material for plaiting baskets, for which it is excellently adapted. Our only fear is that the baskets will cost too dear.

EXPERIMENTS on a sugar estate in the Patti district (Java) have shown the possibility of forthwith using for fuel the crushed cane as wet as when it comes out of the mill. The fire-place apparatus used for the purpose is a new invention supplied by the engineering firm of Van Heumen & Co., at Delft, in Holland.

THE local paper writing of the Lucknow agricultural exhibition a few days before it came off, remarked.—The approaching Agricultural Show has conduced to a widespread dissemination of Exhibition literature. The indefatigable Secretary is publishing papers upon all manner of subjects more or less identified with the agricultural question, and were it possible for the actual Show—as such—to prove a failure, we should still have such a collection of interesting data unearthed that the results would yet be very valuable. Some of the memoranda on oilcake are very interesting. Some very valuable information has been printed on "seed grain sowing" and on "manures;" whilst an important paper on "cattle improvement" is in the press and will be discussed at the Meeting.

IN 1880, the dogs killed 5,369 sheep in Kansas.

A MICHIGAN farmer, in 1880, grew fifty acres of onions.

THE value of poultry and eggs produced in Kansas, in 1880, is given at $531,550.

OLD and experienced farmers in Pike county, Mo., report the wheat crop as safe thus far.

IOWA has some 350 butter and cheese factories, the products of which, for 1880 are estimated at $20,000,000.

IN the north-east of Pike county, Mo., the peach buds are reported as not all killed, plenty remaining to make a good crop.

MADISON county, Ill., grew more wheat than any other county in the State, in 1880, having harvested 3,530,000 bushels.

THE cost of sugar in ordinary house-keeping in the Eastern States, is greater than for flour, greater than for any other article of food, except meats.

AGRICULTURE IN 1880.—We understand that Mr. Henry F. Moore, a well-known agricultural writer, has in the press a small pamphlet, containing a short history of agricultural events in 1880, and also a series of commentary articles on the leading events of the year bearing on agriculture.

PLEURO-PNEUMONIA IN IOWA.—There is hardly any room to doubt that contagious pleuro-pneumonia has at last gained a foothold in one Western State at least, if not in more. Information comes from Bedford, Taylor County, Iowa, that a number of cases of this disease have occurred there.—*Prairie Farmer.*

IT is said that the total amount of butter made in the United States, New York, produces 140,000,000lbs. yearly, and 100,000,000lbs. of cheese.

A LONDON paper points out that foot-and-mouth disease may be spread by men as well as dogs. Yet at Islington and Deptford no note seems to be taken of this fact. The ignoring of the above fact is not peculiar to London.

SELECTIONS.

MR. WEDDERBURN'S AGRICULTURAL BANKS' SCHEME.

MR. WEDDERBURN gives a succinct statement in a recent issue of the *Gazette* as to the prospects of agricultural banks. Capital could be easily obtained at 4 *per cent.* under Government guarantee for the use of which the Dekkan ryot would gladly pay 12 *per cent.* With a central office at Bombay and respectable branch agencies in the mofussil, the bank could work satisfactorily and, of course, independently of existing arrangements. But there are two conditions necessary to the success of the scheme: 1st, the ryot must be freed of his old paper debts; and 2nd, the bank have power to recover the advance from the ryot crop. Mr. Wedderburn's object in proposing the rather heavy rate of 12 *per cent.* is "to create a reserve fund which will be available to assist the bank's clients in tiding over years of scarcity to keep them in their villages, and not to allow them to become *paraganda.*" This is well: only don't kill the ryot by too much kindness say we.—*Indian Spectator.*

AGRICULTURAL CUSTOMS OF THE UMBALLA DISTRICT.

WHEN the sowing season approaches, all the zemindars of the village meet at mid-day, or a *pahar* before day-light, at the *chaupal*, where they are met by the village Brahman, who has brought with him his astrological books.

All Indian agriculturists consider the land to be asleep at certain seasons of the year, and to be awake at other seasons, and the sowing only takes place when it is declared by the village astrologer that the land is awake.

The zemindars also believe that it is unlucky to plough in the month of *Jeth*, and say that this month is *Jati* (holy). Sowing, as a rule, commences in the month of *Asarh* only, but no sowing ever takes place on the 5th, 7th, 9th, 10th, 21st, and 24th of *Asarh*, because on these dates it is said that the land is sleeping, and therefore seed sown then will either prove a failure or will not yield much produce.

The Brahman announces the auspicious day for sowing. When they go to sow, if they should meet a widow with a bald head, they return to their homes as the omen is bad. Likewise if they hear outside the village on the left hand side the call of a partridge, or the howling of a jackal, they postpone the sowing for that day; but if, they hear the call of a partridge, or the howling of a jackal, on the right hand side, or in front of them, it is regarded as a good sign.

The call of a *koil*, or the Indian cuckoo, is always considered very lucky.

When the zemindars go to their fields to sow, they tie pieces of red thread called *mauli* or *pdranla* to their right wrists, to the horns of their plough bullocks, to the ploughs, and to the yokes, and touching the ploughshares and the bullocks with pieces of *gur*, and putting some of the *gur* in their own mouths, commence to plough their fields.

The Brahman receives on that day, by way of charity, a seer or two of grain for every plough. The zemindars partake of *dalia*, or sweet-rice, and give some of it to their ploughmen.

The harrow is also worshipped. The zemindars go into the field with seven leaves of the *akh* (*asclepias gigantea*) which they place on the harrow, and on the leaves some parched rice and sugar (*gulyah*), and burn incense. This is known as the *sohaga ka puja.*

They first sow as an omen of good promise, seven kinds of grain called *satnaja* in one spot, in a corner of the field; and this sowing is technically styled the *halota.* They always carry the seed for the general sowing in a *jholi* or bag, and while sowing they keep repeating a prayer that by the blessing of travellers, of birds, and of beasts, the produce of their fields may be abundant.

They give in charity from the same store to such beggars as come and ask for charity, as also they give some of it to their herdsmen who take care of their cattle, when they sow wheat for the *rabi* harvest. After the sowing they boil the surplus seed. The boiled wheat is called *bakhian*, which is distributed to all those present, who eat of it plentifully, praying to the goddess Sri (Lakshmi) to bless their labors.

On the night of the *sdir*, or the night of the *sankrant* of the month of *Asoj*, a clear sky is believed to be a good sign for all *kharif* crops; and in the hilly tracts of this district the zemindars have public worship on such a night with singing and general rejoicing.

No particular ceremonies are observed while the crops are growing. When the crops are ripe and ready for the sickle, first a load of every kind of grain is cut and brought home; and after it has been offered to the household gods, the grain which is called *puchkani* is distributed to the Brahman and to beggars in charity. After the performance of this ceremony the general reaping takes place, which is usually on a Tuesday or a Wednesday. The reapers are called *dwa*, and receive half a load of grain each per diem as wages. After reaping, the women of the village servants are allowed to glean in the fields. These gleaners are called *sithari.*

The sheaves are then brought to the threshing floor, and bullocks are yoked (*gah jorke*) to tread them.

When wheat and grain are being trodden by bullocks, all the dung dropped by the animals is allowed to accumulate on the threshing floor, as long as the threshing continues. They believe it is unlucky to remove it, nor do the men guarding the grain sleep in the threshing floor on *charpois.*

After the sheaves have been sufficiently trodden by the bullocks, they winnow the grain with the *chhaj* or winnowing basket and the *tangli* or winnowing fork, and never in the day time, but only in the first or last watch of the night: they collect the grain in one large heap with a *chhaj* called *chang.* The person who uses this *chhaj*, must strike the heap thrice each time before he draws a fresh breath so long as he is occupied with the work. They then draw a line, called *kar* round the threshing floor, and pouring a mixture of oil and butter, they place a jar of water within this circle to guard the grain from evil spirits.

They take a *chhaj* and top the heap of grain with the edge of the *chhaj.* They then take some fresh cowdung, and placing on the top of the heap some fresh green grass, they deposit the cowdung on the grass, sticking into it also a ploughshare or reaping hook. They now burn some incense on cowdung fire, and, kneel and so pray before the heap, and after distributing some *gur* among those present, they put aside from the heap some grain

which they make into three of seven little heaps, called *sauri*. Brahman's, and mullahs, and sweepers get this grain, as it is considered to be the share of the gods and of *sasnag*.

Next they bring an earthen vessel called a *nep* to which is attached a piece of red thread. They measure the grain with this vessel.

They do not speak in a loud voice during the progress of these ceremonies, and will not permit any noise; profound silence particularly being maintained while the grain is measured with the *nep*. Any excess less than the last measureful is distributed in charity to the village servants. They now begin to converse with one another, and the grain is carried home, weighed and stored. When the grain is storied in bins, the bins are leeped with cowdung; and the owners stand before their bins with their hands folded, and pray for a blessing.

As regards storing in pits, it should be stated that only the produce of the *rabi* is so stored. The produce of the *kharif* is seldom or never stored in pits. Indeed, as a rule, zemindárs do not store their grain in pits, except when they happen to be large landed proprietors, and have more grain than they can readily dispose of; banais however constantly do so.

When a pit is about to be dug, some oil is poured on the site, and *gur* is distributed. The pit has first a layer of *bhusá* deposited at the bottom, and the sides are lined with mats and *dhak* (*butea frondosa*) leaves. Some *bhusa* is inserted between the lining and the sides to keep out the damp. When the pit is filled, the mouth is closed first with mats and then with mud.

Cotton seeds are smeared with cowdung before sowing. Before commencing to pick cotton, women generally being engaged to do the work, two of the women put a little parched rice (*khilán* or white uncooked rice and white *til* seeds in their mouths, and one running on one side of the field, and the other running on the opposite side, without crushing the grain in their mouths, spit out the grains and scatter them all over the fields. This scattering is called *bari phurakana* or *kapas ka phurakna*. This is done with the object of getting white cotton, and with the hope that the yield will be abundant, and the seeds preserved from the ravages of insects.

All the cotton picked by the women on the first day is not carried home, but is taken to the bazaar and sold, and *gur* is bought from the proceeds, which the women eat and distribute among themselves.

Sugarcane is sown on a Wednesday or a Saturday, or Sunday. On that particular day the women of the family of the zemindar do not spin cotton, so that the canes may not be stringy; and on that day they tie to the arms of the ploughmen and to the plough, red thread and distribute *gur* among their friends, and indeed smear the plough with *gur*. The men after eating the *gur* bless the field, and pray that it may produce good canes. On that day rice is cooked at home and the rice water is poured from the roof of the house down the water spout, with the hope that the canes will be full of juice, and that the juice will pour like abundant rain into the sugar mill. Sometimes they add sugar to some of the rice water and drink it. The rice is eaten by the zemindars mixed with curds before they go to sow.

After the canes are ready for the mill, arrangements are made to crush the canes. The proprietor brings some rice and *til* seeds and sugar mixed together called *tilbakhera*, to the field; and takes a load of 8 or 10 canes and ties them up with red thread, the load having the name of *merha*. And he fumigates this *merha* with incense and offers up the *tilbakhera* and *merah* to a divinity called *Mukal*,* or the patron god of the sugar mill, invoking him by name.

The work of cutting the canes now begins. First, after a load of cane has been cut, the *tialbakhera* is distributed among those present, and their fervent prayers are that from each *kachcha beegah* of canes (about an eighth of an acre) not less than a *bari* (or 24 hours' continuous crushing) of cane juice may be produced.

Then, one or two more cartloads of canes are cut, and on the right side of the mill, an excavation in the earth of a cubit long and a cubit deep, is made which is leeped inside and outside with cowdung. This excavation is sacred to *Mukal*: in fact the excavation itself is commonly called *Mukal*.

A hole is now dug for the mill. In this hole a cane is broken up and thrown in, and five canes are similarly broken up and thrown into the excavation sacred to *Mukal*. The mill is then sunk in the hole made for it. The mill is set to work, and the canes are to be crushed. After one or two loads of canes have been crushed, some of the juice is first poured into the place of *Mukal* and the rest is offered up in the names of the ancestors of the proprietor, and to his household gods, and afterwards distributed to brahmins. Mohamedan zemindars distribute the juice to faquirs. This rite is known as *raspohon*.

When the *gur*, *shakur*, or treacle is first prepared, the man who prepares, it takes half a *kutcha* seer (three chattack) and drops it into the excavation sacred to Mukal, and the proprietor takes one or two *bheli*, or lumps of about three seers each, and places it before this sacred place and prays to *Mukal* for abundance of produce. The fireman takes about six chattacks for himself, and the rest is divided among the other persons employed in the work.

After this the mill is worked without further interruption for religious observances.

They also sink near the mill an earthen or wooden vessel which is capable of containing four maunds of cane juice. This is called *baha*. Whenever the *baha* is quite full, five *kutcha* seers of juice is given to the bullocks which turn the mill.

J. G. DELMERICK,

in Roman Urdo Journal.

* Literally, creator of sweets. He is the god of sugar and of fish, and was the son of Brij Arjun, and the grandson of Parus Ram, the sixth Avatár of Vishnu.

ARTIFICIAL INDIGO.

WE learn from Munich that "Artificial Indigo equal to Indian, has been discovered there by a scientific man." This is not by any means the first time that an announcement of this kind has been made, and has caused some alarm in Mincing-lane and elsewhere. But the artificial product of the laboratory has as yet failed to meet the requirements of manufacturers. Yet it is always "on the cards" that some chemist will invent a perfect substitute for the Indian dye, and thereby be instrumental in ruining a very important industry in this country. The following table shews the quantities and value of indigo exported from India in ten years:—

Year.	Quantity. cwt.	Value. £	Year.	Quantity. cwt.	Value. £
1869	99,205	2,898,823	1874	115,980	3,555,300
1870	98,085	3,178,045	1875	81,466	2,578,892
1871	108,184	3,192,508	1876	110,392	2,875,065
1872	115,414	3,705,475	1877	100,384	2,862,766
1873	115,212	3,426,824	1878	120,605	3,494,334

We are indebted to Chamber's Encyclopædia for the following remarks:—

"This dye is, without doubt, the oldest in use; the Greeks and Romans obtained a knowledge of its uses from India, where its employment has been very general for a great length of time. Much obscurity involves indigo and its early use in consequence of the variation in its name; for instance, the Tamils of India call the plant *Averie*, and the dye itself *Neelum*; in Sanscrit, the plant is *Vishashodanie*, and the dye *Nili* and *Nilini*, whence the *Anil* of the Portuguese. The Malays call the dye, *Tarom*, and the Arabs, *Neel*. Commercially speaking, indigo may be said to be the produce of India and Central America, as these are the only localities which supply the recognised form of the article. In India, the chief seat of the indigo manufacture, Bengal is the most important district. The total quantity received in Great Britain in 1861 was nearly 80,000 cwt—a vast quantity when it is borne in mind with what difficulty it is cultivated and manufactured. When pure indigo has a rich, dark-blue colour almost purple, it is in small cubes or parts of cubes, and its fracture shows a tendency to break up into square pieces and indicates cracks in its substance, often filled up with a film of whitish efflorescence, probably the lime used in precipitating it. It has neither taste nor smell, and its specific gravity is about 1·50; if rubbed with any hard substance, it gives a streak with a bright coppery lustre. The varieties recognised in commerce are—1st, Bengal, which from the care taken in its preparation, and the large scale on which it is made in that district, is the best; and its various gradations of quality, ten in number, varying from 9s. to 5s. per pound, are always kept distinct. In other sorts, they are usually much mixed. 2nd. Madras and Kurpah; 3rd. Oude; 4th, Manilla; 5th, Java; and 6th, South American. The last is packed in serons or cases of dried ox-skin, and its qualities are distinguished as follows: 1st, Flores; 2nd, Sobres, and 3rd, Cortes; all the others are in wooden chests, containing about 250 lbs. each. Few materials are of greater importance to the dyer than indigo, and none require the exercise of more care and skill in using. Being insoluble in water, it requires the action of other solvents to render it capable of penetrating the fibres of the materials to be used. Many compounds of great chemical interest have been derived from indigo blue. It was from indigo that aniline (now so largely employed in the production of the pigments known as *mauve* and *magenta*) was first obtained."—*Madras Mail.*

THE AGRICULTURAL VALUE OF HOUSE SEWAGE.

THE Government having asked for information as to "whether any practical results have attended the efforts of the Collector of Tinnevelly to impress upon the people the agricultural value of house sewage," Mr. Pennington has reported to the Board of Revenue that he was under the impression that a report would only be necessary when some material progress had been made. "On receipt of the Government Order, I communicated it to the several Divisional Officers and the Vice-Presidents of the Municipalities and invited their particular attention to the subject in view to the people being induced to utilize house sewage, &c., in the manner already pointed out. The Commissioners of the Palamcottah Municipality say that the 'question has had no practical results' in their Municipality 'for the simple reason that hardly anything worth the name of sewage exists. The town being built on a natural slope, the drainage is carried off at every shower of rain towards the existing natural receptacles, viz., the channel, the river, and the fields, then and there, and thus no opportunity is afforded for any large accumulation anywhere.' This system of storing and selling night-soil, &c., is however, being improved and perfected gradually, and the people are generally careful of the contents of their privies and utilize everything as manure. The Vice-President of Tinnevelly Municipality reports 'the residents of this town have all along been careful in collecting the house rubbish and the night-soil of their private privies for the purpose of agricultural manure, so much so that they would not allow the Municipal toties to clean their privies and remove the filth from their back yards. Even those who have no lands of their own heap them up for the purpose of sale. All that the Commissioners were able to do last year has been to give wide publicity to the advantage of the dry earth system; and with a view to initiate the people into that system, they have also opened a dry earth depôt near the Municipal Office and employed four toties to distribute dry earth amongst the several house owners for being used in their privies.' What is still wanting is to avoid the waste of fertilising matter all round the towns and in the roads, and the consequent nuisance that prevails so extensively, and also to improve the management of private privies."

GENERAL INTERFERENCE WITH PRIVATE ENTERPRISE.

THE system under which Government undertakes the nursing of new industries seems to require remodelling. In the matter of tea, everything has been done in accordance with the principles of common sense. It is true a mistake was made in the introduction of a trashy variety of plant from China, but considering the amount of information at the disposal of the Government in the early days of the industry, we feel convinced that impartial historians will give it much credit for what it did. In connexion with cinchona, on the other hand, we think a mistake is being made. The profitable cultivation of that valuable plant has now been placed beyond the reach of doubt, and the industry may be said to have long passed beyond the experimental stage. Such being the case, the Government should before this have receded from the business, and disposed of its plantations, thus leaving the industry to the care of private enterprise. There can be no doubt that capital would readily be found to take up and carry on the work.

Another industry has lately been initiated by the Government,—that of growing tobacco, and preparing the same for the consumption of Europeans. In connextion with this, neither of the two former plans has been followed. The Government has, in some extraordinary fashion, leased the farm to an enterprising firm. If the experiment was a success, the Government should at once have retired from the business. On the other hand, if success had

not followed its efforts, it was equally bound to give the business up, leaving the commercial public to form their own opinion as to the causes of the failure. That success followed the experiment no one who has studied the subject can doubt. There are few crops grown in India which give such a good return as tobacco, perhaps none, cinchona alone excepted. Under these circumstances, there should have been no difficulty in disposing of the property. The negotiations at present pending in regard to the latest experiment of this kind, in connexion with silk, seem to point to the imminent adoption of a similar course. We learn that "it has been decided by Sir George Couper that the management of the sericulture operations in these provinces (N.-W. P.) shall for the future be entirely made over to Messrs. Lister & Co., an eminent silk firm of Bradford, in England, on certain terms which have not yet transpired." These last eight words would seem to point out to a lease, or a conditional sale, neither of which is in accord with the principles Government ought to follow in such matters.

Having relinquished the experiment, Government should dispose of the whole concern to the best advantage, and put the public in possession of the information it possesses, and the experience it has gained.

In respect of tobacco, no benefit of a commercial nature has yet accrued to the general public from the few years' trials made by the Government of the North-Western Provinces and Oudh. The whole concern has been made over to a private firm, whose interest naturally lies in the direction of secresy. Had the farm been sold to the firm, this would have been perfectly in order, but its only being leased to them points to the fact that the farm is stil Government property, while this particular farm is the only one in a position to derive any benefit from the expenditure of public money incurred in the experimental stage. It is true that Mr. Buck in 1878 published a pamphlet giving details of what had been done, but at that date sufficient time had not been given to the subject, and the conclusions arrived at were naturally crude and incorrect. For instance, we are told "that the outturn of good leaf from a properly cultivated acre of land ought not to be less than 800lbs" This is misleading and might do much injury, by preventing investors or cultivators from taking up the industry. The average outturn of tobacco in the Punjab in the two years 1877-78 and 1878-79 was 787lbs. per acre If, then, this was the average under ordinary native cultivation we have no hesitation in saying that "the outturn of good leaf from a properly cultivated acre of land" should be very much more than 800lbs. We are convinced that on good land, such as tobacco ought to have, over a ton ought to be the average. Good tobacco, well grown and carefully cured, may safely be expected to realise two annas per lb. at least. This has no reference to the ordinary native cured tobacco, but to that cured under scientific supervision, and adapted to European use, in open market. At a ton per acre, this represents an income of Rs. 280; while the expenditure is comparatively trifling. We mention two annas per lb, but if any one tries to purchase thoroughly well cured tobacco, fit to make good cheroots for European consumption, he will find it cost much more than this.

Tobacco is now receiving considerable attention at the hands of those in a position to judge its merits properly, and we look on it as one of the most promising industries calling for our attention at the present day. —*Englishman.*

INLAND TRADE OF BRITISH BURMA.

FROM the Official Report on Inland Trade, British Burmah, for the year 1879-80, it appears that the only monopolies now retained by the King of Burmah on the trade of the Irrawaddy river, are those of petroleum and pickled tea (*let-pet*). The *oil-wells* of Upper Burmah are exclusively in the hands of a native of India, one Moolla Ibrahim, who sent down 108,511 maunds, value £61,448, during the year, against 78,019 maunds, value £35,632, in 1878-79. When the British Resident was withdrawn from Mandalay in October 1879, the monopolist fearing complications, sent all his stock across the frontier into our territory where, it is said, a good deal of it still remains unsold. The oil is sold through agents in our towns, but meets with strong competition in the American kerosine oil imported at Rangoon. The monopoly of the trade in *pickled tea* was in the hands of the Royal Steersman, who pays the King a large monthly sum for the privilege of being the sole vendor, and all the makers of *let-pet* are obliged to sell their stocks to him. He has agents in the various towns, and fixes his own price. This is said to be so high that the humbler classes of the Burmese have been obliged to forego the use of *let-pet* altogether, and hence arose a very great reduction in the imports, which fell from 29,009 maunds, value £54,008, to 11,880 maunds, value £24,746. Why do not the Indian tea-planters, who are hard up for a market, make some pickled-tea and cut out the Royal Steersman? A small quantity is already imported *viâ* Toungoo. There is a large and increasing demand in British territories for the *ponies* which are brought across the Thyetmyo frontier for sale, but the trade is cramped by the rule of the Burmese Government, which forbids the export or either stallions or mares. The stock imported consists solely of geldings, which fetch prices averaging from £10 to £15 in Rangoon. A considerable and steady trade is done in *lacquered ware, drinking cups*, &c., and also in *metal* manufactures, such as idols, bells, gongs, pagoda-crowns, &c. The trade in *jadestone* is in the hands of the Chinese, who export large quantities to their own country: prices vary continually. The *tobacco* produced in Upper Burmah is not in favour, consumers preferring that which is grown in our territory.

The principal articles of export to Upper Burma are cotton twist, yarn, and piece goods, European tinned provisions, salt, &c. A large business in cheap English crockery is done with Upper Burmah, the trade being in the hands of Burmese and Chinese, who have agents in all the river stations. Lacquered trays and platters are rapidly being replaced by these goods, which are making their way into every household. According to the returns the trade doubled itself in the year under report. The trade in metal manufactures has increased, owing, it is said, to the Mandalay lotteries having diverted the attention of the people from the native industry." For the same reason there has been a large increase in the trade in English silk piece-goods, and the excellent harvest of the year has given several exports an additional impulse. The local manufacture of salt is rapidly declining, and European salt, of which a great deal now reaches Rangoon annually, is everywhere taking its place.

POPULATION OF ENGLAND AND WALES.

A PAPER "On the Increase of Population in England and Wales," was read by Mr. R. Price Williams on the 15th ult., before the Statistical Society, in which he pointed out that the total increase of the population of England and Wales during the whole of the last century, was only 3,417,586, the average decennial rate of increase being 5 per cent.—whereas during the present century, up to 1871, there was an increase of nearly 14 millions, the average decennial rate of increase being over 14 per cent. The rate of increase in the decade 1811-21, was the maximum attained in this century, *viz.*, 18 per cent., as from that period down to the census of 1861, the rate of increase of the population had continuously diminished. He observed that a great increase of the population took place at the time when steam power began to be used for manufacturing purposes, and while the towns increased, the rural districts were found to diminish. Mr. Williams estimates that the population of England and Wales, by the census of 1881, will be 25,785,900. In the case of the population of London, the decrements were very slight indeed, showing that it had not reached that declining stage in the rate of its increase long since arrived at in the case of Liverpool, Manchester, and many other large towns. The population of London had increased from 958,863 in 1801, to 3,251,918 in 1871.

THE WOOLLEN INDUSTRY.

THERE are few things more remarkable than the growth of the woollen industry of the world during the present century; and this growth which has been most marked since 1830, is mainly due to the extension of our own colonies and the development of the United States. The wool clip of the world has increased by five times since 1830, when it was equal to about 320,000,0000 lbs. while in 1878—the latest year we have complete figures for—it amounted to nearly 1,600,000,000 lbs., which when scoured, gives 850,000,000lbs. of clean wool. Previous to 1830, nearly all the world's supply of wool was furnished by Europe; 280,000,000lbs., out of the entire world's supply of 320,000,000 lbs., being European:—

	1830.	1878.
European produce ...	280,000,000 lbs. ...	740,000,000 lbs.
River Plate	22,000,000 lbs. ...	240,000,000 lbs.
United States	10,000,000 lbs. ...	208,000,000 lbs.
Australia	6,000,000 lbs. ...	350,000,000 lbs.
South Africa	2,000,000 lbs. ...	48,000,000 lbs.
	320,000,000 lbs. ...	1,586,000,000 lbs.

The tendency is to increase and improve the production of wool by improving breeds, by careful management, by improvements and cleansing the wool of the sheep before clipping, as well as by improved machinery for washing and scouring fleeces after having been clipped and sorted. It would be interesting to show the total number of persons engaged in the woollen industry of the world, as far as operatives are concerned. We have a fair idea of the numbers, although the manufacturers of wool and cotton fabrics represent an almost equal amount in value, the number of operatives in woolen mills is only two-thirds of that engaged in cotton mills:—

	Operatives.	Spindles.	Consumption.
Great Britain ...	280,000 ...	5,100,000 ...	380,000,000 lbs.
France	170,000 ...	2,500,000 ...	380,000,000 lbs.
Germany	120,000 ...	1,800,000 ...	165,000,000 lbs.
United States ...	120,000 ...	1,400,000 ...	250,000,000 lbs.
Russia, Austria, &c....	223,000 ...	1,800,000 ...	400,000,000 lbs.
	913,000	12,600,000	155,000,000 lbs.

Although France and Great Britain consume the same quantity of wool, in France it is to a greater extent the unscoured wool of the River Plate, which only turns out 30 per cent. of wool, whereas in England, it is native or washed Australian which is mainly used; hence the woollen manufactories in Great Britain are considerably greater than in France, although the pounds weight consumed would appear to be the same.—*Wool.*

FIELD EXPERIMENTS ON SWEDES.

MR. JOHN HILL, President of the Marshbrook Agricultural Improvement Society, has favoured us with an account of a series of experiments carried out at Felhampton Court, Shropshire:—

The soil may be described as a moderately good turnip and barley soil, lying on the Caradoc or Bala beds, with a deposit of clay and drift gravel in patches, and partly mixed. The experimental plots were all situated side by side on a portion of the field which was of very equal staple throughout. They were one acre in extent—were sown on the 1st of May, on the flat, the manure being sown by the drill in a line under the seed, and the drills were 24in. apart. There was no rain during the sowing, but on the 10th of May there was a slight rain, and on the 26th of May there was a heavy soak The swedes were all hoed during the first fortnight in June. The following is a statement of the manures sown and the weights produced:—

Plot.	Manure sown per acre.	Cost per acre.	Produce per acre.	Remarks.
		S.	T. C.	
1	5 cwt. superphosphate ...	20	26 17½	
2	5 cwt. redonda phosphate, 2½ cwt. superphosphate	30	25 0	Rather damaged by fly.
3	2½ cwt. superphosphate, 119 lbs. bone meal ...	20	25 1½	
4	5 cwt. superphosphate, 108lbs. sulphate of ammonia ..	40	23 17½	Rather damaged by fly.
5	2½ cwt. superphosphate, 2½ cwt. redonda phosphate ...	20	26 0	
6	No manure ...	...	7 6½	
7	5 cwt. redonda phosphate	20	30 0	Much choked by charlock.

The striking contrast observable between the results from each variety of manure used, in comparison with the produce of the land where no manure was used, is well worthy of special notice. The smallest increase in the weight of swedes produced by the artificial manure used was in the case of the superphosphate and sulphate of ammonia; here an increase of 15 tons 11 cwt was obtained at a cost of 40*s*. The largest increase was obtained from the use of the redonda phosphate, simply ground to a very fine powder; here an increase of 22 tons 13½ cwt was obtained at a cost of 20*s*. It appeared to be very important that we should extend the inquiry so as to form an opinion as to the feeding character and composition of the swedes produced. So far as regards this series of experiments, No. 7 lot which was manured with 5 cwt of redonda phosphate per acre—at a cost of 20*s*. per acre gave the largest weight per acre (30 tons); the roots were the heaviest in water, they were also by analysis shown to be the best in feeding quality. The smallest crop of swedes was that grown with superphosphate and sulphate of ammonia, *at double the cost* per acre for manure; these roots were lightest in weight, and the lowest in their feeding power. Although it is not safe to be entirely guided by a single series of experiments, there does appear to be good evidence before us in reference to the inquiries which were being dealt with. As to the first inquiry, whether the phosphate should be used in an entirely soluble condition, as in superphosphate, the reply given is more adverse to its use than I had expected. On the second inquiry, I may say we have obtained most encouraging and satisfactory results from the use of the redonda phosphate, simply ground, and without any chemical treatment. Then as to the third inquiry, respecting the advantages of a supply of ammonia, there has been not only no advantage gained by a double outlay for the purchase of this manure, but the quality has been rendered very inferior by the ammonia, and the weight of the crop has also been decreased by its presence.—*N. B. Agriculture.*

LIME AS A MANURE.

THE very abundant and highly important substance popularly called lime, but dignified by chemists with the name of *protoxide of calcium*, has long been used by agricultural nations as a manure. It has been in use for nearly 2,000 years, for, according to Pliny, the Gauls successfully raised heavy crops of corn with it; while the Romans found an application of lime very beneficial to their vines and olives. It was, however, about the middle of last century before liming was introduced into this country.

The reason why lime acts so powerfully on vegetation is that combined with decayed animal and vegetable matter, it forms into a compound soluble, which, melting by the action of rain, supplies the plants with the chief elements of vegetable life—oxygen, hydrogen, and carbon; while it at the same time attracts carbonic acid from the atmosphere and forces the plant to absorb those gases more rapidly than usual.

Lime is found to be more efficacious upon—1. Land that has been habitually lightly manured than upon land that has been habitually heavily manured. 2. Land that in its composition contains no alkali than upon land which does contain alkali. 3. Land containing lime in its composition which has been habitually ploughed deeply than upon land in a similar state habitually ploughed lightly. 4. Newly broken up old grass land than upon land which has been previously continually cropped.

Lime ought not to be applied at all to lands which, according to their nature, already contain any of it in their composition; neither ought it to be applied to soil, no matter how rich that soil may be in other manures, as long as the remains of any previous application continue to exist therein. It is well known that lime from its nature, always seeks down into the ground; and it is also well known that some soils retain its influence longer than others. According to one authority, twenty years is supposed to be the limit of its beneficial action over a great part of the south of Scotland; while another, a farmer in one of the Border counties, after laying down and liming a field of grass, found its influence extended to nearly thirty years.

Soils which spontaneously produce the cow-wheat, the colt's-foot, thistles, or poppies, and which have little spontaneous growth of grasses, also land which after a drought crumbles away with the first rain, may safely be cultivated without the use of lime; while, on the other hand, that which has a cold, wet, sandy surface, with a stiff clayey subsoil, and which grows luxuriantly the chestnut tree, the larch, or the Scotch pine, is almost destitute of calcareous substances and would receive much benefit by a liberal application of alkali. Dr. Sheier, an agricultural chemist and a great authority on such matters, says:—'In Scotland we often hear of soils which have been scorched with lime. Such land grows green crops and grass well enough, but not grain crops. The cases of this kind which have come under my observation are chiefly thin soils, naturally deficient in lime. It appears in such cases to be the result of overcropping immediately preceding the application.' All the manure in the land having previously been exhausted, the lime having nothing to work upon, of course could have no other effect than to burn the crop; the mistake lies in the fact that it is regarded as a nutriment, and that crops will grow on it and nothing else. After farming away until all the animal and vegetable substances in the soil are exhausted, the farmer doses his land with lime, and upon finding that a dry season burns up patches here and there over the whole field, cries out that lime doesn't pay. We couldn't live without salt, yet, put a man upon salt and nothing else, and see what will become of him; the same with land, give it lime and nothing else, and it will soon become in a worse state than it was in at first.

Lime greatly accelerates both the dissipation of manure and the chemical decomposition of the soil; and in the very degree in which it increases fertility by this species of action, the land on which it operates must, in order to maintain the fertility, be supplied with proportionally large doses of manure, and perhaps with occasional doses of such mineral constituents as combine chemically and nutriently with the lime. Grass lands which have been allowed to run to seed, and which have become overrun with rushes and coarse vegetation, may be greatly improved by a dose of quick lime; for, according to Dr. Hunter, 'Quick lime is an instrument of death to the coarse herbage of meadows.' The same authority says that it is also known to change the taste of certain kinds of grasses altogether. 'If a handful of lime be thrown on a tuft of rank sour grass, which has in former years been invariably refused by cattle, they will afterwards eat it close down.' Fine pasture lands have likewise been found to be materially benefited by a top-dressing of the mineral in a mild form.

The scourings of ditches, the sediments of mill-dams, &c., together with road scrapings and rack, in fact any kind of rubbish or decomposed vegetable matter, may advantageously be formed into a lime compost. But although the celebrated chemist, M. Pouvis, eloquently sings the praises of such composts:—'Lime in compost is never injurious to the soil; it carries with it the surplus of alimentary manure which the surplus of product demands for its sustenance; light soils, sandy or gravelly, are never tired by a repetition of this compound,'—a judicious farmer may find them everything such as M. Pouvis describes; but, on the other hand, one who does not know their nature may impoverish his land by their use. In fact, composts are so deficient in ammonia and phosphorus that they ought always to be used along with either bone dust, guano, or else ordinary farmyard manure; they ought never to be used alone.

Farmers ought to look well to the quality of the lime which they purchase. 'I have seen,' says Dr. Hunter, 'farmers not unfrequently driving home a thousand cartloads of what they thought was lime; all the time they were unknowingly bestowing their money on a disguised substance, half of which was sand or clay.' Pure lime is commonly white, and is thoroughly soluble in nitric acid; it is also the best which is the whitest, the softest, and the lightest.

Now, when the old days of farming are passing away, in which, according to a seventeenth century writer, 'rains and dews, cold and dry winters, with stores of snow, I reckon to be the best kinds of manures,' impregnated as they are with celestial nitres,' I cannot conclude better than in the words of Liebig:—'A time will come when plants growing in a field, will be supplied with their appropriate manures prepared in chemical factories, and when plants will receive only such substances as actually serve them as food.'—*David Swan, in N. B. Agriculture.*

QUANTITY OF GUANO AVAILABLE.

IT is roughly estimated that the nitrate beds of Peru contain about 60 millions of tons. Those of Bolivia, thus far known, are, although large, inferior in extent to the neighbouring ones in Peru. In Northern Chili some 3,000 tons per annum are exported from deposits already reported. It is not improbable that extensive nitrate deposits may yet be found in Argentine Patagonia, able to compete with those of Peru. In 1878 the estimated tonnage of the southern deposits of guano was as follows:—

	Tons.
Huanillas	1,000,000
Point Lobos	200,000
Pabellon De Pica	350,000
Chipauabay	250,000
Add for the Lobos Islands	600,000
Total	2,400,000

Other deposits of great extent have been reported, but their cubic contents and market value are doubtful. The average annual consumption of Peruvian guano during the ten years from 1869 to 1878 inclusive, was about 345,000 tons. The consumption of nitrate by the North Atlantic nations is shown by the following table of Peruvian shipments:—

	Tons.		Tons.
1865	99,440	1873	284,715
1867	115,925	1874	252,783
1868	36,659	1875	326,869
1869	118,957	1876	320,491
1870	183,791	1877	218,940
1871	163,908	1878	250,000
1872	200,948		

—*South American Journal.*

PERSIAN OPIUM IN CHINA.

VARIOUS notes lately written by the English Consul in China show how the consumption of Indian opium in that country is affected, first, by the trade in Persian opium, and, secondly, by the cultivation of the plant in China itself. Persian opium is rarely smoked by itself, being used by the Chinese to adulterate Malwa or the better classes of home-grown opium. It is much inferior to the Malwa kind; but it has this advantage, that while Malwa opium pays an export duty of Rs. 750 per chest, Persian opium is exported free of any tax, "thus showing," says her Majesty's Consul at Foochow, "the extent to which it can damage the prospects of the Indian drug, the more so when it is considered how much less it costs to produce Persian drug in Persia, than Malwa in India, owing to the inferiority of the former kind." Hence it is, Mr. Sinclair adds, that the profits of Persian traders are enormous, and this again has encouraged the extension of the area of opium cultivation in Persia. With regard to opium grown in China, Mr. Herbert [illegible], her Majesty's Consul at Kinkiang, writes that within the last three years there has sprung up a fair demand, which is likely to increase, for opium grown in the province of Szechuen. Chinamen who are well off, and can afford to be particular, smoke Malwa opium; but the majority of the country people and fishermen living along the banks of the Yangtsze have to content themselves with a cheaper article, and they use the Szechuen opium mixed with a small quantity of the Persian drug. The increased growth of opium in China [illegible] curious comment on the [illegible] made by the Chinese [illegible]

in England to obtain an expression of popular feeling against the immorality of the Indian opium revenue. The facts about the import of Persian opium into China, show that Persia is quite ready to make up for any falling-off in the supply from India.

THE annual report on Horse-breeding Operations in the Punjab for the year 1879-80 again presents the picture, not exactly of the just man struggling with adversity, but, what is almost as affecting, of the zealous departmentalist chafing against financial restrictions. Mr. Hallen reiterates so urgently the necessities of his establishment that an obdurate Government might well be moved to fall in with his desires, were it not that, unfortunately, his figures attest the most favourable results under the existing provisions. In such an even course of prosperity, in fact, as the report records, it is difficult to find room for remark. One of the most noticeable features connected with the subject is the rapidity with which the Punjab is outstripping the North-West Provinces as the horse-breeding province of India. Whereas in the previous year the number of stud branded mares in each was nearly as possible the same, or in round numbers 3,750, in that under review the Punjab shows over 5,000, the North-West 3,859; and this in spite of the drain caused by the war, which fell most heavily on the frontier province. In the matter of breeding, the Norfolk Trotters continue to hold the first place as sires, their progeny being more strongly built than that of the English thoroughbred, and larger than that of the Arab. But the difficulty of getting exact particulars of the stock is one of the chief complaints of the department, who in the absence of any means of personal inspection are obliged to go by the popularity of the different classes with the native breeders. Mr. Hallen recommends the purchase also of country-bred sires for the purposes of the department, but the Government are not persuaded that the indigenous breeds have not improved sufficiently to warrant this departure. The report shows also that mule-breeding is no less certainly on the increase, the demand for these animals having received a great impetus during the late war. There are several reasons why mule-breeding should be profitable, and its usefulness is universally admitted. The announcement that it is about to be introduced systematically into the Central Provinces generally acceptable.—*Pioneer.*

A NATIVE paper gives the following statistics:—The exports of silk in Yokohama from June 1879 to the same month in 1880, were 17,822 bales; of which 4,406 was despatched for England; 8 194 for France; and 5,222 for America. During the same period the arrivals of that staple to Yokohama from producing districts were 31,034 bales. Exports from July last year up to the 28th January this year were 14,155 bales; of which 1,734 were for England, 8,642 for France, and 3,779 for America; and the arrivals from producing districts to Yokohama in the corresponding period were 27,714 bales The present stock in Yokohama is 6 618 bales composed as follows:—Hanks 2,283, filatures 2,597, Kakedas, 1,235, Okusen 168, and Hamatsuki 330 bales.

THE LONGEVITY OF THE ORANGE TREE.

AT a meeting on the 4th December, of the Adelaide Gardeners' Improvement Society, the longevity of the orange tree, which had been previously discussed, was again brought up for consideration. The following report of the discussion is given in *The Garden and the Field*:—

Mr. J. F. Pascoe said that in view of the great importance of the cultivation of the citrus tribes in this colony there need be no apology made for dealing with the matter at considerable length There were large areas now being cultivated with oranges, and we were beginning to export the fruit, which was acknowledged to be of superior quality. In Sydney our oranges had obtained a special first prize, whilst the Sydney-grown fruit had only been awarded an ordinary prize. If the orange trees would only live for the short period assigned to them in this colony, viz., about 20 to 25 years, it would not pay, for during the first five years the trees bore no fruit; during the next five they produced very little; and, if during the next 10 or 15 years they bore abundantly, the crops would scarcely recompense for the long peirod of unproductive cultivation. Before we got really good, thin-skinned, good-flavoured fruit the trees must have acquired age, and, therefore, the early death of the trees through the ravages of disease could not be regarded in any other light than as a national calamity. Mr. M'Donald being a man of experience in gardening, and holding a position of influence among gardeners, had done some good by disputing the longevity of the citrus tribes, and there was no doubt that still greater good would be gained by a discussion of the whole question, as suggested by Mr. P. Hogan. Most probably Mr. Robinette had hit at the foundation of the evil when he suggested that it was due to the stock upon which the sweet orange was grafted. If seeds were taken from fruit raised upon sickly trees, or those which were weakened by any cause, and the seedlings were afterwards grafted, it might be that the trees grown this way would be short-lived. But Mr. M'Donald did not seem to notice that there is a difference between natural decay and decay caused by disease, and, in opposition to the facts adduced, still made a pretence of clinging to his idea, ignoring the statements of some of our most eminent botanists and horticultural writers and pinning his faith to so much of one person's statement as suited him—that of Don Jose de Canto, whose remarks were made with reference to the orangeries of the district of all others most liable to the attacks of the disease. If that gentleman's very able letter—or so much of it as they had been favoured with—were carefully read without prejudice, it would be found to bear out, literally and generally, all that Mr. Pascoe contended for; and if they followed the course adopted at the Azores, instead of quietly watching the destruction that was going on, and bemoaning their fate, they would stand a chance of obtaining the same result. The facts of Don Jose de Canto's letter, which were admirably dealt with in a leading article in the *Sydney Morning Herald*, were as follows:—Until 1836 the orange trees budded, blossomed, and fruited with unvarying regularity. The grower would as soon have suspected the sun of variation from his diurnal course as the orangeries from their yearly round of duty. They were handed from father to son, and lasting as they did from generation to generation, it is not surprising that they became a symbol of permanence. [illegible] cost the growers no care, no attention, no labour, save the labour of picking and packing, so far as we can understand. The people [illegible] and drink the year round, and the orange would blossom [illegible] round without trenching, without manuring, without [illegible] without pruning. The plant was neither fickle nor fastidious, and the islanders rejoiced in their orange trees. Suddenly, however, there came a change. This bright picture of the growing, green-leaved, self-contained tree, surrounded by a joyful, sun-loving, dancing people, dissolves away, and gives place to a pale-leaved and sickly tree, surrounded by a care-faced and inquiring population. Their first proceedings were those of the panic-stricken, they were carried to extremes. From absolute indolence they rushed into alarming activity; but it was the blundering activity of ignorance. Having had little need to inquire into the physiology of the plant, or the relations subsisting between the soil and the plant, they adopted measures to set things right which outraged both, and only made things worse; but gradually, by the aid of the suggestions of science and a teachable disposition, a middle course was hit upon, and restorative processes were prescribed with an intelligent knowledge of the patient's requirements. At first the trees were overloaded with manure and stifled with shelter and a great deal more was done to them than they well could bear. Now they perceive that thorough drainage is at the foundation of successful orange growing; that, next to this, trenching to a great depth is essential; and, thirdly, that manure must be applied—but with discretion. It is true the trees are more fickle than they were, and die more frequently, and the fruit will not keep so long. But growers can again count with tolerable certainty upon their crop. The disease of the orange was first discovered in the Azores in 1836, when it was found that the oldest and best trees, as much as 200 and 300 years old, and producing each 6,000 to 20,000 oranges, were disappearing. It was observed that all the trees affected produced a very heavy crop the very year that the disease manifested itself, that the leaves became yellow and fell off in great quantities, and on the trunks or stems near, and sometimes beneath the ground, the bark opened, and drops of a kind of yellow gum exuded. The drops resemble tears (*ligrimas*, in Portuguese, and therefore the disease was named lagrima. Many orangeries were quite destroyed, and a remedy was eagerly sought. Opinions as to the cause of the disease were much divided. Many thought it must be that the orange-tree had a limited period of existence and this being reached, the tree must thus naturally decay. As we then only propagated trees by layers, this explanation was not thought to be unreasonable, but afterwards it was found that seedlings were attacked in the same way. Then it was found that superabundance of moisture in the soil was one of the worst conditions for the disease. Soon it was discovered that the destruction of the diseased bark and wood in the stem of the tree was the best method to save it. From February till August a skilled horticulturist visits every tree, and at the slightest sign of exudation of gum he cuts the bark across, to allow it to run out. If the disease is in an advanced state, the bark and the whole of the diseased wood is cut out, the roots being bared to a distance of a foot or two feet from the stem, every portion of diseased root being cut away. By this means the tree is cured if the disease is found at an early stage; if not, it is dug out and a fresh tree put in from a reserve which is always kept for such contingencies. Although the disease still continues the gardens now look very prosperous, for the remedy is known. . . . So we are returning to the old traditional culture. We are clearing the shelters, pruning the interior of the trees for the admission of air and light, are less liberal with manure, and keep the ground free of weeds, except when we want to excite vegetation. We have abandoned propagation by layers, and graft good chosen kinds upon seedling stocks For shelter we prefer trees with their foliage, and take care not to let them grow too high From these abstracts of the contents of the letter referred to, and the leader it would be seen that in the Azores for hundreds of years they had grown the orange successfully and without trouble, and previously to the outbreak of the disease (*lagrima*) they had trees 200 to 300 years old, producing immense crops of from 5,000 to 20,000 each. In 1836 the disease broke out, spreading consternation and ruin, but remedies were discovered in time, and in 1868, when Don Jose de Canto wrote, the disease, though still existent, ceased to cause uneasiness; and although the fruit was inferior to that formerly produced, confidence was restored, and growers were "returning once more to some of the old traditional culture." It certainly appeared a strange method of reasoning to endeavour to prove by the statement made in the above letter that the orange was a short-lived tree. The opinion ventured that those trees which have attained great age have got into places particularly favourable by Nature and circumstances was a most important one, and contained the very gist of Mr. Pascoe's argument. Nothing he could say would more fully sustain it. It was a well-known axiom, "Like causes produce like effects; and knowing as they did, not only single trees, but groups and plantations, of vast age and in great vigour, it was their duty and (with present prospects) necessity to inquire into the attendant circumstances with a view of remedying existing evils. The idea that the genus citrus had lived its allotted time, and had so degenerated, that its course might be said to be finished, seemed to him too ridiculous for consideration, and totally opposed to all theories of rise, progress, and decay that he had ever met with. It was a very convenient doctrine for Greeks and Mohamedans, and those who believed "whatever is, is right," or were too indolent to investigate causes. Disease in fruit trees and fruit-producing plants was of common occurrence, and the citrus family did not stand alone; but perhaps of all the fruit trees they were acquainted with they had enjoyed less opportunity of studying the nature and habits of the orange than that of any other. The culture of it in its natural habitat was unknown to them, and its natural age was so great that they could do little in a generation, but, having it in their midst, they must study its nature and treat its diseases as they studied the nature and diseases of other fruit trees. When the odium broke out in France the people did not stand idly bemoaning their loss, nor did they imagine the vines had lived their time, but they searched into the character of the disease and found a remedy by which we at the present day benefited. The "American blight" attacked the apple-trees, but the gardeners found out in time that the aphis could be beaten, so far as the roots were concerned, by grafting upon "blight-proof" stocks. The apricot, peach, plum, almond, and other trees were subject to fungoid growths and encroachments, but gardeners found a remedy in sulphur, &c. So with respect to the orange, a careful study of the subject, with careful observations of all the conditions, would be very interesting, though perhaps slow; but in time a fact would be discovered here, and something from there, until a mass of information would be gathered which would enable them to cultivate the orange as successfully as any other fruit tree. That our orangeries were seriously diseased was an admitted fact—from every district in which trees were planted came the same story. One by one they were losing their oldest and best orangeries, and many of those newly-planted were looking very queer, but so little attention had been paid to the subject that they could not even tell what the disease was, or give any definite idea of its cause Its effect they all new too well; but as far as he was aware no one had made any systematic attempt to cope with it. Several, for very shame's sake, had made pretence of doing something, but, having no definite object in view, had accomplished nothing. He thought their attention should be chiefly directed to the nature of the soil, the method of production, treatment during early stages of growth, and manner and time of watering. As regarded the first, Risso told them that at Genoa and Florence

they were grown in a strong yellow clay, richly manured; this was considered by Italian gardeners to be best suited to the orange tribe. He also said that in France clayey loam, rotted vegetable matter, and rotted horse-dung were considered the best compost. Our ideas as to a suitable soil were quite opposed to this, and we sought a sandy loam with a gravelly subsoil. In his (Mr. Pascoe's) opinion some most radical changes and improvements must be made in the method of production. It was his firm belief, after carefully watching the matter for years, that the stock they worked upon was the chief cause of the mischief—in fact he had seen the stocks of one year-old trees as they came round from Sydney so bad with disease that it seemed a sin to sell them for planting. The question then arose, how were they to propagate. Layers were generally condemned—how deservedly he was in doubt; the stocks in present use they knew to be bad; then what must they use? Experience only would tell them. Miller recommended citrons; London citrons and Seville oranges, and he had heard experienced horticulturists recommend the poor man's orange and the shaddock. His advice was to try them all, though he believed the Seville would be found the best stock the orange family could be worked on. Mr. Moore, of Sydney during his investigations into the nature of the disease in Europe found those trees worked on Seville stocks to be almost free from disease, and it is a noticeable fact that the great majority of those trees in Spain now flourishing and from 600 to 700 years old, are Seville, and were planted before the sweet orange was introduced into Europe. The treatment of the tree when young was of vast importance. That any tree should be pampered and forced, or allow to produce heavy crops when young, was totally opposed to all physiological laws, and Lindley said the abstraction of fruits and flowers augmented the vigour of the branches, or of the parts in connexion with them, and that the removal of any part which takes up a portion of the food employed in the support of the flowers increases their luxuriance. The manner and time of watering Mr. Pascoe would leave to men more practical than himself. They were told on good authority that the citrus family did not like cold or excessive moisture; but to see the way in which they were inundated sometimes one would almost imagine they were semi-aquatic plants.—*Australasian.*

COTTON STATISTICS.

We take the following from the annual report on "Cotton in the Bombay Presidency," issued by the Commissioner of Customs, Opium, and Abkari:—

The most important cotton-producing districts in British territory are Ahmedabad, Broach, and Surat in the Northern Division, Khandesh in the Central Division, and Belgaum, Dharwar, and Kaladgi in the Southern Division, each of which, except Belgaum and Dharwar, had larger areas under cotton cultivation in 1879-80 than in the previous year, and the out-turn correspondingly larger. In Belgaum, although the total area cultivated with cotton in 1879 80 was smaller than that of 1878-79 by 2,972 acres, and in Dharwar by 6,298 acres, it yielded a better crop than that of the previous year, which had suffered by the ravages of rats.

The districts of Kaira and Panch Mahals in the Northern Division, those of Nasik, Ahmednagar, Poona, Satara, and Sholapur comprised in the Central Division, and all the five districts in Sind, grow cotton to a small extent, while the districts of Thana, Kolaba, Ratnagiri, and Kanara do not grow it at all. The area brought under cotton cultivation in Sind in 1879-80 was less than three-fourths the area similarly cultivated in 1878-79, owing, it is said, to fear of the floods.

Among foreign territory, the province of Kattiawar has the largest area under cotton cultivation, the area so cultivated in 1879-80 being 1,053,800 acres as against 710,928 acres in 1878-79. The next in importance is Baroda in which cotton cultivation increased from 161,284 acres in 1878-79 to 280,341 acres in 1879-80. States in the Southern Maratha country had 194,080 acres of land grown with cotton in 1879-80 against 189,618 in 1878-80. The States of Cutch and Akalkot, and those comprised under the Mahi Kantha, Rewa Kantha, and Palanpur Agencies grow cotton to a small extent, and show for 1879-80 some fluctuation compared with the areas under cotton cultivation in 1878-79.

The season was most favourable to cotton cultivation throughout the presidency; but crops suffered to some extent in Khandesh from later excessive rain, and in Dharwar, Kaladgi, and Southern Maratha country from blight.

The total area brought under cotton cultivation in British districts in 1879-80 was 2,109,591 acres, being in excess of that similarly cultivated in the previous year by 300,169 acres; while the area in foreign territory increased from 1,171,450 acres in 1878-79 to 1,648,604 acres in 1879-80, or by 477,154 acres.

CULTIVATION OF THE FIG IN TURKEY.

The United States' Consul at Smyrna states that the Aidin district is the only one which produces figs for exportation. The fruit will grow anywhere in the neighbourhood of Smyrna, of a good quality for consumption, in a green state; but the Aidin plain is unique in its climate and soil as being favourable for the proper curing of the fig. The thermometer seldom falls below three or four degree under freezing point, and in the summer seldom rises above 130 degrees Fahrenheit in the sun. In Aidin, the winters are generally wet, the dry weather commencing in May and continuing till the end of October. Any rain at the end of July or during the month of August and September, when the fruit is under the process of drying, injures the quality by causing it to burst, hardens the skin, gives the fig a dark colour, and spoils its keeping quality. Heavy dews will cause the same evils.

The fig tree will grow in almost any soil; a rich heavy soil is, however, preferable; but to produce figs that will dry well and please the merchant, the soil ought to be of a good depth and of a rich, light sandy nature; this, if the weather be favourable, will produce large figs, of a white thin skin, and of the finest quality. Before planting the ground is well ploughed two or three times, to a good depth, well fertilised, and freed from all weeds and extraneous roots. The fig is propagated from slips, selected with as many fruity buds as possible. To form a tree, two slips are planted, one foot apart, and then joined at the top. The trees, if planted in rich soil, should be placed about 30 feet apart, and for poor soil, about 25 feet distant from each other. The cuttings are planted in the month of March, two in each hole, at about 9 inches or a foot apart at the root end, and during the growth of the trees, the ground is ploughed up two or three times during the winter or spring, and the space between them is used to cultivate cotton, sesame, or Indian corn.

The fig harvest generally lasts about six weeks, and when the fig is ripe, it falls of its own accord from the tree. Women and children are employed to pick up the fruit into small baskets, to be conveyed to a place in the garden well exposed to the sun, where they are spread on a bed of dry grass, or mattings, singly, and not one on the top of the other, and are turned over every day, in order to get every part of the fig exposed to the sun. After a few days of this exposure, those figs which are sufficiently dry are selected from the mass, and divided into first, second, and third qualities, care being taken not to dry them too much. They are then sent to Smyrna, where they are assorted and packed for shipment.

On arrival at Smyrna, they are conveyed to the fig bazaar, or market place, where the merchants attend early next morning to effect purchases. The parcels belonging to each individual owner are separately examined each purchaser giving his own price; a broker is nearly always employed as an intermediary by the merchant on payment to him of 2 per cent. of the value, the amount being ultimately refunded by the seller. A seller is but seldom the owner himself, this latter being generally represented by a Jew or Armenian merchant, at an exorbitant charge of 7 per cent. as a commission. The figs are then, after purchase, conveyed to the packing establishment, to undergo manipulation and putting into boxes; the sacks are emptied out on the floor in a square heap and on all sides are squatted rows of women and girls, employed in merely twisting round each fig two or three times between the forefinger and thumb, to render it soft and give it the required oblong form. On the heap are a row of low baskets, into which are thrown separately the first and second qualities to be used for packing; at least 10 per cent. of the whole mass is worthless for putting up in cases, and, during the first process, the inferior fruit is picked up and thrown in a separate heap. Undersized, tough, or spotted figs, and such as are burst, come under this category, and are packed, or rather preserved, promiscuously in small boxes, and labelled "Figs for family use." Sometimes, when the parcel is unusually good, three qualities are selected instead of two. The figs are then laid on long benches at which are seated the practised packers. Each man has a box before him, and swiftly and dexterously the figs are placed alongside each other in rows, the rows varying in number according to the depth of the box, the flat ones, which are in more general use, requiring but two. This mode of packing is called "pulled." Above all, a row of "layers" is then placed, to show the figs to advantage. The "layers" are stretched out by means of both hands, and laid flat side by side in parallel rows. Of late years, "layers" throughout the boxes have come into great demand, and nearly all the best qualities are packed in this way. In packing, the fingers are now and then dipped into a bucket of sea water, to ease their working; the figs become thus moistened with salt water, which it is said has the effect of has tening their sugaring. The boxes are again passed on to the women, who complete the process by placing laurel leaves between the upper rows, before the final nailing down and polishing off by the carpenter. The packages used are of various dimensions and forms; at one time all figs exported to the United States were placed in drums or paper boxes, but of late years flat wooden boxes are being extensively shipped. Very few drums, if any, find their way to the English market, to which the best qualities are usually sent. America consumes but little of the superior qualities, though the demand for such has now increased. Small canvas bags are now being used with much success, and in fact, every season some novelty in the style of packing may be noticed. The refuse, or "naturals," are put into large boxes or barrels, and shipped to England, Egypt, Europe, and Turkey, the high rate of duty in America entirely excluding those inferior figs from the market.—*Journal of the Society of Arts.*

NOTES ON USEFUL PLANTS.

(from the Kew Report for 1879.)

The report on the Royal Gardens, Kew, for 1879, which has recently appeared, contains some notes on the introduction and acclimatisation of useful plants into India and the Colonies, which may be interesting to the readers of the *Journal.*

With regard to those important medicinal plants, the cinchonas, Sir Joseph Hooker deals firstly with what are known as Columbian barks, namely, those producing the *Calisaya* of Santa Fe, and the hard Carthagena barks. Both of these are of an extremely valuable kind, and only a few plants remained at Kew at the close of the last year. One of these was sent to Jamaica, from whence the Superintendent of the Botanic Garden reports:—"Our specimen of Carthagena bark is in splendid condition. We have now seventeen well established cuttings, with promise of more." The remainder of the plants were sent to India, and a subsequent report from Calcutta says that they are doing well, and there is every probability that they will soon be successfully propagated.

Regarding the extended cultivation of the well-known species of cinchona, *C. succirubra*, *C. officinalis*, and *C. micrantha*, reports are given from several centres. Thus, from Assam, Mr. Mann says with respect to the small patches of cinchona plantations below Nungklow, in the Khasia Hills:—

"*Cinchona officinalis* appears to be healthy, the other two species (*Cinchona succirubra* and *Cinchona micrantha*) all present a sickly appearance, and most of them have only a few leaves at the extremities of the branches. Both species flower sparingly and form no good seed-pods. This condition of the plants is ascribed not so much to the climate and altitude as to the very steep slope and shallow surface soil resting on rock, which does not retain sufficient moisture to suit these plants. The plants of *Cinchona succirubra* near Jirang, look very much better, and both altitude and situation, as well as the soil in that place, seem to be more suited to this species than in the Nungklow plantations."

From Burmah the report of Major Seaton is not very favourable on the prospects of cinchona cultivation. The plantation seem to have been made so far back as 1879. He says:—

"All things considered, the cinchona experiment does not promise well The oldest trees dying off, and the trees of very small size flowering and fruiting freely, are only too sure signs that the tree finds itself in a site not adapted to its requirements." It appears, however, that a Ceylon planter has made inquiries about a grant of land in the neighbourhood. It is possible that with the technical knowledge as to the methods of cultivation of cinchona, and of obtaining a speedy financial return from it, which have been worked out in Ceylon, a better face may be put upon the experiment in Burmah."

At Gadcrif, near the frontier of Abyssinia, *Cinchona succirubra* is said to do well. In Ceylon, it is stated that—

"The enterprise of the planters, and the necessity of obtaining a speedy return for invested capital, has led to much more rapid methods of harvesting the bark crop being adopted in this Island than at the first commencement of the enterprise would have been thought possible. The following statement appeared in the *Ceylon Observer* for Septem-

ber 18th, 1878:—"Over large areas in Ceylon it seems as if *Cinchona officinalis* came to maturity in four and-a-half years, while if trees begin to show signs of canker or decay at even two and-a half years, the bark ought at once to be utilised. Bark of such trees will pay well for the gathering. We once sent to Messrs. Howard a specimen of bark from three and-a-half years old trees. The verdict was, 'good marketable bark as it stands.'"

From Jamaica, the Superintendent of the Botanic Gardens writes:—

"My chief care at the cinchona plantation is the establishment of large open air nurseries instead of the glass propagating houses which I found here. I sow the seed under thatched sheds, and prick out the plants into beds shaded by ferns. This is a simple inexpensive style, which is universally adopted in Ceylon but unknown here. I fear that the system of glass houses and propagating and hardening frames has done much to frighten people from trying cinchona here and besides [the Government plantations] have never been able to distribute more than a few hundred plants, as they had not enough for their own use. In a few months, by next planting season, I shall have 80,000 which I can conveniently spare and by the end of the year, possibly 50,000." * * * * "Unless the trees are planted thickly enough to 'bower' the ground, as the planters say, the cost of weeding is nearly £4 per acre per annum. But the third year the trees, if well planted and well supplied, ought to cover the ground and save all subsequent weeding."

In the Mauritius:—

"The cinchonas have grown but slowly. Few experiments have been made with the plants, owing to more pressing work. The plants planted in the forests at a greater altitude than that of the gardens have not grown satisfactorily, but it is hoped some method of growing this useful plant, which will give beneficial results, may still be hit upon; only it must differ considerably from that of other countries."

From Singapore:—

Mr. Murton (Superintendent of the Botanic Gardens) reports:—

"All attempts to grow this here have proved fruitless, but *Cinchona calisaya* and *Cinchona succirubra* are likely to do well at 2,000 feet elevation in Perak."

While from Tinnevelly:—

Col. Beddome reports:—"A few plants were sent from the Nilgris for trial in this district (1856), and the *Cinchona succirubra* plants were put down at an elevation of about 3,000 feet, in a small clearing in the ghât forests; they have been left entirely to Nature, but owing to the moister climate the growth contrasts very favourably with that of Neddivattum or elsewhere on the Nilgris. During my last inspection I found one of the larger trees to be nearly 50 feet high; it had three large stems at about one foot from the base, the leaves having, it was said, been broken by a monkey when young."

Regarding the cultivation of cinchonas in Sikkim, the report of Dr. King published in the *Journal* for September 3rd last, p. 309, is of a subsequent date to that quoted in the Kew report.

On the subject of *Eucalyptus* planting, Sir Joseph Hooker reports as follows:—

Seeds of species of this Australian genus are continually asked for, and supplied from Kew. The following notices represent the progress made in the cultivation in various parts of the world:—

ASSAM.—Mr. Gustav Mann reports:—"*Eucalyptus globulus* is by far the fastest growing species cultivated in the Khasia Hills, next to it comes *Eucalyptus rostrata*."

BENGAL.—Dr. King remarks:—"The *Eucalypti* from Queensland give little more hope of success than the more southern species, by the planting of which in the plains of Bengal sanguine people hoped to abolish malaria."

BOMBAY (NORTHERN DIVISION).—Mr. Shuttleworth reports:—"Seeds of different varieties of *Eucalyptus* were sown; nearly all failed. A few of *E. rostrata* are surviving."

BOMBAY (SOUTHERN DIVISION).—Col. Peyton reports that the plantations of different species of *Eucalyptus* do not appear to prosper, and "their numbers are rapidly diminishing." . . "They are weedy and whip-like in growth, and require to be propped up to prevent falling over." Near Dharwar what is supposed to be *E resinifera* appears to prosper. "Four trees are remarkably fine, although only six years old. They have attained on an average 40 feet high, and are five inches in diameter five feet from the ground."

JAMAICA.—Mr. Morris reports:—"Of Australian trees the most desirable here is *Grevillea robusta*, which is adapted for nearly all elevations, and stands wind well. The gums (*Eucalyptus*) get very much blown and seldom look well except in clumps, where, for the first four or five years they are sheltered on the outside by other trees."

SAHARUNPORE.—Mr. Duthie reports:—"There are at present upwards of 31 species under cultivation in these gardens."

"The healty appearance of some of the kinds, and the rapid growth they are making are sufficient reasons for encouraging their extensive cultivation in India." This is in accordance with what is known of the climate of that (extra-tropical) part of India.

SINGAPORE.—Mr. Murton reports:—"When sown *in situ* they seem to thrive fairly well in Singapore, but do not appear to stand transplanting. *Eucalyptus siderophloia*, *E. Baileyi*, and one or two other species are growing well in the nursery."

ZANZIBAR.—Dr. Kirk informs me:—"The *Eucalyptus citriodora* from Queensland is now in less than two years from seed about 18 feet high, with wide branches."

On the very important subject of fodder plants, the Kew authorities have a great deal of information, as the following extracts will show:—

GUINEA GRASS (*Panicum jumentorum*).—This, it appears takes the place of all other fodder grasses in Dominica, as it is hardy and requires but little cultivation.

Dr. Imray says:—

"By keeping the lands down and a little manure occasionally, it may be cut down, crop after crop, for many years. I have had a guinea grass piece treated in this way for full twenty years.

PRICKLY COMFREY (*Symphytum peregrinum*).—From various trials that have been made, it has been shown that this plant, although of great utility as an early fodder crop in cool and temperate countries, is not adapted for cultivation in hot countries:—

MADRAS.—The Agri-Horticultural Society report:—"Experiments with Prickly Comfrey have failed, the plants which were in the gardens, though receiving rather more than their fair share of attention, having one by one perished."

SAHARUNPORE.—Mr. Duthie reports:—"I do not believe that the conditions at Saharunpore, as regards either climate or soil, are favourable for the profitable cultivation of this plant. At Chajuri it thrives fairly well. Three crops were taken during the year from 35 roots growing 3 feet apart. The average weight of each crop was 30 lbs."

SOUTH AUSTRALIA.—Dr. Schomburgk reports from Adelaide:—"Prickly Comfrey has again been a thorough failure, and it is now a fact that this plant is of little use; at least, on the south Australian plains."

On the Teosinte (*Euchlæna luxurians*), Mr. Woodrow reports as follows from Bombay.—

"*Euchlæna luxurians* produced a heavy crop of forage when treated as a garden plant, but not better than would be given by sugar-cane in the same circumstances. When treated as a fixed crop, under the same condition as Jowaree, the produce was inferior to that crop."

QUEENSLAND.—Mr. Walter Hill reports from Brisbane:—"The seeds received by me were duly planted, and grew both strong and healthy, flowering about the month of May. From the opportunity I have had of judging of its nutritive qualities, I am not of opinion that it can be grown to much advantage in this colony; the stalks appear to be too fibrous and hard to possess much nourishment. I shall, however, make further experiments."

SAHARUNPORE.—Mr. Duthie reports:—"As far as cultivation is concerned, success has been complete. The majority were fine, healthy plants, and an abundant supply of excellent seeds was obtained."

SINGAPORE.—Mr. Murton reports:—"This grass, although useful, does not bear out its reputation in the Straits. Large quantities of seeds have been distributed, but all accounts from the Native States state that it pays far better to grow maize, as the same ground that will grow Teosinte will produce excellent maize."

SOUTH AUSTRALIA.—Dr. Schomburgk reports from Adelaide that, notwithstanding the disastrous drought of the early part of 1879, "the prevailing dryness did not injure the plants, showing not the slightest effect on their leaves, which preserved their healthy green, while the blades of the other grasses suffered materially. . . . At the Government garden, at Palmerston, in the Northern Territory, the growth of the *Euchlæna* has been surprising. In the course of five or six months the plants reached the height of 12 to 14 feet, and the stems on one plant numbered 56. The plants, after mowing down, grew again several feet in a few days. The cattle delight in it in a fresh state also when dry. Undoubtedly, there is not a more prolific forage plant known . . . . I can recommend it as a most valuable summer forage plant in our dry climate, especially if it can be planted in a moist soil. The only drawback with us will be that the ripening of the seed crop will be problematical, as early frosts will kill the plant."

The most recently introduced fodder plant is known as the Tagasaste (*Cytisus proliferus var*).

"It is a shrub indigenous to the Canaries, the leafy branches of which are said to be a useful fodder. It requires a light dry soil, and is rather intolerant of frost in winter. The plants should be placed 6 to 10 feet apart, may be cut two or three times a year and will last 10 to 20 years. Thirty-five pounds of fresh-chopped Tagasaste mixed with 20 lbs. of chopped straw is said to be sufficient for the daily nourishment of a horse or cow. The seed is very slow in germinating. The seed was pretty widely distributed from Kew. It is too soon to expect the results of trials at present."

MADRAS.—Most of the seedlings died off after germinating, Colonel Grant reports at commencement of present year:—"At present only two or three are looking healthy, and from them I should think very little fodder could ever be obtained."

SOUTH AUSTRALIA.—Dr. Schomburgk reports from Adelaide:—"The seeds were sown, and all came up. The growth of the plant is vigorous, some of the plants having reached 2 to 3 feet, looking healthy, not in the slightest degree affected by the severe dry weather we have had to contend with. I have many plants for distribution."

(To be Continued.)

MINERALOGY.

THE imports of petroleum into Java have increased from 367,746 cases in 1876 to 1,719,801 in 1880. The monthly consumption of petroleum there, amounting to 22,500 cases in 1876, rose to 104,150 in 1880.

WE see it is proposed at home to establish a Gold Institute, with its three principal departments of chemical, mechanical, and practical, on the lines of the existing Iron and Steel Institute, which has done so much for the particular industries and productions with which it is conversant. The new institute whilst recognising the maternity of the Society of Arts, which has been the fruitful mother of scientific and technically industrial offspring, will from the beginning have its own separate organisation; and it will start with a very valuable nucleus of a library and museum, towards the formation, of which Mr. Lock has offered his rare books on metallurgy and his illustrative collections of spicimens, as a first contribution.

AUSTRALIA is increasing her yield of gold, according to the *Melbourne Argus*:—

The estimated total product of gold for the year ended 31st December last is 812,092 oz., the best return on record since 1876, and nearly 100,000 oz., better than in 1879. The improvement thus manifested began towards the close of 1879, and the state of affairs throughout the colony leads to the belief that it will be maintained throughout 1881. To arrive at the estimated yield, the following amounts are added together:—Total exports, 193,058 oz., total amount received by mint, 587,015 oz; net balance held by banks on 31st December, 32,019 oz.; total, 812,092 oz. Work which was interrupted by the holiday, has since been resumed, and the stock market remains active.

FROM Queensland we read "The Charters Towers escort brought down 85,000 oz. of gold last year."

THE following facts, if they can be relied upon, go to show that petroleum ought to be sold at a much cheaper rate in the world than it is. An American paper, hailing from the oil-producing region of Bradford, states that there has run to waste in that

district since midsummer 1880 something like 600,000 barrels of oil. There are, it goes on to say, in the district, in round numbers, 8,000 producing oil wells, with a daily yield of 70,000 barrels. The daily demand, on the other hand, comes to 55,000 barrels. The accumulations of oil long ago, it says, exhausted the storage capacity that had been prepared, and that, in consequence, for three months of the past year, 6,000 barrels of oil have been running to waste every day. The estimate is that in wooden tanks at the wells there are 2 million barrels of oil stored, and in other storage tanks 8 millions, making a total of 10 millions of reserve stock; while, in addition, improvised tanks are being constantly constructed.

The production of gold in Russia is said to be increasing steadily, and how welcome such a fact will prove to the nation, if the discovery of the new veins of the precious metal, and the unproved machinery set to working them, continues to increase the outturn. From the statistical returns of the Russian mines, that outturn has still to augment very largely to keep pace with the requirements of the nation, as it grows in wealth and enterprise. From the year 1866, the total outturn of the gold mines of Russia, for each quinquennial period up to 1880, has been as follows:—

Years.		Total,		Yearly average.
1866 to 1870	...	£4,200,000	...	£840,000
1871 to 1875	...	£4,700,000	...	£940,000
1876 to 1880	...	£5,000,000	...	£1,000,000

It is within the range of possibility that coal may be found in workable quantities not far from the town of Singapore. A sample of that mineral has been found in the excavations at Telok Ayer, and Mr. William Adam, the manager of the works, who has had large experience in mining both in Scotland and in Borneo, considers that there are sure indications of coal fields in the cuttings, and that a workable seam might possibly be discovered were the ground bored and properly prospected. It is premature to speculate on the importance of coal fields to a port like Singapore, but it is to be hoped the matter will not be allowed to rest without further inquiry.

THE OIL WELLS OF ARAKAN.

FROM time to time scanty accounts have appeared in our columns on the working of these wells; and these meagre statements have arisen, chiefly, from the reluctance of those interested in the undertaking, to furnish the necessary information on the subject. We are, however, in a position to give our readers some particulars as to the advance made in this direction. The two main districts, in which work has been going on, are in the Borongu Islands and Kyouk-Phyoo; in which two separate concessions have been granted. The oil resources of these districts were first brought to public attention at the Akyab Exhibition of 1875, and for some time afterwards, a grant was given to Mr. Savage of an area of one square mile for inspecting purposes. Mr. Savage, it seems, "struck oil" in one of his wells in 1878, and although the flow was considerable for a time, it eventually fell off. Mr. Savage is now raising very little oil in this district, his energies and attention being principally devoted to those of his fields, where we believe the quality is much superior than that obtainable at the Borongas. On the Eastern Borongs Messrs. Gillam & Co. have obtained a concession for oil and coal getting. The concession granted to them extends over an area of four square miles, and the Company has a subscribed capital of £10,000, and have sunk four wells namely, the *Gude* yielding, as the report under review states at first 35 barrels a day, and subsequently when visited by the Chief Commissioner, only four or five barrels, by hand pumping. This well has been sunk to a depth of 976 feet. No. II is called the *Sladen*, and is at a depth of 890 feet, producing about three barrels a day by manual labour. The next is the *Arnot*, 850 feet deep, but the well, at present, is unused, the Company waiting for machinery to work it properly. The last of the wells is the *Gillam*, sunk at a depth of 400 feet; and on this well, the only engine at work on the Island, is erected. We believe it is the intention to carry this well down to some 1,800 or 2,500 feet as a test well, until the oil bearing strata shall have been fairly proved. Amongst the other points of interest connected with the working of the Borongs Oil Wells, it is worthy of note, that the workmen on the island have mutually agreed between themselves to carry out temperance principles. The climate of the oil settlement, though perhaps not of the best, yet we are glad to observe that both Europeans and natives have been fairly free from fever, notwithstanding the rough buildings, that have been erected, and in which the people have lived in during the year round. We are, however, given to understand that it is contemplated to have better dwellings constructed for the Canadians and other European workmen on the island. The oil produced in this district is clear like pale sherry, and is reported to be about 30 per cent. purer and better than the crude oils obtainable either from Pennsylvania, or Ontario, and finds a ready sale at Rangoon, Calcutta, Chittagong, as well as in the local markets, at prices varying from Rs. 10 to Rs. 15 per barrel. The oil is stated to flash at a temperature of 148. Fahrenheit by the open test.—*Arakan News*.

THE COST OF PRODUCING GOLD FROM QUARTZ.

MANY sacrifices must be made in order to obtain the precious product, sufficient to yield in due time twenty to thirty per cent. dividends. A report lately drawn up on this subject by Mr A. W Forde, the Consulting Engineer to the Bombay Municipality, gives some valuable information with regard to "cost of production." He does not ask us to trace the difficult course of the stamping and other machinery from its cradle in the English foundries to its working in the plateau. He cuts short that interesting history by intimating that he has gone all through it and ascertained that "the expense of treating the quartz and extracting the gold . . . and all contingencies, I estimate at about Rs. 5-8 per ton.' In comparing this estimate with that given by Mr. Brough Symth in the official report which he submitted to the Madras Government in October 1879, we observe that the latter's estimate of the cost per ton amounts to 9s. 6d. This is based on actual cost in Australia, Mr Frode, in the report to which we have referred, advices that machinery for working gold mines should be especially prepared by first class firms at home who have been accustomed to make mining plant both for Australia, and South America; and for the better guidance of these machinists, Mr Frode would have bulk specimens of the quartz sent, so as to enable the makers to adapt the crushing machinery to the special nature of the ore. Some of the gold companies, in the Wynaad more especially, are endeavouring to utilize water power as a motor. As steam often proves an expensive and difficult power to be worked in remote Indian districts, while fuel is always a costly item, as a general rule every effort should be made to use water where it can be obtained. It has already been stated that the cost of working one of the mines is something under Rs. 6 per ton. As gold may be recokoned at Rs 2 per dwt. (20 to the ounce), so three pennyweights would clear the cost, while one ounce to the ton—and this is a moderate estimate—being Rs. 40, will yield a profit of Rs. 34 per ton. But this presupposes that a fairly, large quantity of quartz shall be crushed per diem. The quantity of work done depends on the number and weight of 'stampers' used. There is a passage in Mr. Brough Symth's report which explains these 'stampers' When worked out the operation stands thus:—10 stamps, costing £5,000 inclusive of cost of erection and building, will crush 25 tons in the 24 hours: 40 stamps, costing £20,000, will crush 100 tons. Then 100 tons at a gold profit of Rs. 34 per ton—Rs. 3,400 per day and in 300 working days Rs. 10,20,000 per annum. But as the sober business man will regard the profit as 'a dream of avarice,' we must let down the estimate to half an ounce of gold per ton of quartz, thus showing a profit of four lakhs twenty thousands rupees per annum or 85 per cent. on the capital. As to the question of probable yield there are plenty of data on which to form an opinion. One company have extracted 40 ounces from 44 tons of ore, and that too, with very indifferent machinery; and another company, with wretched appliances obtained 2-4-10 dwts. per ton. In Victoria where since 1860 the most complete statistics have been compiled, the average yield in the sixteen years ending with 1876 was 11 dwts 6·30 grs. Some of the companies in Australia have obtained from one to two ounces of gold per ton. There are grounds for believing that the quartz in some portions of the Mysore and Wynaad districts is richer than that of Australia. If science is worth anything, the promise of profit in this line of investment is safe enough; but there must be constant care and circumspection in the first plans and in the subsequent management of the concern, also a determination not to be discouraged by the preliminary difficulties that may have to be overcome.—*Bombay Gazette*.

GOLDEN SAND IN CANADA.

AN ounce of gold to the ton is a trifle as compared with the expected yield from some auriferous sand on the Riviere du Loup in Beauce, Quebec, Canada. Some of this sand has been assayed at the Metallurgical Laboratory Royal School of Mines, Kensington, and has yielded 14 ozs. 1 dwt. 3 grs. of gold and 1 oz 8 dwt. 19 grains of silver. The owners of 1,745 acres held in fee simple, and of mining rights over about 927 acres in addition thereto, ask but £15,000 in cash, and £80,000 in fully paid-up shares for the property:—

"The formation is of conglomerate and talcose slate and sandstone, with numerous small veins of quartz from which samples have been taken, showing free gold visible in the rocks. An analysis of a sample of this rock gives a result equal to 800 dollars to the ton. There are enormous deposits of auriferous gravel high up on the banks of the river, and it is proposed to commence operations by washing the gravel by the hydraulic method now so successfully employed in California and New Zealand under similar conditions. Two seasons have been devoted to the exploration and opening up of these deposits, and Mr A. A. Humphrey, who has conducted this work, estimates that there are 30,000,000 cubic yards of gravel in sight carrying gold at the rate of 30 cents per cubic yard, equal to 9,000,000 dols. The cost of washing this gravel will be 2½ cents. per yard—equal to 750,000 dols.—leaving a net profit of 8,250,000 dols., or £1,650,000 from this part of the property alone."

It appears from an official report to the Geological Survey of Canada that during the five days the writer was engaged superintending the experimental washing gold to the value of £31 2s. was obtained with pick, and shovel at a cost of £15, leaving a profit of £16 2s.

GOLD RETURNS FOR VICTORIA IN 1880.

ACCORDING to our usual custom, we have obtained statistics which enable us to estimate approximately the yield of gold for 1880. The estimate is arrived at by taking the amount of Victorian gold exported in 1880, and the amount of Victorian gold received at the Mint in the same year, and adding thereto the difference between the amounts held by the banks on the 31st December 1879, and the corresponding date of 1880. It will be seen from a table appended to these returns that the large decrease on the return of 1877. A similar small decrease which had gone on annually for many years in the gold returns of the colony was checked in 1878, though there was then still a small decrease occurred in 1879 as compared with 1878; but towards the close of 1879 a decided improvement took place in gold-mining, which continued throughout 1880, and we have now for the first time since 1872, when the [illegible] gold-field was very prosperous, to record an increase. Although the increase is not by any means so large as some sanguine persons anticipated, it is still a most substantial one, and as the prospects of mining in the colony generally, and more especially on the great Ballarat gold-field, are now very good, it may fairly be expected that the [illegible] of 1880 will be continued throughout the [illegible] the yield of 1881 on that of [illegible]

as compared with 1878, was 35,585oz.; but 1880 now shows an increase of 93,884oz. over 1879.

We have not been able to ascertain from the Mining Department, on account of the official returns not being yet complete, what was the mean estimated number of miners employed during 1880, or the estimated number on the 31st December last; but judging from the estimates published by the department for the other quarters of the year, the mean number may be taken to be slightly higher in 1880 than in 1879.

The Customs returns of the amount of gold exported during the years 1880 and 1879 give the following information:—

	Amount. oz.	dwt.	Value. £
1880			
Victorian gold	193,058	7	772,212
New Zealand gold	48,929	2	195,712
	241,987	9	967 924
1879.			
Victorian gold	214,197	16	857,294
New Zealand gold	91,758	2	367,244
	305,775	18	1,224,538

The returns from the Melbourne Mint, showing the amounts of gold received there during the years 1880 and 1879, were as follows:—

	Oz.
1880.	
Victorian gold	587,015·44
Foreign gold	171,705·40
	758,720·84
1879.	
Victorian gold	493,062·22
Foreign gold	163,493·62
	656,555·84

The quantity of gold held by the various banks on the 31st December last was 92,547oz., as against 62,582oz. 14wt. held by them on the corresponding date of 1879. By adding the amounts stated together, *viz.*, Victorian gold exported (193,058oz. 7dwt), Victorian gold received at the Mint (587,015·44), and the balance held by the banks on the 31st December last (92,547), a total of 812,092oz. is obtained, from which has to be deducted 60,528oz. 14 dwt. held by the banks at the termination of 1·79—and therefore included in the Mint or export returns of 1888—leaving 812,092oz. as the total yield of 1880, as against 718,208 in 1879, or an increase for 1880 over 1879 of 93,884oz.

The following table gives the average number of miners employed during the past 14 years, and the amounts of gold obtained in the past 15 years:—

Year.	Number of Miners.	Yield of Gold. Oz.
1866	73,749	1,536,541
1867	65,857	1,493,831
1868	63,181	1,474,187
1869	68,087	1,367,903
1870	60,367	1,281,341
1871	58,101	1,308,879
1872	54,651	1,317,102
1873	52,544	1,240,407
1874	46,000	1,1 2,614
1875	42,000	1,058,823
1876	41,561	93 ,260
1877	38,382	792,839
1878	37,400	758,793
1879	37,553	718,208
1880	......	812,092

—*Australasian.*

FORESTRY.

THE administration report for the official year 1879-80 of the Forest Department in the Bombay Presidency, has just appeared. During the year the Forest Act of 1878 was brought into force chiefly by the influence of the late Governor, and a large area was added to the forest reserves. There are now close on 15,000 square miles of territory, divided into reserved and protected forests. Over the reserved portion the Forest Department has complete control, but certain rights are allowed over the area called protected. An officer in each forest district called a settlement officer was also appointed to settle all claims and questions of right. Fire still seems to give great trouble, and no means have at present been found to combat this great enemy of forest growth. It is, however, satisfactory to notice that the apathy which in former days characterised any attempts at preventing the yearly hot-weather fires of the forest region has disappeared. During the year the revenue has made a great bound towards a return to the prosperous days before the famine; and although more superior officers have been employed, the expenses have been less than the estimates for the increased supervision. Several useful maps are issued with the report. Altogether considerable progress seems to have been made during the year in forest conservancy throughout the presidency.

During the year 1879-80 the Forest Department sold 1,512,220 maunds of fuel from the Darjeeling Reserved Division at an average price of Rs. 26-9-7 per 100 maunds; while the expenditure averaged Rs. 24-11-9 per 100 maunds; leaving a surplus of Rs. [illegible]. This surplus is less than in the previous year, and the falling off is attributed by the Conservator to the establishment and [illegible] being heavy in proportion to the amount sold. The [illegible] in sales was due to the competition of the Municipality competition which has now ceased. The Forest Department is to be congratulated from a departmental point of view on having at last secured the entire monopoly of the supply of fuel to Darjeeling; the public are to be condoled with.

THE number of tons of sandalwood sold in Mysore in 1879-80 was 1,396½, about 310 tons in excess of the sale of the previous year, and the average price per ton was Rs. 354 against Rs. 338 of the previous year. The receipts from timber, &c., in the Reserved forests were only Rs. 40,813; that from district forests, chiefly from minor forest products amounted to Rs. 57,000.

ACCORDING to recently published statistics, the number of fruit-trees in Bohemia of all sorts, but chiefly apples, appears to be 14,000,000. Of these 10,000,000 are in gardens 1,600,000 in waste lands, and about 2,000,000 on the sides of the public roads. The number of young trees annually planted is about 1,500,000. Between 6,000 and 7,000 miles of road are planted with fruit-trees, mostly of the best sorts, and the revenue therefrom, is very large. The fruit is largely exported to the north of Germany and Russia.

FOREST CONSERVANCY IN INDIA.

ON Friday evening, January 21st, Sir Richard Temple, Bart., G.C.S.I. delivered an interesting lecture before the Society of Arts, in London on the above subject. He entered first of all into a description of the principal trees which flourish in India, both in the plain and hilly districts. He referred to the deodar, or cedar as being one of the most useful of trees. Of the teak, he remarked that it possessed every virtue of which wood is capable: it was good everywhere and under all circumstances, being seldom attacked by insects, its appearance always strikes the eye, as it rises straight up from the ground. Then there was the Sál, commonly called "ironwood" on account of its great strength and durability; it has a tall straight trunk with fine head. Of the *terminalia* there were two useful kinds; one had a white and the other a black stem; one resembled a pillar of white marble and the other a black column. Among trees of the plain, he mentioned the acacia (*babul*) which was used for every purpose of daily life; also the mango which, besides furnishing a suitable article of food for the masses of the people, was fairly valuable for timber. He referred to the great forests of the Sunderbunds extending for thousands of square miles. There were India-rubber trees, bamboos, and several varieties of the palm, the date, the palmyra, and the cocoanut which latter tree supplied almost every want and was so valuable that even one or two constituted quite a little property.

Sir Richard spoke in glowing terms of the many other useful trees in India, and then came to the question how all this fine natural wealth should be preserved. But he remarked, the trees are valuable on two accounts, one being *economical* and the other *climatic*. As regards the former there are not less than thirty-seven millions of inhabited houses in British India, and the majority are made of wood. It might be imagined, then what an enormous demand there was for timber for house-building alone. Most of the domestic implements of the people are made of wood. There were not less than half a million villages in that dominion, and assuming that in each one there were from fifteen to twenty ploughs, it might be imagined how enormous was the demand for wood for agricultural implements. Then, as regards carts, they must be counted by millions; and as for fuel, there was in most parts of India an absolute want of wood, and consequently the people used cow-dung, which ought to be reserved for manure.

As regards the climatic influence of forests, there are many people who consider that the drought of India are caused by the destruction of the forests. Too much must not be made of that. There is a certain amount of evaporation from the Indian Ocean. He did not suppose the total rainfall of the continent of India can be affected by forests, but the *distribution* of it is very much affected. The clouds pass over the dry plains and go straight on to the mountains. They arise in the Indian Ocean, and the first obstruction they meet with is along the western coast. They sweep over the dry plains of India, and meeting with the mountain ranges, their vapour is there condensed and causes torrents and rushing streams which swell the rivers making floods in the valleys, which could be prevented if forest were on the plains: a cold surface is presented to the clouds, and causes them to condense. If there are no forests, the clouds pass on until stopped by the hills. The same principle applies to the vapours which sweep over the plains of Bengal and are stopped by the great mountain ranges In regard to how forests affect the distribution of rainfall if there are no forests, the chances are that at one time there will be drought and another time immoderate rains, a period of flood almost always following upon a period of drought. It is to the forest that we must look for being blessed with the early and latter rains in due season.

The next point in reference to climate, is the retention of moisture. If the vegetation is destroyed, the streams run dry unquestionably. If the vegetation is preserved, the moisture is preserved for the dry season. This is important in those parts of India where canals exist, and if we are to retain our canal system, the forests must be preserved.

One more point in reference to the climatic consideration, and that is the preservation of pasturage. The cattle in India have too much food at some seasons and too little at others, the consequence is that they suffer from hunger during the dry months, and are apt to surfeit themselves at the commencement of the annual rains. The great object is by preserving the forests to preserve the grass during the dry seasons. If there is a certain amount of forest land, grass will be sheltered from the sun and thrive so as to be fit for the cattle.

More ought to be done on the plains of India for the establishment of forests. Every village should be induced to establish a forest, which would afford a certain amount of timber and fuel, and also tend to preserve grass for the cattle.

These are the main reasons in brief why the preservation of forests is a matter of such vital concern in India. He now came to the measures to be taken for preserving these forests; and sorrowfully admitted the neglect of this subject which has prevailed in former years. Nobody was more zealous than he in vindicating the conduct of the Indian Government, and its officers, but he must admit that in the preservation of forests, we have not until within the last twenty years done as much as we ought to have done. Want of knowledge and technical education has contributed to the partial destruction of this great source of national wealth, so essential to the well-being of the country. We have now a large staff of trained

forest officers; he wished he could add that they had been trained in this country. He referred to the project which had been started for establishing a school in Epping Forest, and said that hitherto our Indian forest officers have been trained in France and Germany, and it must be allowed that the school at Nancy has turned out excellent foresters. He could not see why it should not be done in England. A large forest was not necessary for teaching the profession of forestry, there are plenty of available woods in England, Scotland and Wales.

We have now in India a Forest Department which was second to none in the world. What does this department do? The remaining forests are divided into two great categories by law. Firstly, reserved forests, which are absolutely preserved; and secondly, protected forests which are imperfectly guarded and preserved. To give an idea of the extent of these forests he would mention the area in square miles. Bengal Presidency, 51,000 square miles; Bombay, 18,000; Madras 5,000; making up a great total of 69,000, say 70,000, square miles. This will be augmented by the many square miles yet to be marked off. He ventured to say that within a few years we shall have not less than 100,000 square miles of forest in India. The greater portion is imperfectly protected, but still he thought nearly half was well preserved; at least 25,000 square miles are thoroughly guarded and preserved, and the whole of the great area named is under some protection. What does this preservation and guarding consist of, and to what purpose is it protected? It is first directed to the matter of wood-cutting. The forests are not treated by the Government in a dog-and-manger fashion. The timber is wanted for the use of man. Trees are not preserved for ornament, but use. As soon as a tree is grown to its full height and maturity it ought to be cut. In many cases the trees grow so thickly that thinning them is a positive benefit. The restrictions upon wood-cutting are not absolute, but instituted in order to ensure a number of trees being left for reproduction.

The next point is to regulate the practice of "*rāb*," which means that the young shoots of the trees are burned and their ashes, which contain the necessary chemical constituents, are used for manure especially where the natural manure, *viz.*, cow-dung has been used for fuel. This cutting shoots and burning for ash manure, is a practice, which if not regulated will cause great damage to the forest. It is necessary to a certain extent.

Another matter is the prevention of the jungle fires, which are partly accidental and partly intentional, and when they are accidental present some of the most magnificent spectacles that can be imagined. Many people have been all night in the midst of these fires, which rush over the country, travelling at the rate of several miles an hour, the animals flying before the flames, in terror the inhabitants of the forest being caught in the flames and Europeans galloping to escape from the conflagration. The racking of the trees sounds like artillery; the trunks form pillars of fire and smoulder for a long time.

Fires are also intentional and lighted up every year to ensure a plentiful crop of fresh green grass for the cattle. That to some extent, is permissible in the months of April or May. Many of the hill tribes carry on their agriculture not by ploughing, but by means of burning the forest and letting the ashes lie upon the ground until the rain comes. This is a barbarous practice and arises from the ignorance of the people and their want of agricultural appliances. In extenuation it may be said that certain localities are very steep, and not easy to plough. The object of the British Government is to wean these people from the practice, by making small advances of money to them whereby they may purchase cattle and ploughs, so as to depend upon agriculture rather than burning the forests.

Forest conservancy is directed towards the preservation of the grazing. If cattle winter in the jungle, they will destroy ten times as much as they eat. The object is to restrict the grazing by means of the block system to allow the cattle to graze in certain blocks or areas of the forest, and to prevent them in others, so as to preserve the vegetation.

It will readily be perceived that when a question arises tending to restrict the rights of the people, there is always a contest between the forest officers and the civil officers. People who live in the forests have been accustomed to burn and destroy trees, and they can only be reclaimed by degrees; while on the one hand their rights are protected, on the other hand they must not be allowed to destroy the forests. In a judicious manner forests must be preserved, while a fair consideration is given to the old-established customs of the country.

Among the most distinguished Indian foresters he mentioned, is Dr. Brandis, a German Inspector-General, at once scientific and practical, and the author of an excellent work entitled "The Forest Flora," and his distinguished countryman, Dr. Schlich. There was also Dr. Cleghorn, of Madras; the late Dr. Stewart and Mr. Baden Powell in the Punjab; Messrs. Pearson and Forsyth in the Central Provinces; Beddome and Campbell, Walker in Madras, Dalzell and Shuttleworth in Bombay; and Seaton and Ribbentrop in Burmah. These have struggled to preserve our forests with a considerable measure of success; they have endured many toils, and risked their health, some of them even losing their lives in the service of the forests of India.

In conclusion he ventured to think this subject was worthy of the best attention of the Society of Arts.

In reply to the invitation of the Chairman, Mr. Andrew Cassels, who invited discussion Dr. Cleghorn stated that he had been much interested by Sir Richard Temple's graphic description of the forests of the Indian Empire, and the results of 20 years' departmental administration. It was extremely desirable that correct information should be promulgated on this important subject, and no one had wider and more general knowledge than Sir Richard Temple, who had steadily given the weight of his great influence to Forest Conservancy, and his commendation was most gratifying to an old forest officer. The department was formed in Burmah in 1855; Madras, 1856; Upper India, 1861; and the First Forest Act in 1864, amended in 1878. He referred also to the evils of denudation, due in a measure to the ramification of railways, which for fuel alone exhausted the forests for miles on either side.

Sir J. Fayrer expressed his tribute of admiration for the encouragement Sir Richard Temple, had always given to the science of forestry, than whom no Government officer had done more. On sanitary grounds he argued on behalf of the preservation of the forests.

Sir W. Robinson did not think much of the climatic consideration, and thought that the Government should act with great caution so as not to trench upon the rights of the people.

Mr. Bottley thought that the extension of agriculture in India should be encouraged in every way.

A vote of thanks was passed for Sir Richard Temple's interesting lecture, and the latter in returning thanks said that one twenty-fifth of the empire was under forest conservation, but that area, instead of being too much, was too little. He added also that it was for the welfare of the natives these regulations were made, and that there was a very large quantity of unreserved and village forests.

"MHOWA," OR "MAHWA," AN INDIAN FOOD-TREE.

By C. G. Warnford Lock.

THE problem of ensuring a sufficient food-supply for India's millions, cannot yet be said to be satisfactorily settled, though much has been done to avert future famines. Some remarks upon the *Singhara* nut, a highly important article of diet among numbers of the natives of India, appeared in the *Journal* of January 31st, 1879 (No 1367, vol xxvii., p. 174). An equally deserving subject is the produce of the *mhowa* tree.

The name *mhowa* which is spelt by Europeans in at least a dozen different ways, is applied, it would seem not only to *Bassia latifolia* the most important species, but also to *B. longifolia* and *B. butyracea*, whose fruits are likewise edible. The singularity of the genus consist in the fact that besides offering eatable fruits, their fleshy deciduous corollas are largely employed for the same purpose and in point of fact, constitute a staple and sometimes almost the only article of diet available to the poorer classes of Indian natives during several months of each year. *Bassia latifolia* is abundant in all parts of Central India, and is cultivated in many other districts.

Towards the end of February or the beginning of March as the crop of flowers approaches ripeness, the corollas, becoming fleshy and turbid with secreted juices, gradually loosen their adhesion to the calyx, and fall to the ground in a snowy shower. The duty of collecting the fallen blossoms is chiefly performed by women and children; at dawn they may be seen leaving their villages, with baskets, and a supply of water for the day's use. Before the crop has began to fall, they take the precaution to burn away the grass and leaves at the feet of the trees, so that none of the blossoms may be hidden when they fall. The gleaners generally remain under the trees all day alternately collecting the crop, and sleeping, and the male members of the family visit the trees once or twice during the day in order to carry away what has been collected. At night bears, deer, and other animals visit the trees to take their share of the crop. At early morning and late evening the less frequented trees on the borders of the jungles attract numbers of jungle fowl and pea fowl. Cattle are also very fond of the flowers, and cows' milk has in consequence at this season a strong flavour of *mhowa*.

It often happens that the collectors come a considerable distance, in which case they erect with the branches of the *sâl* tree (*Shorea robusta*) a temporary encampment of huts, in which they live until all the crop is gathered in. In front of each of these huts a piece of ground is made quite smooth and hard for the purpose of spreading out the flowers to dry in the sun. When perfectly dry they have a reddish brown colour and are reduced to about a quarter their original size and half their original weight. It is a custom with some of the natives before spreading the flowers out to dry, to pull off the ring of minute foliaceous lobes which crowns the fleshy corolla. It is very difficult to obtain any trustworthy statements as to the yield of the trees. A first-class tree, it has been said will continue to shed its blossoms for 15 days, at the rate of 120lbs. a day; but this estimate is probably double what it ought to be. The rent of trees varies with their abundance in the district, the quality of the preceding rice harvest and various other circumstances bearing upon demand and supply. The extreme prices ascertained by Mr. V. Ball of the Geological Survey to have been paid for permission to collect, in various places were 2*d.* and 4*s.* The saved crop varies equally in price, the extremes being 120lbs and 480lbs. for a rupee (2*s.*) but when, as is most frequently the case, the exchange is made in kind, the merchants give only a small quantity of salt, and 6 to 8lbs of rice, for the maund (80 lbs.) of *mhowa*. During the famine in Manbhoom, a rupee would purchase only about 24lbs.

Some authorities state that two maunds of *mhowa* will furnish a month's food to a family of two parents and three children. It is, however, seldom eaten alone, being mixed with the seeds of the *sâl* tree (*Shorea robusta*), or with the leaves of jungle plants; sometimes a small quantity of rice is added. When fresh *mhowa* has a sweet taste with an odour somewhat suggestive of mice; when dried it presents some resemblance to inferior kinds of figs. Cooking renders it vapid, and utterly devoid of flavour. On distillation, the newly-dried flowers yield a highly intoxicating spirit, called *daru* which is generally diluted with five to ten times its bulk of water and is then sold at the rate of about 1*d.* a quart. Its odour in most offensive to Europeans, but British soldiers have been known to secure intoxication by drinking it with held noses. By careful distillation, it is possible to get ride of the essential oil which causes the unpleasantness. As much as six gallons of proof spirit have been got from one cwt. of the flowers. The rectified spirit when placed in oak casks, takes a yellowish colour and is preferred to high class Irish whiskey. Analysis shows it to be wholesome. From the seeds, is expressed a kind of oil, which is used for cooking purposes, for admixture with *ghee* (clarified butter), and for lighting and soap-making.

The tree thrives in poor stony ground, and might therefore, be cultivated on land not available for other crops. Though the natives protect such trees as exist, they do not seem to take any steps to increase the number. The yield of followers is proverbially regular from year to year. When dried, they will keep for almost any length of time. The large proportion of sugar (50 per cent) contained in them has attracted the attention of agriculturists in this country, who see in them a valuable cattle food; and Messrs. T. Christy & Co., of Fenchurch-street, are already importing them for that purpose.—*Society of Arts Journal.*

The *mahwa* tree (*Bassia latifolia*) is such an important Indian tree that it is satisfactory to find there is no chance of its becoming scarce. We gather this information from an official letter from the Chief Commissioner of the Central Provinces to the Government of India, in which he says that, as a general rule, the *mahwa* tree is not destroyed by the people. It is too valuable for its produce to be cut down and sold as timber; ordinarily the trees cut down are those that have ceased to bear fruit. The diminution in *mahwa* trees over considerable areas results from the enormous extension of cultivation there has been during the past fifteen or twenty years. They have disappeared in common with other forest trees. Of the *mahwa* trees, however, many

are left, and these are seen now in the midst of cultivation. Being valuable, they have been spared when other trees have been cut down. But no seedlings grow up in the cultivation, and there are therefore no young trees. With the view of ensuring the preservation of the tree in village areas, the *mahwa* has been included amongst trees which proprietors prohibit from being cut down without proper authority. It will be remembered that the fleshy flowers (not fruit) of this species constitute an important article of food.—*Gardeners' Chronicle.*

GROWTH OF TIMBER TREES.

A PAPER was read by Sir R. Christison at the last meeting of the Edinburgh Botanical Society upon the "Growth of Wood in 1880." In a former paper, he said, he endeavoured to show that, in the unfavourable season of 1879, the growth of wood of all kinds of trees was materially less than in the comparatively favourable season of 1878. He had now to state results of measurements of the same trees for the recent favourable season of 1880. The previous autumn was unfavourable for the ripening of young wood, and the trees in an unprepared condition were exposed, during a great part of December 1879, to an asperity of climate unprecedented in this latitude. This might have led one to expect a falling of n the growth of wood, and it appeared, from comparison of measurements that with very few exceptions, the growth of wood last year was even more below the average of favourable years than that of the bad year 1879. Thus, in fifteen leaf-shedding trees of various species, exclusive of the oak the average growth of trunk girth in three successive years was—1878, 8-10ths; 1879, 45-100ths; 1880, 3-10ths and-a-half. In four specimens of the oak tribe, the growth was—1878, 8-13ths; 1879, 77-100ths; 1880, 51-100ths. In twenty specimens of the evergreen Pinaceæ the growth was—1878, 8-10ths; 1879, 7-10ths, 1880, 6-10ths and-a-half. After giving details in regard to particular trees, Sir Robert stated, as general deductions from his observations, that leaf-shedding trees, exclusive of the oak, suffered most; that the ever green Pinaceæ suffered least; and that there was some power of resistance on the part of the oak tribe which was remarkable, the power of resistance of the Hungary oak being particularly deserving of attention. In another communication on the "extent of the season of growth," Sir Robert stated as the result of observations on five leaf-shedding and five evergreen trees, that in the case of the former, even in a fine year the growth of wood was confined very nearly, if not entirely to the months of June, July, and August; while in the case of the latter growth commenced a month sooner, terminating, however, about the same time. Mr. A. Buchan said it was proposed that the inquiry should be taken up more extensively over Scotland.

AVENUE PLANTING IN THE MADRAS PRESIDENCY.

THE attention of taluq officers in the Chingleput district was lately directed by the Collector to the subject of avenue planting and to the necessity there was for Tahsildars, Sub-Magistrates Revenue Inspectors, &c., in inducing villagers not only to plant avenues in the borders of their lands, but to encourage the planting of useful fruit trees. In the southern districts and along the great trunk roads between Madras and the towns south of Chingleput, large mango, jack, and other fruit trees may be seen spreading their lofty branches, and under their shade, and especially under the "sacred banian," many a weary traveller halts for the day or night, cooks his food, makes his *poojah*, rests a while and resumes his journey. The Local Fund officers and the revenue subordinates exercise some supervision in this branch of their work, so that the trees may be preserved and their fruit sold for the benefit of the sircar. In some districts, the produce of the jack, mango, and tamarind trees is given out on contract, and the returns form a not unimportant item in the village accounts. In the Chingleput district the roads leading to the Mount, Palaveram Poonamallee, Villacheri, and other distant villages, are lined with tamarind and mango trees, which not only afford shelter to the traveller, but the produce of these trees is sold for the benefit of the Government and in many places, passengers avail themselves of the fruit. The idea of planting these trees in the distant suburbs of Madras is a commendable one, and shows that in days long past the European and native district officials were not blind to the interests of those who were to come after them. But in our own day, is anything being done to preserve these avenue trees, to replace those that have decayed or to plant fresh ones where necessary? It is to be feared that very little is being done in this direction. In the town of Madras, the Municipality are planting avenues with *neem portia*, *poorsaram*, *b nian*, and other trees. The last named, though a shady tree and well able to withstand the effects of wind and weather, is destructive in this way. The fruit it produces, popularly known as the Indian fig, is eaten by crows, kites, and other birds, and the seeds are dropped on house-tops. These germinate so rapidly that one not infrequently sees banian trees growing on the top of houses or from the cracks in garden walls. These plants take such firm root in walls that they cannot be removed without difficulty. We think, therefore, that the best description of avenue trees which the Municipality may advantageously plant in Madras and the suburbs is the *jack* and *mango*, which, in addition to affording shelter to pedestrians, supply delicious fruit which may be sold and the proceeds credited to Municipal funds. In the districts the Local Fund Boards, Municipalities, revenue officers, and tahsildars, to whom are entrusted the duty of improving villages and planting topes, may well follow in the footsteps of those who preceded them, and by planting useful fruit trees, they will not only follow a wise and beneficial course, but will lay the seeds of what will, in future years, prove an important source of revenue.—*Madras Standard.*

THE FORESTS OF AMERICA.

MR. T. MEEHAN states that "in the States of Virginia, Tennessee, and North Carolina, there are, at the present time, millions of acres of magnificent forest trees. Among these are white oak, red oak, and the tulip poplar, in immense quantities; with a great quantity of species, useful but less known, used in the leading arts, such as beech, birch, elm, sweet gum, black or sour gum, buttonwood, linden, cucumber, and other magnolias, ash, sugar, and other maples, locust chestnut, and horse chestnut, walnut, and hickory, enormous sugar berry trees, and dogwoods larger than in the north, besides many others interesting to the botanist, but for which the special uses have yet to be found. Besides these, there are among the resinous trees immense quantities of the yellow pine *Pinus tæda*), bull pine (*Pinus mitis*), and post or Jersey pine (*Pinus inops*), which grow up into forest of straight trees, very different from what we find them in New Jersey and Pennsylvania. Besides these are Hemlock spruce in some quantity, white pine in less, and in still smaller quantities balsam fir (*Abies frasers*) and black spruce (*Abies nigra.*)

GARDEN.

ROSES IN POTS.

THOSE who contemplate beginning the culture of the 'queen of flowers' in pots, cannot choose a better time to make their start than the present month. From the middle to the end of October is the best period of the year for transplanting roses, either in the open ground or in pots. Growth is finished, and the plants, though leafy and green, are hardened, and disposed to go to rest. They will therefore receive no check in being transplanted, while their tendency to rest is accelerated by the treatment, and the plants are rendered better fitted to withstand the rigour in winter in our climate on account of the additional hardening induced by the process.

It is altogether a mistake to suppose the falling off of the last leaf must be waited for before transplanting roses or any other deciduous plant. If the wood is not soft and sappy, it matters little how many leaves remain on the plant. The more the better, as a general rule, because the leaves while they remain on the plant will help materially to establish it in its new position by their aid in the production of new roots.

But it is more with regard to establishing roses in pots than in the open ground that we have to do in this paper, and we say again now is the best time. Everything is in favour of this early start. If the plants have to be selected from a nursery stock, or from the stock of a friend, or your own store of cuttings or plants bought in last year, the best can be selected and potted up, before they are appropriated by any one earlier astir than yourself in the matter. The first thing to be well informed upon in connection with this step is the selection of the right sorts, or those that succeed best in pots. If possible, and by starting early the possibility is reduced to certainty, let only sorts that are well known to succeed in pots be chosen, and let them be chosen also upon their own root, rather than budded or grafted on the manetti or the briar stock. There are very few varieties that are not superior on their own roots, in point of durability and floriferousness, to those that are grafted or budded on the stocks above mentioned. They are hardier also, and better adapted to variations of soil, than when budded or grafted on any stock whatsoever. But should the plants not be obtainable on their own roots, there is no help but choose them, the best that can be had, on the manetti or briar stock. The latter is preferable to the former for pot culture, as indeed it is for any method of culture, being more hardy and vigorous.

When the plants must be selected from those on either of these stocks, let them be potted low, that is, bury the roots so that the base of the bud or graft shall be an inch or more under the surface of the soil. If this is attended to, the plants will soon be on their own roots, because roots will quickly be emitted from the union betwixt the stock and scion, and thus the plants will by-and-by be independent of the stock altogether. In order to attain this the more fully, choose plants with short stems, those which have been grafted or budded low on the stock, for, as it is undesirable to use a larger sized pot than one of 6 inches diameter, the stock should be short enough to be potted so low in a pot of the size named as that the base of the scion will be well covered. The compost should consist of rough, fibry loam. To this m y be added about a third of a peck of bone meal of the best quality. The soil should be pressed firm, but not rammed solid, a practice recommended by some, but which is injurious to the plants. When potted the surface of the pots should be sprinkled with water and then plunged to the rims in coal ashes in the open air. In this position they may be allowed to stand till frost becomes frequent and threatens to be severe, when they should be placed in cold frames, where they can be protected from frost by means of mats or straw. In fine open weather let them be freely aired; indeed, the lights should never be kept close except in severe frost, or to exclude rain and snow.

As we are describing the treatment for plants that have just been potted up from the open ground, which so far is identical with that required by established plants, we must now note a difference which becomes necessary as to the starting of the plants into growth in spring. It should be borne in mind that these newly-potted plants will not bear being forced the first season. It is often done, but never without crippling the vigour of the plants. They should be allowed to start into growth in the natural course, giving them no more excitement than may be obtained by the protection which a cold frame affords. Before growth commences the plants must be pruned. Hybrid perpetual roses should be cut well back, leaving only two or three buds at the base of each shoot. Tea roses should not be cut back so severely, but should be pruned into firm well ripened wood in any case. When growth has started, great care must be exercised to prevent cold frosty air getting into the frame; nothing is more injurious than checks at this stage of the progress of the plants. Be careful also in watering neither to overdo nor underdo the supply. The syringe should not be used while the nights are cold and frosty, but as soon as such weather is past let the plants have a dewing over twice a day. And as the days and nights become warm, let more air be given, so that sturdy, healthy growth may be secured. When the plants have filled their first pots with roots, shift them into others a size larger, using the same compost, by and by, when these also are filled with root give liquid manure twice or thrice a week. The lights should be taken off, or better still, the plants be plunged in manure or leaves in the open ground. In this way splendid plants may be got up in one season's growth for forcing the following season.

The following are among the best varieties of roses for pot culture:—Abel Grand, Achille Gonod, Alfred Colomb, Anna, Alexieff, Marie Baumann, Victor Verdier, Centifolia Rosea, Bessie Johnson, Charles Verdier, Annie Laxton, Coquette des Blanches, Charles Lefebvre, Docteur Andry, Charles Margottin, Jules Margottin, Edouard Morren, Dupuy Jamain, Baroness Rothschild, Glory of Waltham, Senateur Vaisse, Madame Lacharme, Duke of Wellington, Hippolyte Jamain, La France.

ORANGES.

FOR a time when in England the orange was not—we must go back far into the mists of antiquity. As early as the year 1290, it is recorded that seven oranges (*poma de orenge*) were landed at Portsmouth from the cargo of a Spanish ship, but for two centuries after that there does not appear to have been any particular commerce in them in this country. Then they became an important item in our imports, Billingsgate being then as now the great landing-place for them. The Chinese claim the orange as a native fruit, and though as Mrs. Bayle Bernard points out in "Our Common Fruits" there being no reference to it in the travels of the accurate and observant Marco Polo, has led some to doubt this, yet it is more likely that he may have overlooked or forgotten it than that it should have spread so widely there and no record remain of its introduction had it been transplanted thither. So thoroughly, too, was it formerly identified with that country that the sweet fruit was once universally known in Europe as the Chinese orange, and it still bears that name in America and even in India. A large part of our present supplies comes from the Azores; but Spain, Portugal, and Sicily contribute immensely, and send us their crops earlier than do the Azores Islands. Particularly large is the importation from Valencia, which is one of the busiest sea ports and the most thriving of Spanish cities. But the Azores—and especially St. Michael, the largest of the group of the nine islands—furnish us not only with vast quantities, but the fruit is of a superior character, though we often get other oranges when we innocently buy what are represented to be "sweet St. Michael's." From this island there is a regular trade by means of steam vessels, each carrying 10,000 boxes or more, and their arrival in the neighbourhood of Billingsgate creates a busy scene; the porters with huge 'knots' on their heads, going to and fro as fast as they are able between the vessel and the fruit-brokers' warehouses in Pudding-lane, and the surrounding thoroughfares, where the fruit is sold by auction three or four times a week.

ORANGES IN JAPAN.

THE orange crop in Kiushiu has been unusually large this year. From the two townlands of Arita and Unami in that province about twenty thousand boxes of fruit have been sent daily to the Osaka and Kobe markets. The numbers of oranges in a box depends of course on the size of the fruits—that of the boxes being generally fixed—but we shall not be far wrong if we estimate it at one hundred and fifty, at which rate the consumption of the Kobe and Ozaka fruit eaters would amount to some three millions of oranges per diem. But indeed eggs and oranges represent something more than mere edibles in Japan. They are the messengers of courtesy, the very rank and file of that intrinsically worthless but morally inestimable army of gifts from which all the outposts of Japanese amity and conventionality are garrisoned. Abolish baskets of oranges and boxes of eggs from the region accessible to coppers, and you shall subject the social existence of this country to a loss not less paralyzing than that of the jacket button, without which its owner was not at liberty to construe Horace. Oranges deftly piled up in plaited pyramids and eggs neatly pillowed in a bed of husks, do not convey much from the donor or confer much on the recipient, but in the eyes of a Japanese they are bulwarks of that very material old hospitality which forbade friendship to be ever empty-handed, and taught at the same time that the value of a gift is measured by its intention, not by its quality.

OPERATIONS FOR APRIL.

I.

IN HILL STATIONS.

THE FLOWER GARDEN.—All plants intended to flower in summer should be sown now. Another sowing of hardy annuals should be made where they are to remain.

Mignionette and Stocks may be sown now, and Biennials and Perennials transplanted. Sow Pansy and Heartsease. Propagate by cuttings Erythrina Crista Galli and Laurifolia. Bud Roses. Prune Roses not pruned last month. Prick in tender annuals to three or four inches apart in a fresh hot-bed, or thin them out. Sow half hardy annuals.

THE VEGETABLE GARDEN.—Jerusalem Artichokes may yet be planted out, and plant offsets of Globe Artichokes. Sow Parsley and Spinach, and plant Potatoes for main crop. Sow Turnips, Carrots, Cabbages, Cauliflower, Knol-Khol, Peas and Lettuce, Marjoram, Savory, and Thyme.

II.

IN THE PLAINS.

THE FLOWER GARDEN.—Store all bulbous plants the leaves of which have died down. Plant Achimenes in shallow pans or ring-pots, and water well.

THE VEGETABLE GARDEN.—Very little can be done now but water well such vegetables as may remain and Asparagus.—*Indian Amateur Gardener.*

TEA.

A RANCHI correspondent writes :—"Tea planting has proved eminently successful in Chutia Nagpore; and it is a fact worthy of record that the first efforts of a native gentleman I allude to our worthy citizen, Baboo Khettra Chandra Ghose in this direction, have been crowned with deserving success." The uplands of Chutia Nagpore seem to be favourable to the growth of tea. Coffee, too, is successfully grown here and the gentleman referred to owns the largest coffee garden in Ranchi.

THE Batavia *Dagblad* draws attention to the fact that the Government Java cinchona bark brings in the European market an estimated average price of 2*s.* 2*d.* per English lb., while Jamaica cinchona bark brings an average of 3*s.* 9*d.* per lb.

THE *Produce Markets' Review* speaks of low class teas tending to keep down prices at home, could not our planters see their interest in confining themselves more to the fine qualities in future, thus they would raise the name of Indian teas, keep done stocks in London, and considerably help the market generally.

"INDIAN tea continues to be largely offered, and owing to a less active demand and to the poor quality of the bulk of the supplies, prices have been more favourable to buyers. The increasing proportion of the commoner broken sorts has for some time exceeded the demand, and has had a depressing influence on their values. Although the consumption of the commoner descriptions of Indian teas is large, it has been materially checked by the exceptionally low prices which similar grades of China growths now fetch. There appears every prospect of abundant supplies of all sorts of common tea, both from India and China, and a considerable increase in the demand may be necessary before a material rise in the values of such descriptions can take place. The depreciation has extended to the Souchong, Pekoe Souchongs, and the less desirable medium parcels, while the eager competition for Teas possessing quality and strength has caused the recent firm prices to be maintained for the latter kinds. At the public sales 11,712 packages were brought forward, but except for the really finer sorts the tendency of the market throughout was adverse to importers. Two small invoices of Java teas have been offered, but the quality was inferior."

BULKING.

THE frequent and well-founded complaints of irregularity in Indian teas bulked in the London warehouses, are still a constant source of annoyance to the trade, and must lead to the conclusion that the system of "bulking" adopted is a faulty one.

The "bulking" of tea in India has hitherto been carried on to such a small extent that a comparison between the outturn of breaks bulked there and at home can scarcely yet be made, while the absence of regularity in both the size of the packages and the quality of the tea too often apparent in parcel offered here as "bulked in India" shows that the difficulty, from whatever source it arises, still remains to be overcome on the other side.

If we now turn to the produce of China, we see a very different condition of things. China tea is not bulked in this country, and such a thing as a claim for regularity is practically unknown. It would be well, therefore, to look at the plan adopted by the Chinese, which works so satisfactorily, and which, moreover is extremely simple, with a view to judging of the practicability of applying it to Indian tea.

The method is as follows :—Immediately after the final firing, and while the tea is still hot, it is spread in even layers, two or three inches in thickness, one on the top of the other, at the end of a godown, the height and breadth of the heap being according to the size of the parcel, or chop, as it is there called, to be made. An ordinary wooden rake is then drawn down the face of the pile, thus raking an equal quantity from all the layers, and securing (the all important point) a thorough mixture of the tea. As fast as it raked down it is shovelled into baskets and weighed, an equal quantity being put into each chest. Then, while still warm the tea is packed and soldered up at once. The chest being made of an oven weight, it will thus be seen that by this careful system, irregularity both in quality and tare is avoided.

The principal difficulty that the proprietors of London warehouses might find in following the above plan is the limited space which is often at their disposal, but we rely the end attainable must show the desirability of overcoming this and of giving up the present unsatisfactory process. It would also be well if more care than is now used was exercised in treading back the tea into the chests. Fine broken Pekoes, for instance, are often much injured in appearance, and consequently depreciated in value, by the treatment they receive.

In India, where space is not of so much object as in this country, the Chinese mode of "bulking" might well be carried out, and we are strongly of opinion that if the owner of gardens can see their way to making arrangements for equalising the size of packages and thoroughly mixing their teas before packing, thus doing away with the necessity for bulking at home, the article will keep better and the Indian tea trade will be carried on with more satisfaction and more profit to all concerned.

THE TEA TRADE.

IN the years 1836 to 1848, the monthly consumption of tea of all kinds was between only 1,000,000lbs and 4,000,000 lbs; by the year 1868 it had increased to 7,104,000lbs; and since then it has been nearly doubled to 18,500,000lbs.; the amount estimated for 1880. From 1860, when Indian tea claimed greater attention, to 1865, the average monthly consumption of that growth increased from 100,000lbs. to 250,000lbs.; in 1868 it had reached 823,000lbs.; in 1871 as much as 1,163,0 0lbs.; by the year 1876 it rose to 2,145,000 lbs; and so on up to the present time, when it is computed to be about 4,000,000 lbs.

CHEMISTRY OF TEA.

A GERMAN chemist, I. M. Eder, has been investigating the chemical composition of tea as it leaves the hands of the Chinese. It would be too long here to follow the author through all the details of this inquiry, but we may arrive at once at the general conclusion, *viz.*, that the tea leaf is very highly adulterated by the Chinese, independently of any fraudulent admixtures which it may receive at the hands of the dealers. The Chinaman's most common offence is that of the mixing old teas with the newly plucked leaves, the worst with the better sorts, &c., and calling these mixtures by certain fancy names but not much importance is attached to this by our author, neither to the process of scenting by keeping the tea in contact for a certain time with strongly odoriferous flowers, and then removing it. There is no tangible adulteration in these practices, but beyond this there is actual adulteration to a considerable amount, and Dr. Eder divides these adulterants into four classes :—1. Mineral substances for increasing the weight. 2. Mineral colouring matters. 3. Organic

substances for increasing the weight; and 4. Organic colouring matters and astringents. The latter, which are difficult to detect, constitute a very noxious adulteration, and will end by driving tea out of the market altogether if persevered in. It is already well known that pure tea is tolerably astringent, and that persons past the meridian of life who indulge in tea more than once a day, are apt to suffer from the effects of constant constipation. Of course these baneful effects will be still more increased by the addition of astringent organic matters and vegetable colouring matters possessing the same injurious qualities.

The Chinese sometimes mix the leaves of other shrubs with tea but this is easily discovered (if not at first sight) by making an infusion of it into which put a grain and a half of blue vitriol (copperas) if it be good genuine *green tea* and set in a good light, it will appear of a fine light blue; but if it be adulterated green yellow, and black colours will be distinctly seen.

After this fraud was detected the Chinese *dyed* the leaves of damaged and ordinary *green tea* with Japan earth (*terra japonica*) which gives the leaf the infusion, and the tincture the colour of *bohea*. This is to be detected in many ways; first, a less quantity of this dyed tea gives a deeper colour to the same proportion of water than if it was good. 2. The colour it gives the water will also be of a reddish brown, whereas it should be dark. 3. When the leaves have been washed by standing a little, they will look greener than good *bohea*. 4. This dyed tea is generally much larger, therefore it is better to buy the small-leaved tea. 5. The infusion, which should be smooth and aromatic to the palate, tastes rough, and more harsh. 6. If milk be poured into it it will rise reddish instead of dark or blackish brown. 7. A little sulphate of iron put into this liquid will turn it light blue, which otherwise ought to be of deep blue, inclining to black. 8. Water of ammonia makes the good tea of a deep brownish yellow after it has stood a while, like new drawn tincture of saffron, but it has not that effect in bad tea.

Green tea is also counterfeited by dyeing bad *bohea* with green vitriol, but this may be detected by adding a little powdered gall to the infusion, which will turn it immediately black; spirits of hardshorn will make it of a purple colour, and cause a slight precipitation, instead of a deep greenish yellow, when it has stood for about six minutes.—*Monthly Magazine.*

THE INCREASED CONSUMPTION OF INDIAN TEA.

AFTER a long series of bad years, an opening in the clouds is observable in the tea industry. Such a prospect must be very pleasant to those who have been in the very slough of despond for such a length of time. Hope deferred maketh the heart sick, and the unfortunate tea shareholder has had enough to make him sick almost unto death. However, "the darkest hour is that before dawn," and so it has been in this connection. Low as prices have been for a number of years, they seem to have reached their nadir about three months ago, when a check was felt, and a slow, but apparently steady, increase set in. During the past year an intelligent effort was made to find new markets for our tea, and a considerable amount of success resulted in Australia. That, however, cannot be said to have influenced the home market yet, consequently the outlook is all the more hopeful, because it is entirely confined to the English market. This is only one point, in connexion with this subject, which wears an encouraging aspect. It might, for instance, have been due to some accidental condition of the market, such as a deficient supply; but this is not the case, as the imports for the whole year (1880) amounted to 45 million pounds, against 38½ and 36 million pounds in 1879 and 1878 respectively. We must, therefore, look for another cause. It might also have arisen from the supplies from China being of inferior quality, but this is also not the fact, as the London brokers' reports tell us that the Chinese are making an effort to recover their lost ground, and that, in consequence the recent arrivals from China have been of much better quality than usual. Impoverished stocks have nothing to do with it, for we find stocks to have stood at 20 millions lb, on 31st December 1880, as against 17½ and 14¾lbs. in 1879 and 1878 respectively. No, the change has set in from the best of causes, an increase in consumption, and this is the most hopeful feature of the event. In 1860, the consumption of tea, per head of population, was, in the United Kingdom, 2·612 and ·038 lbs. for China and India respectively, and both increased till the year 1875, when the figures stood at 3·728 and ·712 lbs. respectively. As regards Indian tea, the increase has continued up to date, while the deliveries of China tea have practically remained stationary since that time. The consumption of Indian tea per annum, per head of population, has been as follows, since 1875:

	lbs.
1875	·712
1876	·803
1877	·836
1878	1·087
1879	1·037
1880	1·269

During the last four months of 1880, the deliveries were at the rate of 4 million pounds per month, which was equal to an annual consumption of 1·891 lbs. per head, or 91 per cent over the consumption of 1875. This ought to reduce stocks and this reduction will be aided by the fact, that during the past three or four years, the low prices obtaining for tea have discouraged the extension of cultivation, and this, in turn, will keep down the heavy ratio of increase in production, which has been characteristic of tea garden operations for some time. The efforts that have been made for the last four or five years to introduce Indian tea to the British public in a pure and unmixed state, are now beginning to bear fruit, and to the fact that, in many towns and centres of population, Indian tea can now be had in an unmixed state, this increase in consumption is largely due. It is hard to understand how it could be otherwise, as, if a hundred people drink pure Indian tea for a month ninety of them will keep to it if they can procure it; hence, a large increase in consumption has resulted from the introduction of Indian tea in such a form that the consumer could obtain it genuine.

Now that the tide has turned, it will be the tea manufacturers' fault if the industry ever falls in public estimation. That the desirable end of keeping Indian tea in a high place in the favour of the public may be assured, the greatest care must be taken that it should be good and that there should be no difficulty in the consumer obtaining it pure and in such quantities as he may desire. This latter has been the desideratum in days gone by. The consumer was perfectly willing to pay a fair price for the article, but there existed no means of his obtaining it genuine unless he purchased a chest which was an original package. Now that he can obtain a single pound of it, he may be depended on as a good customer, so long as the manufacturer keeps up the quality. It is not necessary perhaps that we should comment on the effects of rasping tea on the consumer. This has been discussed *ad nauseam*, and we are convinced that the planter is becoming alive to the importance of producing a delicately favoured tea suitable for drinking, without any mixture whatever. This granted the future of the Indian tea industry may be considered as assured.—*Englishman.*

COFFEE.

THAT the consumption of coffee in the United Kingdom does not shew any signs of increase is clearly shewn from the following table, which we extract from the *Ceylon Observer* :—

Summary of imports, deliveries, and stocks of coffee in the United Kingdom during the last thirteen years, from official records :—

	Imports	Deliveries		Stocks end Dec
		Home use	Exports	
	Tons	Tons	Tons	Tons
1880 ...	77,797	14 540	65 600	17,000
1879 ...	80 869	15 489	65 000	15 000
1878 ...	63 670	14 808	53 000	18,500
1877 ...	80 486	14 656	56 000	18.000
1876 ...	67 069	14 885	61,000	9 058
1875 ...	79 708	14 450	60 500	18,000
1874 ...	70,704	14 223	54 000	14,000
1873 ...	84,184	14,433	72 000	12,000
1872 ...	74 586	14,134	70 500	13 500
1871 ...	86,000	13 844	76,000	25,000
1870 ...	80,287	13 674	64 652	31.000
1869 ...	77 418	12,991	57,211	29,468
1868 ...	77,635	13,665	60,297	22,545

A NATIVE planter in Ceylon epitomizes the causes of loss in coffee planting under the following heads :—

1.—By unfavourable seasons at the time of blossoms.
2.—By leaf-disease.
3.—By buying lands on enhanced rates, also on borrowed capital.
4.—By putting up costly and permanent buildings.
5.—By paying very high salaries to managers, &c.
6.—By paying a heavy percentage for cash, credit, exchange, disbursement, &c.
7.—By paying tax to medical aid.
8.—By paying extra watchers to protect crop from villagers.

MR VAN MAANEN, of Salatiga (Java), the inventor of a process to dry coffee artificially by heated air, has sent round a circular to coffee planters in Java offering to make known his invention to them in case of sufficient support, at a remuneration of half a guilder for every picul of coffee produced on their estates in 1880. The Samarang *Vaderland* of the 15th January describes Mr. Van Maanen's process as simple, easily managed even by natives from no engineer being required, and refuse, such as coconnut shells, bamboo, &c., may be utilised as fuel. The apparatus can deal with from 22 to 100 piculs of coffee in 24 hours. The coffee comes out of the apparatus perfectly dry without any injury to its quality, and the total drying expenses amount to only 6 guilder cents. per picul. The cost of setting up an apparatus for a product amounting to 2,000 piculs is 1,500 guilders, scarcely any repairs to it being afterwards required. These facts are certified by three managers of coffee estates who have experimented with the invention. In their certificates appended to the circular, they estimate the expense of drying 2,000 piculs of coffee by the ordinary method at 6,000 guilders, while by Van Maanen's process it will amount to only 175 guilders, thus at a saving of 97 per cent.

THE *Natal Mercury* mentions, as a curious fact that "Monkey Coffee trees" are flourishing on the estate of Mr. H. B. Wood, "Caremont," while on the same estate the pruned and tended coffee trees are decaying. Perhaps if inquiries were made, a very large proportion of the estates on the Nilgiris will be found to have originated in monkey seedlings. It is usual to collect these seedlings in the sholah and form nurseries of the same. The seedlings are the product of the very best seed, as monkeys are choice in the selection of the fruit they pick off. The seedlings, if taken from the shola, before they become drawn and spindly, make excellent nursery plants.

THE WYNAAD LABOUR SUPPLY.

ON the 10th January, the Government of India wrote to the Government of Madras to acknowledge the receipt of their letter dated the 16th August last, submitting a memorial from the Wynaad Planters' Association. The Association requested that the interests of the coffee districts may be carefully considered by the Government of India in the impending changes connected with the rendition of Mysore. They specially desired, first that the future Government of Mysore may be brought to pledge itself to place no restriction on the Emigration of Mysore labor to the planting districts, and secondly, that the existing facilities for the execution in Mysore of the processes of British Courts may be preserved. In reply, the Supreme Government requested that the Secretary to the Wynaad Planters' Association may be informed that the Government of India will give due consideration to the point to which the memorial has invited attention, "although, in such a matter as the execution of processes, it may be difficult so to arrange matters that the existing procedure should not be in some degree affected by

the termination, in Mysore, of the present system of administration under the Government of India." The Association have addressed another communication to the Madras Government on this subject, as the Committee consider the reply of the Government of India "most indefinite, having regard to the imminency of the pending change and the interests at stake."

LIBERIAN COFFEE IN ITS NATIVE *HABITAT*.

WE are indebted to a subscriber for bringing under our notice the following passage from a book published in 1854, entitled "The Revelations of a Slave Trader." Captain Canot, the trader in question writing of the Colony of Liberia, says:—

"Coffee trees grow much larger than on this (the western) side of the Atlantic; single trees often yielding sixteen pounds, which is about seven more than the average product in the West Indies.

"I wish to confirm and fortify this statement in regard to the value of coffee culture in the West African colonies, by the observation of Dr J. W. Lugunbeel, late colonial physician and United States agent in Liberia. The doctor 'gave particular attention to observations and investigations respecting coffee culture in Liberia. 'I have frequently seen he says, isolated trees growing in different parts of Liberia which yielded from ten to twenty pounds of clean dry coffee at one picking, and however incredible it may appear, it is a fact that one tree in Monrovia yielded four and-a-half bushels of coffee in the hull at one time, which when dried and shelled weighed thirtyone pounds. This is the largest quantity I ever heard of, and the largest tree I ever saw, being upwards of twenty feet high and of proportionate dimensions.' The doctor is of opinion, however, that as the coffee tree begins to bear at the end of its fourth year, an average yield at the end of the sixth year may be calculated on at least four pounds. Three hundred trees may be planted on an acre, giving each twelve feet and in six years the culture will become profitable as well as easy."

In the low-country of Ceylon the "Liberian" coffee begins to bear after its second, and freely after its third year; but the estimate of an average yield of ten cwts per acre (from 300 trees) in the sixth year is doubtless a fair one. Over small areas, that quantity has been realized in Ceylon, however, at an earlier date.

COFFEE PLANTING IN AFRICA.

THE *Norddeutsche Allgemeine Zeitung* gives a long account of an attempt which is being made by the Hamburg firm of Woermann to cultivate the coffee tree of Liberia by free negroes on the West Coast of Africa. The place selected for the experiment is the French colony of Gaboun. The execution has been put into the hands of Hermann Soyaux, author, of the well-known book, "Aus West Africa," who accompained the first German expedition to the Congo coast in the character of botanist. Herr Soyaux has now been at work on the spot for nearly two years; his coffee plantation lies about a day's march inland from Gaboun on the Awandu. Beginning at first under adverse criticism and difficulty, he has succeeded in organising a band of nearly one hundred free negroes, who had to clear away the primæval forest with axe and fire, though they now have more scientific appliances at command, using electricity and dynamite for the felling of the huge giants of the forest. Many thousand coffee trees from Liberia have been planted in the clearing; attempts have also been made with coffee seed, and Herr Soyaux expects to send his first great crop to Hamburg in 1882. Herr Woermann supplies the colonists richly with machinery cattle, horses, and mules, being determined that the experiment shall not fall through lack of thorough testing. The French Government has acted with great kindness and consideration, freeing the German coffee farm from the obligation of paying the customary import dues. Meanwhile Herr Soyaux is not neglecting to make scientific use of his stay in this interesting district. He sends regular meteorological reports to the Leipzig Observatory, and has enriched the Hamburg Museum with many contributions.

MR. MARSHALL WARD'S SECOND REPORT ON COFFEE LEAF DISEASE.

(*Concluded from page 53.*)

SUMMARY.

IN conclusion, I beg to offer the following short summary of what appear to be the chief steps established. After referring at some length to the newly-discovered turnip-shaped spore (*Teleutospore*) and its products, so far as I have been able to observe them, some stress was laid on the great importance of learning exactly what becomes of the *conidia* or small spores budded off from it. I then proceeded to state the results of a difficult task—the discrimination and relations of various filaments found on the coffee, and shewed that four different kinds occur all over, and that, partly from actual cultivation and partly from induction, I attribute to these no genetic relation with *Hemileia*. Nevertheless, from certain difficulties of manipulation not yet surmounted, the exact position of one form is left in some doubt, until certain facts are established: that this filament (springing from an oval septate spore, often tinged with olive) has anything to do with *Hemileia*, is very unlikely.

A considerable mass of positive evidence, however, was offered to prove that the ordinary papillate spores forming the main bulk of the orange-coloured rust, can convey the fungus from plant to plant in a simple manner: this occurs in observed cases as follows. A short, hollow tube grows forth from the spore on the leaf surface; on reaching a stomate it forms a vesicular swelling, the contents grow into the leaf, and there at length develope the coral-like mycelium of the fungus (*Hemileia vastatrix*).

Having traced the fungus from a spore into the leaf, I devoted some paragraphs to an examination of what the mycelium does when in the leaf, and shewed that the discovery of an exhausting organ (*Haustorium*) explains how the contents of the cells, which ought to be employed solely for the nutrition of the tree become transferred to the fungus, serve it for food, and enable it finally to cast off myriads of spores which will (unless interfered with) reproduce the parasite as before. Arguments were then adduced to prove that a considerable effect is thus produced apart from the mere transference of material, that a disturbance of function must be taken into account. Some important deductions follow from the analysis of diseased coffee leaves, and are valuable especially as being made independently.

I then examined what is at present clear as to the leaf-fall so much complained of where the premature fall is caused by leaf-disease, what has been said above will explain how it is brought about. A number of effects of leaf-fall were then discussed, and the whole question shewn to be far from simple; but one easily understood result is that branches denuded of leaves may "die back" and exhibit the appearances so common on diseased trees.

In the form of an appendix I add more details.

I have still under supervision several experiments as to the application of remedial measures on a large scale, and am by no means unmindful of the bearing of the new facts upon these: of the practical and economic difficulties I need say nothing here, and the importance of a thorough knowledge of the parasite to be contended against is unquestioned. One fact seems to me to stand forth prominently in this connection—the papillate spores (which I have proved capable of directly conveying the fungus from one coffee leaf to another) can germinate on leaves lying upon the ground; I am assured by several planters that the removal of such leaves can be accomplished, and must urge the necessity of a thorough destruction of what is a certain source of propagation of "leaf-disease." The results of experiments shall be made known when decisive, but no doubt can be held as to the importance of the destruction of the spore-laden leaves. My thanks are tendered to the several gentlemen who have aided me thus far; and especially those who have enabled me to commence experiments, the results of which I am anxiously watching. Meanwhile, no trouble will be spared to thoroughly investigate and report upon the remaining pheuomena of "leaf-disease."

I have, &c.,

December 1st, 1880. H. MARSHALL WARD, B.A.,
CRYPTOGAMIST.

APPENDIX.

The manner in which the results detailed respecting the filaments have been obtained may be generally summed up thus. Assuming that the mesh works of the fungi must obtain nourishment from the inorganic and other matters dissolved in the water on the leaves, since they form such copious growths thereon. I so arranged matters that they should grow in the same way under observation; thin slices of the coffee leaf were cut parallel to the surface, and examined in pure water, and when, after several trials, I had obtained a piece on which was the spore or filament desired, it was manipulated as follows.

Suspended in a drop of fluid from the under side of a thin glass plate which formed the transparent roof of a glass cell, the piece of leaf could be kept in its normal position, and supplied with air and moisture at will. All glass parts were previously boiled in sulphuric acid, and washed with pure water, so that, with care very little risk of admitting foreign spores was incurred. The fluids used were similar to those tried in germination experiments, with particular reference to the kind of fungus.

The results were generally rapid and satisfactory: with the exception noted, the filaments grew in all directions into the special soup prepared for them, and as they extended clung to the moist under-surface of the thin glass roof. In course of time the copious network produced naked spores, and in some cases the perfect fruit proper of the species: I was thus furnished with the data necessary for conclusion as to the relations of these fungi. In most cases the more complex solutions yield the best results.

Similar attempts to persuade the coral-like mycelium to grow out into prepared fluids have totally failed so far; the piece of mycelium selected may remain for days in a state of quiescence, judging from the sharp outlines and vigorous looking contents, but appears too much adapted for special conditions of life to be thus cultivated in artificial solutions.

B.

To give an idea of the number of observations on which the foregoing results are based, I subjoin a list of notes compiled from my laboratory diary; only successful experiments are noted here.

Eleven experiments with the object of growing the coral-like mycelium in artificial solutions: no growth.

Forty-seven sowings of the yellow papillate spores have been made in various solutions (spores of various ages, dry, wet, &c.,) and on coffee; but germination, &c, as described. In some cases no germination occurred, the spores became emptied without forming tubes.

Twenty-one sowings of spores from various fungi found on the coffee leaf; the results are embodied in the report.

Thirteen successful growths of the filaments, referred to above, were kept under observation for periods varying from a few days to a month.

Fifteen sowings of the *conidia* of *Hemileia* were made in fluids and on coffee; in no case did the germination extend beyond the formation of a short delicate simple tube.

Twenty-two experimental sowings of various spores obtained from dead coffee leaves and various grasses on estates, &c., have given support to the conclusions so far arrived at.

C.

I owe the following to the kindness of Mr. G. Wall. A long glass-roofed case was divided into six compartments, open below: this was placed on the ground, and several seeds and young (diseased) plants placed in each. The contents were then treated as follows:—

No. 1 with caustic lime.
" 2 with mixed sulphur and lime.
" 3 received no treatment.
" 4 with carbolic-acid powder.
" 5 with purple Condy's fluid.
" 6 with phosphorus suspended over waters.

The roof was then closed tight, arrangements made for a supply of water through tubes from behind: they remained closed from February 5th to June 20th, when I examined them.

In no case had germination been prevented, and only in No. 4 were all the seedlings destroyed. No recent disease spots were discovered, though several old, worn out brown patches remained on some leaves; on these brown patches I failed to find any of the "black dots" so usually present on the upper side. All had filamentous networks belonging to several different forms; these occurred chiefly on the leaves. The young leaves and seedlings shewed no signs of "rust."

These are the chief results, carefully noted at the time: the experiment is by no means conclusive, since the case (No. 3), which received no treatment, was no worse off than the rest. The filaments may have been derived from insects carrying the spores—the soil below was unfortunately

not baked, and the absence of several other precautions rendered the result somewhat negative.

The chief point to remark is that no relation between the quantity of filaments and of disease was observable; any other inference must be drawn with great caution, and in the light of other facts.

D.

Mr. Hughes' "Report to Planters' Association" (pp. 112—113) states that the results of weighing selected, healthy, and diseased leaves were as follows:—

Weight of fully-matured leaves from three estates.

	No. 1—10 leaves each.		No. 2—10 leaves each.		No. 3—10 leave each.	
	Healthy.	Diseased.	Healthy.	Diseased.	Healthy.	Diseased.
Water	96	70	112	79	188	128
Solids	51	50	65	51	87	76
Total	147	120	177	130	275	204

He explains the large differences as due to differences in size and vigour, No. 3 being very large, and the diseased set very bad, while No 1 was a sample of inferior leaves. He accepts No. 2 as a representative sample, and believes the differences in actual weight are due to ravages of fungus.

The following table shows part of one on p. 148, giving details of analysis of partially dried healthy, contrasted with diseased coffee leaves. Ten leaves of each were selected as before.

	Healthy. per cent.	Diseased. per cent.
Mucilage, sugar, tanin, and other soluble matters	23·76	11·81
Woody fibre (cellulose), &c.	17·33	18 80
Albuminous and insoluble compounds	36·76	45·59

The fatty and mineral constituents appear to undergo little change in amount, but a comparison of the further analysis of ash is very interesting as indicating large differences in detail.

As example of the kind of leaf-fall now experienced, Mr. Mackenzie Laxapana, kindly furnishes me with the following details. The leaves fallen from a given patch of 160 trees were collected at intervals, dried in air, measured, and a sample bushel weighed.

1879.		Bushels collected.	Weight per bushel.	Calculated total weight.
November	1	74	4½ lbs.	333 lbs.
December	24	19	4 „	·6 „
1880.				
February	25	68	3 very dry	204 „
July	18	37	4 lbs.	148 „
August	18	37	4½ „	166½ „
August	31	13	4½ „	58½ „
		248		986 lbs.

Now this amounts to little over 6½ lbs per tree for the ten months. *N.B.*—This is exclusive of prunings—or, per acre of 1,210 trees, he finds about 7,910lbs of leaves had fallen.

Mr. Mackenzie also weighed out ½ lb. of dry leaves and had them carefully counted: he finds 1,230 leaves, or 2,460 per lb.

If this represents a fair statement, we are driven to the conclusion that each tree of the coffee examined dropped on the average 15,990 leaves in the ten months.

I am convinced that these numbers are too high; but they will serve to shew that a great fall evidently occurs at times. The chief sources of error in the above experiment seem to me to be as follows:—

(1). In the rough air-drying of the leaves, uniformity cannot be secured.
(2). A sample bushel probably varies considerably in weight.
(3). A number of leaves will vary greatly in bulk and weight.
(4). Many difficulties in the collection—such as care that no soil, &c., is mixed, that all the leaves are from the given trees, &c., must be taken into account.
(5). Broken leaves take up less space, and much curled ones occupy more space than the normal.

But suppose we take a low estimate in all directions above: we have then 248 bushels collected, weighing say, on the average 3lbs per bushel. The total=744 lbs. Each lb. contains, say, 2,000 leaves Even now the total number of leaves collected would be on the average (allowing only 4lbs. per tree) 8,000 leaves per tree fallen in less than a year.

F.

Through the kindness of Mr. G. Ross, I am enabled to give another experiment proving that a large fall of leaf may occur, although the results differ materially in detail. The leaves were collected from under 100 trees on a patch protected from wash by two roads, and from wind and rain by the wide spreading of the branches: little disease had shewn for over six months, and no prunings had fallen on this patch for nearly a year. The trees are old, and by no means thick, though at the time the fallen leaves were collected they were fairly clothed with a fine foliage. No crop to speak of had interfered with the estate of the trees. There were collected, after being carefully dried in the sun, 127 bushels fairly measured. Five separate weighings of a bushel of these leaves averged—a bushel weighed 1¾lb.

A bushel of *selected* leave was then measured, the leaves were chosen so as to exclude all but unbroken ones. It required 1,300 leaves to fill a bushel box, and they weighed ¾lb. A similar result was attained on repetition.

This bushel of whole leaves was then crushed and broken up to some extent; the product now measured about ⅝ bushel. If we run these results, it follows that *at least* 165,100 leaves were collected from below 100 trees, and we will assume that they represent the fall of six months, though probably a shorter time would be nearer the truth: from this must be accepted that the 100 trees dropped 330,200 per annum, for the fall is almost certainly not less in the north-east monsoon than in the south-west, when these fall.

Hence is inferred that 3,302 leaves per tree per annum fall on the patch in question, and is believed to be within the mark.

On one of the trees, selected as typical, were counted 2,628 leaves by stripping them off and placing in a sack; in the fresh state they measured 1¼ bushel and weighed 4¾lbs.

How far the differences in the estimates depend upon differences in size, weight, and number of leaves, or on differences in manipulation (drying, weighing, measuring, &c.,) will be subject for further inquiry.

G.

Mr. Anton, Pundaluoya, has been good enough to furnish me with the following data at my request. A number of diseased coffee plants, which had been established about a year, were examined; counting only those which were in a condition representative of the majority and neglecting all which had no leaves, as well as those in shaded, or otherwise favoured situations, the average number of leaves was as follows:—

500 plants had 2,544 leaves
500 „ 3,165 „

Or, in the former case, each plant averaged about five leaves; in the second example, about six. Considering all things, these numbers are far below the normal.

An analysis of these numbers will aid in forming a more exact estimate of the state of the plants, if it is borne in mind that a plant established for one year, bearing say only eight primaries, of which the lowest have eight leaves and the uppermost but four, might be expected to shew about 50 leaves at least.

101 plants had above 10 leaves each. Of these 9 had more than 20 leaves No plant had above 25 leaves.

399 plants had less than 11 leaves Of these 284 had 6 and upwards: the majority of these bearings 6 116 had but a single pair of leaves.

H.

To satisfy myself of the fact that the wind conveys fungus spores from place to place, I suspended a glass slip (previously boiled in sulphuric acid and washed in pure water) for twelve hours over an open piece of ground. In one case the result was as follows:—

On a portion of the upper surface, ¼ inch square, I recognised twenty-eight individual spores, one mass of toruloid bodies, and a rather large fungus filament; in addition to these were larger or smaller pieces of amorphous organic matter, bits of cell wall, and inorganic particles. Crowds of brilliant particles (*bacteria microgonidia*, &c.) and pieces of spider's web also occurred. In the twenty-eight spores counted, seventeen different kinds were noticed; one of these was a yellow papillate spore of *Hemileia*. These were caught in the slight dew formed during the very still warm night.

A more startling result was obtained by fixing a similar glass slip in the position of a leaf upon one branch of a coffee tree among several others; in this case I slightly gummed a square inch of the lower side After 24 hours I examined the large drop of water attached to the gummed under side in the early morning; the preceding night had been windy, and a little rain had fallen.

The number of individual spores &c., of various kinds was too many to count After placing a thin cover slip one inch square over the whole, I counted 820 in a space about ¼ inch square; of these 51 different kinds were sketched There were 19 yellow papillate spores of *Hemileia*. I believe that 4,000 spores of various kinds at least could have been counted in the whole drop; many of these were no doubt due to the neighbourhood of several large trees.

I.

It may aid the forming of conclusions to give a short account of some observations to determine the following points, all of great importance:—

(1). How long it takes to construct a leaf.
(2). How long the leaf lasts on an average.
(3). What is the duration of a disease patch.

The results so far obtained appear to hold good for part of the year at least, but there can be no doubt that differences will occur *according to* elevation, climate, and other causes; nevertheless it is necessary to obtain and verify data of this kind by numerous observations. The greatest difference of unchecked opinion exists on the subject in Ceylon.

The means employed were simple to tie different-coloured ribbons round certain twigs properly selected, and keep a series of notes taken every few days: by roughly mapping the leaves examined very accurate and minute notes may be kept I select the following notes:—

On August 25th a bud was selected for examination, its two opposed leaves being just distinguishable.

August 30th —The leaves have separated and, become of an olive-green or almost copper colour.

September 6th.—Now divergent from one another, with a coppery hull, each about one inch in length.

September 14th.—Nearly two inches long, still copper-coloured, very thin. Growing fast

September 30th.—More than three inches long: a small bud between now quite evident.

October 16th.—May be considered full-sized (four inches). The dark hue replaced by a bright green.

October 29th.—The first signs of disease appeared as two small pin-points on the right-hand leaf.

November 1st.—Now two yellow patches, but no spores, &c.

November 8th.—One patch is of a peculiar opaque yellow, the other (they are close together) has burst through, and is of a brilliant orange colour with fresh spores.

November 15th.—The one spot has become old and brown in centre, the other is vigorously producing spores.

November 21st.—Both spots are brown in centre: they remain of the same size and produce spores but slowly.

This experiment shews that it took seven weeks or so to complete a pair of leaves. The disease was established (no doubt from neighbouring old coffee, among which the tree was growing) within a fortnight after maturity, as two simple spots, which took about two days to ripen and then remained vigorous without increasing perceptibly for at least a fortnight.

This series may be supplemented by another, and will then serve to shew with what caution inferences must be drawn.

On August 26th certain faint pin-spots on a mature leaf were carefully mapped.

August 30th.—A spore patch appears at the tip of the leaf.

September 2nd.—This is now vigorous and producing spores in numbers.

September 14.—The production of spores far less vigorous.

September 7.—Tip quite brown, as if burnt; hardly any spores at edge of brown patch.

September 3 .—The leaf has turned quite yellow; no more spore patches have formed.

October 16th.—The leaf had fallen.

In this example the disease was not established, as evidenced by yellow patches, until the leaf was fully formed (for there were three pairs formed above when the observations began), and even then no spore patch appeared except at the tip; this enjoyed a life of some four or five week and the leaf apparently fell sometime after.

MR. MARSHALL WARD'S ADDRESS ON "COFFEE LEAF-DISEASE."

MR. MARSHALL WARD: You have already had a great deal of your time occupied with very necessary and important business which I, although an outsider, can thoroughly appreciate, and I shall therefore pass as quickly as possible to the subject upon which I have promised to address you. When more than a year ago I came to the island of Ceylon to commence the task upon which I had been engaged to endeavour to fulfil, I saw that that task was a greater one than I had expected when I left England. I am sure you will grant how easy that could be so: that one so far away and with so few opportunities of seeing coffee growing on a large scale could not draw a vivid picture of the amount of material he had to work upon. That was, then my first difficulty, and the second was that I had a tremendous amount of evidence to sift. No one knows better than I do myself and those who worked with me the amount of information which poured in upon me in all manners, modes, and times. I soon saw that although this information was given with the best of intentions, it would not do to accept it in its crude form, but that I must gather information from experience and personal experiments, or else I should find myself in such a whirlpool of unsifted evidence which were not facts, that my work would be ruined, and you would get very little good from my visit to the island. But from the fact of being a human being, I am naturally impressionable, and that evidence would rapidly have led me to adopt a theory which would lead us into a whirlpool of helplessness. Therefore, my duty was to ascertain for myself exactly upon what you based your conclusions. To do this, I mingled with you as much as possible. Of course, so far as the details of planting were concerned, I was a learner, but as willing to learn as any one could be. After a certain amount of experience we rapidly made way, and that led me to publish my first report that should at any rate soon throw some light upon what appeared to be then rather vague. I had in fact to clean the slate and write on it anew: that was a tremendous piece of work. When a few days ago the Secretary of your Association, on behalf of the Committee, asked me to address you, I thought I had better use the opportunity to bring, if possible, before you a few new facts a little supplementary to what has already been published, and to insist upon a few remarks I made public a short time ago—the last time when I had occasion to write, as I heard some of you had either misunderstood, or did not consider, what I laid so much stress upon. Now, to do this, it is necessary that I should bring before you as rapidly and simply as possible the series of facts and the way in which they have been established, as to the enemy you have to fight in leaf-disease. Before doing this we had better explain what we mean by *disease*. Disease may well be explained by the word itself. It is a state of disease in which the organs or parts of the organism do not perform their functions properly. In the particular disease we are speaking of, we deal with the leaves of the trees. The leaves of the tree, for some reason or other, do not perform their functions in a satisfactory manner: they are interfered with in some way. What interferes with them? Some of you had formed your own conclusions before I attempted to form any, and you believe there is something the matter with the tree. This is definite so far as it goes. I take it that leaf-disease is characterized by symptoms as clear as are those of the disease of animals, which I will use for the purpose of illustration. The symptoms you and I sadly enough know very well, but one remarkable point may be insisted upon, and that is the occurrence, in connection with the disease, of a peculiar organism which to the aided eye is as perfect for fulfilment of its purpose as is the coffee tree. It is, in fact, a plant, a fungus. It is the examination of the life history of this fungus, the examination of the work of destruction it causes, and to see how it tides over those awkward breaks in life which occur to all parasites, that is, to see how it reproduces itself; this is the knowledge we require for without this knowledge we have always the possibility of error; and, of course, unseen possibilities are much more numerous than seen facts. Therefore the first step was evidently to try to solve this. I need not weary you with what happened in detail. I would shortly call your attention to the yellow dust you know so well on the leaves. Now it would be invidious to draw comparisons of the examinations of this dust in various parts of the world and by various persons. Suffice it to say, that they are explained by one person in one way and by others in other ways. I have my explanation to give, and you of course, can criticise it. I found that provided certain external conditions were fulfilled—this took me three-quarters of a year to find out—any one of those yellow granules could put forward a delicate tube which might be represented by the little finger. This is studded by warts as if made almost for the purpose, one would think, of sticking to everything it fell upon. I find this body puts forward a small tube which contains all this yellow granular dust. If that occurs on the under side of the coffee leaf and the weather is damp, or rather what in the South of England we call "muggy," this tube grows for a short distance. If it occurs on glass, and there is nothing but water added to these growing pieces of organism, the tube increases slightly, fills with water, bursts, and there is an end of it. If it occurs on rock or stone—as may be seen by actual observation—the same thing happens. But if it occurs on a coffee leaf there are a number of small breathing organs which fulfil several other purposes—the so-called stomata. This tube can make its way into the stomata and the interior of the leaf, just as if it made its way into a small sponge; and there it performs certain tricks. To show that what I state is true, I—for I was very sceptical at first—stripped the skin of a leaf off the living plant very carefully and sowed this body. In 24 hours it grew right into the leaf, and I could see the whole process through the microscope. If you are told there is on the outside of the leaf a *mycelium* of which the branches block up the stomata, and there is a piece of fungus inside the leaf, you are led to infer that there is a connection between them. I did not infer that and if you give me an opportunity I will show it to you. If I were to place upon any one or several of you a series of small leech-like animals—I must say I don't wish to push any analogy between animal and fungus life, but it will illustrate what I mean—suppose on any one of you I placed leeches periodically and withdrew them soon after they had drawn your blood, after a few years or less you would be in a very bad way. How would that come about? Not merely by loss of blood, which would weaken you; not merely by loss of the materials which make the blood, but by the active irritation of the parts occupied by the leeches: the abnormal attempt on the part of the small cells to reproduce themselves, and so get rid of what was annoying them. You would have weakness outside, and if that continued, especially if the organism was a typical one, you would be very ill indeed. Now, gentlemen, without pushing an analogy between the vegetable and animal kingdom, this is practically what occurs in coffee leaf-disease. "If that occurs," you will say, "it is all very well to give an illustration of a leech or flea, but a leech has cutting organs, and a flea has a proboscis," and so on. But strange to relate, but perfectly true, inside the coffee leaf this tissue for which we use the technical name *mycelium* remains. It sends out a number of branches in all directions, and they send little sucking organs right through the organs of each cell. These sucking organs when quite young are solid. I have given them in detail in my last report. They are quite solid. As they swell and the tube becomes yellow, I see the cell into which it has gone gradually lose its contents, which have their own work to do. This material goes out of the cell into the fungus, and then the fungus, greedy as he is, begins to extend and send branches through a series of stomata, not far, however, from the point at which it entered. Look at the thousands and millions of these. If it were only that removed material there would be a great deal of harm done to the coffee but that is not all. In a complex organ like the coffee plant if you go annoying one cell and take its life like that the other cells will suffer.

There seems, in my mind, quite sufficient justification for asserting that it is an external parasite which is doing the harm. I cannot give you one-tenth part of the results which have led to the conclusion, but there you have an explanation for two facts, a loss of matter to the coffee—a loss of matter in its cells which ought to go to other cells, and irritation of the functions of the cells in their neighbourhood. I will just run over another series of experiments. Suppose that is the leaf of a coffee plant [drawing a leaf on a blackboard], the *mycelium* forms inside and grows out again, but those spores which appear, all appear in a circle round that point entered, or close in the neighbourhood. If you cut a series of sections in this way and examine each, what you will find is this: the section into which the spore first passed has nothing left, the next has something, and the next beyond that has more, and so in "decreasing progression" (if I may use such a term). The yellow patch is what we have to deal with, and is the whole of the business. If you cut into some sections you will find there is part of *Hemileia vastatrix* away from the spores. That is very important. I would have you call to mind the number of leaves on a tree, the material is now before you, the number of those spots you find and the number of spores produced, and I think you will agree with me that if there is not sufficient to explain all the phenomena in the country, I do insist that all the damage done by *Hemileia vastatrix* is done in that way. Now gentlemen, perhaps you say:—"Well, this may be so, but you don't find that parasite develop on cinchona." I question very much, speaking from your point of view, that it would not have appeared on coffee if there had not been something wrong with the coffee. To settle this point I adopted a very simple expedient. I had some seed imported from the West Indies. There is nothing like leaf disease in the West Indies. When I got this seed I got some of the soil which came from a different part of the West Indies. I baked the soil with the earthenware pot which contained it, and subjected it to a red heat. Then I sowed the seed and it came up. Those plants had no trace of leaf-disease about them. I took two or three of those plants and put them in another wardian case and produced the conditions of moisture, heat, &c., that we require for the development of the spores. I then sowed spores on the plants and soon got the leaves diseased just where these spores were sown. Yet another series of experiments. I took the leaves which had been blown about on an estate near, and again was successful; the spots appeared where I sowed the spores. I mention this not to try to impress you, but I want you to see that so far as this evidence goes there is a control over the disease: that is to say, it can be produced. It proceeds in a certain defined cycle and occurs on certain structures, and those structures are the spots on the leaf. I have the material to say a great deal more, but I don't think you will feel inclined to listen to very much. But I should like to bring this to a test: "If this is as you say (again I am placing myself in your position), you ought to be able to show that if you can in any way get rid of leaf-disease you can keep the leaves on the trees." Gentlemen, even in a small measure there should be more leaves on the trees. If you keep more leaves on the trees you should get more crop. In August last year I arranged with a planting gentleman, who I am afraid is not present, but to whom my thanks are due, and I shall thank him in another place, to have 2 acres of coffee, of which I attempted to gain a thorough mastery as to all its conditions. I attempted to enter into the planter's way of looking at it, and I flatter myself that I succeeded. I attempted to make it not only a kind of machine in my hands, but also to enter into the question before us, and I need hardly remind you that I resolved that no part of the experiments should be reported upon except with regard to facts. We have been led to believe that a new idea is almost more than a human being can bear, but a modern philosopher laid great stress upon the fact that it is impossible to account for the evolution of intellect, because it would be more than to account for the pain of a new idea; the worst one is the pain of a revived idea. Revive, please, that painful idea of sulphur and lime. Please don't scoff at me, and bear with me while I say a few words. I had eight acres untouched; I had the rest sulphured and limed according to a well-known recipe. This was in August. I made a few notes. I may mention that it is on this side of Nuwara Eliya. There were 32 acres, about equally good coffee, which had leaf-disease on it in a not very advanced stage. The coffee was about 24 years old. Eight acres below the bungalow were left untouched, 24 acres above the bungalow, on a higher slope, were treated as I said. The difference is slight, but it is important. I went into the past history of this coffee as far as I could, and learned a great deal about it. I found it was impossible to find coffee in such a condition as wanted, viz., two patches manured at the same time. The coffee below the bungalow had been manured two months before that above the bungalow. I need not go into details as to the way in which the experiment was carried on. I have visited that estate a great many times and watched it very carefully. Don't be alarmed; I am not going to recommend sulphur and lime on a large scale. At the end of about two months, the superintendent and I agreed that the upper coffee looked darker than the lower, although we were perfectly certain that the coffee below looked better at the commencement of the experiment. There was a slight difference in the colour of the coffee. During the continuance of the experiment I am perfectly sure many thousands of spores which germinated in the dew of the morning were killed, and other fungoid growths were also killed. There is no secret in this at all. I am not going to cry the praises of sulphur and lime, as you know that sulphurous gas will kill fungoid growths. I am only going to tell you a few facts. I had the crop kept separate at the end of the experiment. I had ten trees on each area selected; I did not select them myself. They were selected so that each tree should be a fair sample of the trees on the patch, and each of them had ten primaries. Each tree's leaves were kept separate and counted. The results two months after the experiment were these:—On ten trees not sulphured there were 13,422 leaves, or 1,342·2 per tree on an average. Their whole weight was 21lbs. On the ten trees which had been sulphured there were 15,822 leaves in all, or 1,582·2 on an average—[illegible]lbs. Clearly there were about 200 more leaves per tree on the sulphured area, and if you go into numbers you will find it takes about [illegible] leaves, unsulphured, to the lb., and [illegible] of those which were sulphured. From some cause or other the worst looking coffee at starting and which had been manured

later and was more exposed, &c., put on heavier leaves and more of them. There was more than one cwt. more *pallam* (cherry) per acre on the sulphured area, and the percentage of light coffee was but half as much. I need hardly say I was very much startled, for no one was more sceptical than I was. I am perfectly convinced of the accuracy of these statements. I had it repeated a month later. I won't give you the figures, but they bear out practically the result of the first experiment. I may tell you that, at the time of the last experiment, leaf disease had come out again all over the place five or six weeks after the sulphur and lime had been put on. What was I to do? I was much annoyed and perplexed. I think I am justified in accounting for it thus by the tremendous number of leaves which fell off a few days before the sulphur was put on thick with disease and spores, which will do what I said before, provided that they have proper external conditions. If you examine the rainfall for that estate you will see exactly the conditions my experiments demand should be fulfilled to produce leaf-disease when the spores germinated. I consider that it was perfectly demonstrated that the damage was done by the spores of the leaves on the ground. On this account I urge you to pay attention to the fact that you will never get rid of leaf-disease as long as you allow the diseased leaves to remain on the ground as they are now. No specific can be successful so long as you leave the leaves there. (Applause.)

CACOA.

CACOA PLANTS FOR CEYLON.

FROM the Government Botanist, Trinidad, Colonial Secretary.

SIR,—I beg to report for the information of his Excellency the Administrator, and for the notice of the Secretary of State for the Colonies, that I was instructed by his Excellency Sir H. T. Irving in December last, in conformity with the terms of a despatch from the Secretary of State for the Colonies (No. 173 of the 15th November 1879), to prepare a collection of some 240 plants of the best varieties of cocoa for transmission to the Royal Gardens, Kew, thence to be forwarded to Ceylon, Straits Settlements, and Fiji.

2. I now have the satisfaction to announce that the cocoa plants are strong enough to be despatched at once to Ceylon (*viâ* Kew), and that I purpose sending them in five or six Wardian cases by the next mail-packet.

3. I have already, six weeks ago, sent on four representative plants to Kew, to test their condition on arrival there, and am glad to be able to state that they are now sent on to Ceylon in good condition.

4. Some time previous to receiving instructions to prepare these cocoa plants for Ceylon, I had received application for seeds or plants of the tree used commonly here as a shade tree for the cocoa—*Bois immortelle* (or *Erythrina umbrosa*); and some time subsequently a delegate from the Planters' Association in Ceylon, visiting the Islands to obtain information, made special application under the auspices of the Governor of Ceylon for a stock of plants or seeds of the same tree.

5. This tree, or its fellow (*Erythrina velutina*), is indispensable in most localities here, and I imagine it will not be less so in Ceylon when the soil is generally poorer and the wind stronger than here—its function besides that of giving general shade, being to maintain a surface in rich and moist vegetable mould by the deposit and decay of its ample and fleshy leaves.

6. I have to explain that the seeds of this tree are of such a nature that they do not retain their vitality for many days, if exposed, or are not placed under conditions favourable to growth, and therefore, there was (indeed still is) some uncertainty that these seeds could be transmitted to Ceylon in a living state. Moreover, these seeds are sparingly produced, and are besides, from various local circumstances, most difficult to obtain, so that I obtained only a few thousands; but in order to make sure of getting a supply of plants to Ceylon this season, I forwarded on 7th March a tin box containing some 700 seeds to the Royal Gardens, Kew, the same to the Royal Botanic Gardens, Ceylon, and a smaller parcel to Mr. Fraser, of Kandanuwara, Ceylon. Those sent for the Botanic Gardens, Ceylon, were addressed to the Governor in view of getting the quickest despatch and delivery. At the time of sending the seeds I wrote full particulars to Mr. Dyer, Assistant Director at Kew, soliciting his co-operation (which he since kindly promised), and explaining that as I felt pretty sure the seeds would reach Kew in a living state, a reserve lot of plants might be raised there for Ceylon should the seeds sent thither fail, and that I would have a stock of plants ready here in the event of the seeds failing at both points.

7. Unfortunately, although I have received several letters from Kew, announcing the arrival of many other plants and seeds, I find no allusion to the arrival of the "shade tree" seeds (at Kew), yet, knowing how keenly they were looked for, I think if they had *not* arrived the circumstance would have been mentioned. I find, however, that those sent to Ceylon have *not* reached, at least so the Director of the Gardens there informed me by letter written the second mail they after were due; meanwhile those sent to Mr. Fraser reached duly!

8. The two parcels addressed for Kew and Ceylon were sent by the usual means to Government-house here for being forwarded in the Governor's bag, and, so far as I can learn, were duly posted. This on the 27th March 1880.

9. It will be seen that my design in sending the seeds was in a sense, experimental, and in view of economy in time and money, for the cost of carriage of the seeds would be less than 1-200th of what that of the plants would be; and I am greatly disappointed that the experiment has not had a decisive issue, as might have been the case had the seeds sent to the Director of the Ceylon Gardens reached duly.

10. Under the uncertainty in respect of the stock of shade trees, I beg to state that I proposed to send on a Wardian case full (40 to 50 plants) by the next mail, in company with the cocoa plants—7th September.

11. I might here mention that any portion of the branch or stem of the shade tree having a bud on it will make a new plant when severed and laid on moist earth—hence the vernacular name "*Bois immortelle*"—so that with 40 to 50 young plants a large stock might soon be raised by the ordinary process of "cuttings."

12. With regard to the cocoa plants and their variety of kind, I beg to call attention to the fact that the plants are "seedlings," not grafted or "cutting plants." They are therefore liable to variation in respect of their fruit characteristics, i. e., the fruit in some instances will be found to differ from that of the parent trees, and according to which they are named. Indeed from some of the batches I had to weed out the "rogues" or reversions to the original, or at least more ancient and "wild" types called here *Calabacillo* and "Jumbie cocoa," just as nurserymen at home have to do with their batches of seedling fruit plants.

13. This uncertainty of character in the seedling arises of course from the circumstance that in almost every part of the Island many varieties are grown together; the blossoms in consequence receive other pollen or fertilising matter than that of their own tree and the succeeding fruit and progeny are thus hybridized—*i.e.*, they ultimately present characteristics differing more or less from those of the parent trees.

14. This process has of course being going on for ages, and as with the selected fruits in Europe the only means for perpetuating with constancy in a great number of individuals, the characterstics of the parent tree is the process of grafting or layering. Such a process, however, in general cultivation would be impracticable at present, and would cost a great deal more than the results would be worth, in the face of abundant "plant" material, in which the majority of the trees are of the good kinds, and have already given a very satisfactory return to the grower, and which majority might be constantly increased by saving *for planting seeds only of the best kinds.*

15. The best kinds are by no means well known however. Indeed, with the majority of growers here they are not known at all, and they never notice a difference in the character of the trees nor that of the sample or produce—except in respect of the *Calabacillo* or "wild" cocoa, and this they very rarely eliminate. In the whole range of varities, however, there is a difference in the value of yield of at least one to five.

16. Under these circumstances, the value of the cocoa plants now forwarded should be regarded as of rather a botanical or scientific nature than as agricultural or economic one for immediate effect; for the varieties being separated and described as far as it is practical to have them, there is a base for experiments and test as to what are their real characters and what may be done with them in the way of improvement.

17. The issue cannot be obtained however for *five years* at least, and therefore the plants will not be available for planting stock, for a longer time than that in the Colonies to which it is designed to send them.

18. The demand for seeds and plants of the finer Trinidad varieties of cocoa is already so great as to make the matter of supply suggest the character of a commercial enterprise, particularly in respect of Ceylon. So long ago as 1877 the Kew report instances Trinidad cocoa being sent to Ceylon, and since then thousands of plants and pods of seeds have been sent from private sources as well as from the gardens here, the majority being of course of the finer sorts, so that in all probability in Ceylon as here, satisfied with the degree of *excellence* of the mass, the colonists will proceed to plant without regard to distinction of the kinds employed, as they find they are able to obtain plants for the purpose.

19. Moreover, it seems certain that some of the best varieties of cocoa are already in Ceylon, the trees bearing and their produce sold in London at 10*os.* per cwt. A sample of this was brought under my notice last year by a cocoa planter here who, from his good judgment and industry improved his estate and sold it at an advance of 50 per cent. in three years. Trinidad "finest" cocoa at the time sold at 120*s* per cwt. and the opinion of this gentleman was that had the Ceylon sample come from Trinidad, it would have fetched the Trinidad price, so good and well prepared was it. It was with its brand *new in the market*, and therefore was not sought after.

20. With such evidence of so good a kind of cocoa being already in Ceylon, and available for propagation, taken together with the circumstance that any considerable stock of plants could be transmitted from this Colony to Fiji, Singapore, &c., only at great expense and delay, I am led to suggest that effort be made to meet the apparently increasing requirements of these places with cocoa plants *raised in Ceylon* for, as I have endeavoured to shew, the variety of cocoa already in Ceylon seems to be of a higher and more valuable class than is supposed by the Ceylon people themselves.

21. In the event of any cocoa plants being sent to Fiji, from whatever point, I would beg specially to mention, as applicants of long standing, Mr. Stephens of Levuka, Fiji, and Mrs. Kington, Plantation Cove, Fiji, both having applied to me many months since, but who, without some intermediary assistance, I am unable to aid.

22. In conclusion, I would venture to express a hope that there will be no objection to the information concerning cocoa and its cultivation herein given, being communicated to the officers at the Royal Gardens, Kew, who are very desirous to receive such information, and which, not having yet been able to complete a treatise on this subject I have long had in hand, I am desirous to communicate to them on every occasion for doing so that presents itself.

I have, &c.,
HY. PRESTON,
Government Botanist,
St. Ann's, Trinidad,
4th September 1880.

SOMETHING ABOUT CHOCOLATE.

THE complaints put forward in some journals of the adulteration to which all kinds of preparations of cocoa and chocolate are subjected, are exceedingly out of place, so much so indeed that we will undertake to say that very few persons would care to drink a preparation of the cacoa bean in its natural state without any extraneous aid. If this should be insisted upon, then we should have to condemn the whole chocolate industry of Paris, whose delicious preparations find a welcome in almost every corner of the world.

Perhaps the nearest approach to the pure cocoa nut are the preparations known as Schweitzer cocotina and Epps' Homœopathic cocoa, but they although admirable suited for invalids or persons of weak digestion, are not such general favorites as the other products of the nut. We may remark by the way that the sample of Ceylon prepared chocolate powder, exhibited by the grower and preparer of the article at the last Agricultural Show in Columbo, was in like manner not absolutely pure, having been blended very skillfully and delicately with sugar and a little arrow root.

In Paris the manufacture is carried on upon a most extensive scale, as indeed is the case in London with this difference that the French article is far superior in quality to the English. This is accounted for by the fact that the Parisian makers use none but beans of the very finest quality, and bestow more pains in the preparation. They employ an infinity of foreign ingredients in the manufacture and greatly to the improvement of their goods.

Our readers are probably aware that one of the main flavouring ingredients, if not the chief, is vanilla, the produce of Mauritius, Bourbon, and a few other places. Very recently we gave some figures shewing the extent of which the demand for this valuable and delicate flavouring

material had grown in proof of this and as showing to what a degree of excellence everything connected with the chocolate manufacture is carried, we may refer to one of the most recent inventions in the preparation of flavouring materials. A London firm had recently introduced an article into the trade which they term concentrate vanilla sugar which is a perfect substitute for the natural vanilla bean, combining the exquisite aroma and flavour for which bean is held in such high repute, in an admirable manner. The high price of ordinary vanilla has been sufficient to preclud its general adoption and a cheaper substitute, such as the vanilla presents, will no doubt attract considerable patronage from the public in general. Vanilla sugar in addition to its being more economical has the virtue of being most easily manipulated, and for use as a flavouring igent in blanc-manges, puddings, creams, custards, ices, &c., will, doubtless eventually supersede natural vanilla.

The basis of vanilla sugar is pure vanilla crystals which we are told are now being manufactured on a large scale, and consist of the same substance (synthetically produced) as "the papillæ of the natural bean" which alone gives aroma to the latter The strength of these crystals is estimated to be forty to fifty times stronger than that of the natural vanilla. They dissolve very quickly either in alcohol (in the proportion of one part of vanilline in five of alcohol), or in warm syrup, and when mixed with sugar, or dissolve in alcohol or syrups will be found a most advantageous substitute for the troublesome and more expensive vanilla beans, which, as is well known are liable to mouldiness and decomposition, and to very so much in quality.

Neither vanilla crystals nor their different preparations ever ferment or deteriorate in quality, and keep any length of time without undergoing any alteration. Probably all this exquisite flavouring principle employed by the chocolate-makers will be regarded as so much of adulteration by some writers, in ignorance of what constitutes the most popular form of this delicate article of dietary.—*Ceylon Times*

CINCHONA.

THE Batavia *Dagblad* draws attention to the fact that the Government Java cinchona bark brings in the European market an estimated average price of 2*s*. 6*d*. per English lb., while Jamaica cinchona bark brings an average of 3*s*. 9*d*. per lb.

THE cinchona crop in Java last year for exportation amounted to fully 100,000, Amsterdam pounds.

DURING the last official year the Government Cinchona plantations in British Sikkim produced 8.164 bs of febrifuge at a cost of Rs 10-2 per lb. Of this quantity 2,757lbs. were sold to the public, and the remainder was disposed of to the Medical Departments of the three presidencies. The drug is steadily rising in general estimation, as is shewn by the fact that the sales to the public last year exceeded those of 1878-79 by 358 lbs. The total expenditure on the cinchona plantations from the commencement, including compound interests at 4 per cent., has been less than ten lakhs of rupees, while the revenue for the year amounted to Rs. 1,36,773, which is a profit of a little over 5½ per cent. on the capital. This, however, does not represent the whole profit on the year's operations, for the stock in hand has been increased in value by Rs. 42,775, which is equivalent to another 4 per cent on the capital. During the year the amount of febrifuge used in Government hospitals and dispensaries as a substitute for quinine was 5,400lbs., and taking the average price of sulphate of quinine at Rs. 90, the saving effected during the year would appear to amount to nearly four lakhs of rupees, and the total saving since the factory commenced operations has aggregated over eleven lakhs of rupees; actually more than the cost of the plantations. This is a result on which the Government is to be heartily congratulated.

THE number of cinchona plants distributed by Mr. E. J. Thwaites since the year 1868, from the Hakgalla gardens, Ceylon, was as follows:—From 1868 up to 1872, *plants not charged for*, supplied to planters, also to Police Stations, Government Rest-houses, and villages in (Uva).

Not charged for	504.000
Sold 1873	458 000
„ 1874	778.900
„ 1875	779.200
„ 1876	1,224.000
„ 1877	698 000
„ 1878	164 000
„ 1879	38 095
„ 1880	52,260
Total ...	4,696,455

Most of the above plants were raised from cuttings.

CARTHAGENA CINCHONA PLANTS.

THE following is a letter from Mr. A. Jamieson, Superintendent of the Government Botanical Gardens, Ootacamund, to Mr. N. A. Roupell, Acting Commissioner, Ootacamund, dated 11th January 1881:—With reference to your official memorandum, No. 254, of the 14th ultimo, I have the honor to report that five of the six hard carthagena bark plants brought to Ootacamund by Mr. Cross (four of these were young succulent plants) damped off during the wet sunless weather of November last. I was, however, able to save a portion of the plants for cuttings, and have succeeded in propagating four healthy young plants from the cuttings. The sixth plant is in excellent condition and will yield a dozen or more cuttings in the course of a few weeks. Our stock at present consists of five healthy plants and five unrooted cuttings; these cuttings will be rooted and fit to transplant into pots by the end of this month, so that by the first or second week in February the stock of carthagena bark plants should consist of ten established plants and a number of cuttings. The above results would, I have no doubt, been more satisfactory had I been able to give the plants more close personal attention, but unfortunately I was, through severe illness, confined to bed for three weeks when the plants were at the most critical stage and the weather not at all favorable to the growth of plants that required a warmer climate than that of Ootacamund. I have, however, not the least doubt that by the middle of July next the stock of these cinchona will have been increased to fifty or eighty plants. The plant of *erythroxylon coca* is thoroughly established, and has yielded several cuttings.

CINCHONA BARK AND ITS FEBRIFUGE ALKALOIDS.

THE roots, flowers, and capsules of the cinchona tree have a bitter taste with tonic properties, but the upper bark is the only part which is commercially valuable. M. Delondre decided that the fruit and flowers, though having a bitter principle, do not contain the alkaloids, while the roots contain them, though a smaller proportion than the bark of the trunk and branches. The bark is composed of four layers—the epiderm, the periderm the cellular layer, and the liber or fibrous layer, composed of hexagonal cells filled with resinous matter and woody tissue.

In growing, the tree pushes out the bark, and as the exterior part ceases to grow, it separates into layers, and forms the dead part or periderm; which in cinchona is partially destroyed, and blended with the thallus of lichens.

The bark is thus formed of the dead part, or periderm, and the living part or derm.

On young branches there is no dead part, the exterior layers remaining entire while the inner layers have not had time to develope. In thick old branches, on the contrary, the periderm or dead part is considerable, while the fibrous layer of the derm is fully developed. In preparing the bark the periderm is removed by striking the trunk with a mallet, and the derm is then taken off by uniform incisions.

The character of the transverse fracture affords an important criterion of the bark.

Cellular tissue breaks with a short and smooth fracture, woody tissue with a fibrous fracture, as in the case with *Calisaya* bark. The best characteristics by which barks containing much quinine may be distinguished, are the shortness of the fibres which cover the transverse fracture and the facility with which they may be detached, instead, of being flexible and adhering as in barks. Thus, when dry *Calisaya* bark is handled, a quantity of little prickles run into the skin, and this forms one of its distinguishing marks.

Until the present century Peruvian bark was used in its crude state, and numerous attempts were made at different times to discover the actual healing principal in the bark before success was finally attained. The first trial which is worthy of attention was made in 1779 by the chemists Buguet and Cornette, who recognised the existence of an essential salt, a resinous and an earthy matter in quinquina bark.

In 1790 Fourcroy discovered the existence of a colouring matter, afterwards called cinchona red and a Swedish doctor named Westring, 1790, believed that he had discovered the active principle in quinquina bark. In 1802 the French chemist Armand Seguin undertook the bark trade on a large scale, and found it necessary to steady the means of discovering good barks, and distinguishing them from bad ones. He found that the best quinquina bark was precipitated by annin, while the bad was not precipitated by the substance. In 1808 another chemist found a crystalline substance in the bark which he called "self-essential febrifuge," but it is nothing more than the combination of lime with an acid which was named quinine acid. Reuss, a Russian chemist, 1815 was the first to give a tolerable analysis of quinquina bark, and about the same time Dr. Duncan of Edinburgh suggested that a real substance existed as a febrifuge principle.

Dr. Gomes, a Surgeon in the Portuguese Navy, in 1816, was the first to isolate this febrifuge principle hinted at by Dr. Duncan, and he called it cinchonin.

But the final discovery of quinine is due to the French chemists Pelletier and Caventou, in 1820, They considered that a vegetable alkaloid, analogous to morphine and strychnine, existed in quinquina bark, and they afterwards discovered that the febrifuge principle was seated in two alkaloids, separate or together, in the different kinds of bark, called quinine and cinchona with the same virtues, which, however, were much more powerful in quinine. It was believed that in most barks cinchonine existed in the cellular layer, and quinine in the liber, or fibrous layer; but Mr. Howard had since shown that this view is quite incorrect. In 1829 Pelletier discovered a third alkaloid, which he called aricine, of no use in medicine, and derived from a worthless species of cinchona growing in most of the forests of Pegu, called *C. pubescens*.

The organic constituents of cinchona barks are :—

Quina	Quinine acid
Cinchona	Cinchona red
Aricina	A yellow colouring matter
Quinidia	A green fatty matter
Cinchonidia	Starch
Quinine acid	Gum
Tannic acid	Liquid

These materials are in different proportions according to the barks. Grey barks chiefly contain cinchonine and tannin; *Calisaya*, or yellow bark, much quinine, and a little cinchonine; red bark holds a large percentage of cinchonine, while the barks of Columbia chiefly contains quinine, cinchonidine and quinidine. The two latter alkaloids were definitely discovered on 1852 by M. Pasteur, although the Dutch chemist Heijningen had, in 1848, found what he called quinine or quinidine. Quinine is a white substance, without smell, bitter, fusible, crystallised, with the property of left-handed rotatory polarisation (laevogyrate). The salts of quinine are soluble in water, alcohol, and ether. Of all the salts the bisulphate of quinine is preferred, because it constitutes a stable salt, easy to prepare and containing a strong proportion of alkaloid. It is very bitter and soluble, and crystallises in long silky needles. It is prepared by adding sulphuric acid to the sulphate. Cinchonine differs from quinine in being less soluble in water and being altogether insoluble in ether. It has the property of right-handed rotatory polarisation (destrogyrate). Quinidine also has the property of right-handed rotatory polarisation, and forms salts like those of quinine. It becomes green by successive additions of chloride and ammonia. Cinchonidine has not the sulphate of turning green and forms a sulphate almost exactly like sulphate of quinine (laevogyrate.)

The discovery of the alkaloids in the quinquina bark, by enabling chemists to extract the healing principle, has greatly increased the usefulness of the drug.

Cinchonidine and quinidine are quite equal to quinine as cures for fever, and cinchloridine is only slightly less efficacious. It is equally a febrifuge, but must be taken in larger doses. Thus these alkaloids not only possess tonic properties to which recourse may be had under a multitude of circumstances, but also have febrifuge virtue which is unequalled, and which has rendered them almost a necessary of life in tropical countries and in low marshy situations where agues prevail. Many a poor fellow's life was saved in the Walcheren expedition by the timely arrival of a Yankee trader with some chests of bark, after the supply had entirely failed in the camp.

Dr. Baikie, in the voyage up the Niger; attributed the return of his men alive to the habitual use of quinine. And the number of men whose lives it has saved in our naval service and India will give a notion of the vast importance of a sufficient and cheap supply of the precious bark which yields it. India and other countries have been vainly searched for a substitute for quinine, and we may say with as much truth now as Lambert did in 1820.

"This medicine, the most precious of all those known in the art of healing, is one of the greatest conquests made by man over the vegetable kingdom. The treasure which Peru yields, and which the Spaniards sought and dug out of the bowels of the earth, are not to be compared for utility with the bark of the quinquina tree, which they for a long time ignored—MARKHAM.

SERICULTURE.

USEFUL MEMORANDA.

THE following are a few interesting figures which may prove useful to silk growers :—

Weight of Cocoons.—This varies with the breed and feeding. Pasteur calculates that 1 kilogramme contains 785 to 92. cocoons of the Japanese sort; 505 to 720 cocoons of the Italian yellow sort. Comalia found that 860 cocoons of the Meldola sort weigh 1 kilogramme.

Loss of Weight in Cocoons.—This is caused by time of keeping. Dandola found that at a temperature of 17 deg. R. 1·000 kilos. of cocoons was reduced to—

Kilos ...	·991	·982	·975	·970	·966	·960	·952	·943	·934	·925
Number of days	1	2	3	4	5	6	7	8	9	10

Weight of the various parts of Cocoons.—By taking at 1,000 the weight of the whole cocoon—

The chrysalis alive weighs	from ...	830 to 850
The refuse of chrysalis	,, ...	4 to 9
The clean cocoon ,,	,, ...	140 to 166

After the moth has left the cocoon in 1,000 parts of them—

Refuse of moth	5 to 6
Remains of chrysalis	7 to 9
Clean pure cocoon	140 to 166

Number of Eggs.—Malpighi has found that the number of eggs deposited at one laying is generally 504 or 516, and sometimes only 416. As an exception he met once with only 393 without taking into account any which may have remained in the ovaries.

According to Barti-Pichet, 100 females deposit at one laying 40,000 to 45,000 eggs, and 108 females of the Trivoltine sort are required for one ounce of eggs; 100 females of the common sort, 95 of the large, and 105 to 110 of the Japanese.

Number of Eggs in an Ounce.—1 ounce of 30 grammes of eggs was found to contain—

27,000 eggs of the Trivoltine breed.
39,000 ,, common ,,
37,000 ,, large ,,

1 ounce of 25 grammes of eggs was found to contain—

38,500 to 37,000 of the yellow breed.
45,000 to 51,900 ,, Japanese breed.

Eggs which are deposited from the first are little larger than those from the second average number in one ounce, 45,000 eggs.

Weight of each Lay of Eggs.—To find out this without removing the eggs from the cloth or cards, the basis of the calculation is to take the weight of each separate laying. It is known that to obtain the weight of two grammes it requires—

5 lays of the large French breed.
6 ,, common ,,
7 ,, Japanese ,,

From this we can conclude that to make up 25 grammes there is required—

63 lays of the first sort.
70 ,, second ,,
75 ,, third ,,

To make up one ounce of 28 grammes, 70, 84, 90, respectively; to make up one ounce of 30 grammes, 75, 9 ,1 ,5, respectively.

SILKWORM RAISING IN RUSSIA.—In 1860 the Government of Ekaterinoslaw produced 857 chetwerts of cocoons; (the chetwert is equal to 2 0 litres); that of Tauride 4,268; that of Kherson 128; and the different districts of Bessarabia 1,549—total, 6,·02 chetwerts. The same produced 153 pounds of 40 pounds each, at a price of from 3 to 4 roubles per pound, yielding nearly £3,000. This was an increase of 49 pounds on the produce of the previous year.

Among the Russian peasantry, however, little progress is made in sericulture. In the Crimea the Nogais Tartars alone have endeavoured to follow the example of the German colonists in giving attention to this subject

Since 1858, when this industry attained its climax, silk rearing has gradually declined. For instance, the produce of the districts of Bakmoustska, which in 1858 was 200 pounds, fell in 1874 to less than 4 pounds. In consequence the Southern Society of Odessa has abandoned further efforts in this direction.—*Journal of Applied Science.*

WILD SILKS OF INDIA.

MR. S. C. LISTER, the head of the firm of Messrs. Lister & Co., of the Manningham Mills, near Bradford, is about to visit India for the purpose of making investigations relative to the wild silks of that country. He thinks the wild silks of India have an important future before them, but that it will take time to develope them. In a letter of December 4th, he writes :—" Erin and Muga are far before tassar, but any of them can be used profitably when the conditions of profitable success are duly considered. Usually, tassar as when reeled by the natives, is so full of faults as to be dear at any price, and when reeled by Europeans so costly as not to pay. The problem to solve is how to produce it cheaply and yet fit to use, and that is what I am aiming at. As to Erin, it is simply a question of cost of production in the first place, and then can it be reeled? if not, can it be produced so cheap as to pay to use it for combing and spinning?" He writes further :—" I feel no manner of doubt that with time and patience wild silk will be profitably used."

THE JAPAN SILK-WORM EGG TRADE.

WE regret to observe that the Agricultural Bureau seriously contemplates an export of silk-worm eggs from the farms in Yeso. That this pernicious trade should receive official sanction, is not only lamentable but inexplicable. The Japanese have not hitherto given the world any just cause to accuse them of utter commercial ineptitude, but in this matter they are assuredly laying the seeds of such a reputation. Their own language contains two very opposite aphorisms; one describing the rat that gnawed away the base of the pillar in which he lived, and the other telling of a rustic simpleton who sold bait for coppers to those that desired to angle in his pond, instead of catching the fish himself and exchanging them for broad gold pieces. The silk-worm egg farmers would probably be a good deal offended if we used either of these fables to illustrate their conduct, but as a matter of fact the similes would err, not on the side of caricature, but of flattery, for whereas the rat and the rustic were the *only* sufferers by their own *folly, every merchant in Japan will presently* have cause to lament the *fatuity of the egg exporters.*

Indeed, like some of the very elementary truths in mathematics, the thing is so self-evident that one can scarcely command patience to demonstrate it. Surely we need not point out that this trade is at once self-destructive, and fatal to the vital interests of the whole silk manufacture. Self-destructive, because every card that finds its way westward, permanently supplies a portion of the Continental growers' wants; fatal to the silk manufacture, because the result must ultimately be a transfer of the producing power from Japan to Europe.

Official interference in such matters is, as a rule, to be deprecated, but here is a case so obviously detrimental to the country's commercial welfare, that we should heartily welcome any prohibitive action on the part of the authorities. If, however, the Agricultural Bureau is not maligned, we can only bow our heads and say 'Quos Deus vult perdere, prius dementat.'

While writing on the subject of silk-worm eggs, we take the opportunity of correcting a false impression that seems to have been conveyed by a passage in our opening article for this year. In detailing the commercial events of 1880, we confine ourselves as far as possible to the history of the period, and did not therefore refer to conditions whose origin dates back more than a decade. When we described certain operations in the silk-worm export trade, nothing was farther from our thoughts than a desire to recommend the trade as beneficial. Indeed it is scarcely fair, we submit, to draw such an inference from our statement, since nobody approves of smuggling or larceny, though all will admit that considerable profits have been realized by contraband whiskey and swallowed diamonds. Zeal is however sometime disposed to be indiscriminate, and with our contemporary's honest warmth, in such a cause we can most heartily sympathize :—*Japan Weekly Mail.*

The suggestions and inquiries which during his visit to Lucknow in the winter of 1879, Sir George Couper made respecting agriculture in Oudh, have at last borne fruit says the Lahore paper, and the opening of the Lucknow Exhibition may mark a new era in the agricultural history of the province.

The deliberations of the landlords' parliament at Lucknow are conducted in the language of the country, and will subsequently be printed and distributed for the information of the farmer class, and the collection of opinions. Again, in questions of agricultural improvement, as a rule, Governments have not only taken the lead, but they have generally conducted their experiment on their own sole responsibility. In this case, Government is merely a sharer in the enterprise. Only two Englishmen are members of the Committee of Management, the Honorary Secretary (Major Noble) and the Director of the Agricultural Department; the other ten are natives. We need hardly say that the questions under discussion—irrigation, fodders, and manures, selection of seeds, improved ploughs, the extension of arboriculture—are of the utmost importance to the people of Oudh. It is true that the Oudh talookdars have begun with a condemnation of certain systems of irrigation, and it is quite possible that they may have done so from selfish reasons. But it is equally possible that something may be said for the adoption of well-irrigation in preference to canal-irrigation, at least in some localities. In any case, it is a great advantage—as well a rare occurrence—to have heard the candid opinion of natives on an important matter; and the discussion must produce some good.

TOBACCO.

THE tobacco industry of Pusa seems to be making good progress the report of operations for 1879-80 being now to hand.

The outturn of 1879-80 crop is not given, but we are informed that that of 1878 79, was 120,000lbs. against an estimate of 165,000, a deficiency of 27 per cent. This added to their previous stock enabled them to turn out 163,000lbs. of cured tobacco. During the 20 month ending with November 1880, the sales of cake and cut tobacco totalled Rs. 1,17,565, which is satisfactory, as showing that a market exists for it, notwithstanding the firm hold which American cake and English mixtures have on the public taste.

More recently, the manufacture of cigars has been gone into, and the sales are daily increasing, having amounted to Rs. 750 per month, towards the close of 1880. The operations at Pusa and Ghazeepore being now carried on by a private firm, details of cost are not given, but enough is said to warrant the inference that a good business can be done.

Few can be ignorant that a brisk trade in tobacco is carried on by us with the Malabar coast. The tobacco is generally sent up by sailing vessels between October and April. During the south-west monsoon steamers take it, and the quantity very seldom falls short of 6,000 candies. We have already exported 6,000 candies and 5,000 more will be sent before April next. In all something like 100,000 candies will be sent this year instead of 6,000 as usual. It however appears that the trade is not so profitable now as some time back. The price has gone down there and a candy which was before sold at Rs. 300, now sells only 240, from which must be deducted the Customs duty. There is then Rs. 110 which is hardly sufficient to pay the original value of the article in Jaffna.

TOBACCO CULTURE IN SUMATRA.

THE following interesting account of tobacco planting enterprise and prospects in Deli, on the east coast of Sumatra, is sent by a Mr. Tolson to the *Ceylon Observer*. After giving a brief physical outline of the country Mr Tolson describe the manner and form in which grants of land are obtained by intending planters, and he proceeds:—

Having once obtained a contract confirmed in due form, our first object is to get the jungle cut for a sufficient number of coolies and their fields. This we do by contract with the natives, chiefly Battaks, at the rate of $30 per 100 depahs or fathoms square, which is tantamount to $3 per 5 bouws or $6 per bouw, and a temporary shanty is in no time put up for us, though of course it would be pleasanter if we were able to put up with a near neighbour, until a proper house is built. Such a house, standing on posts, having a roof of attap or mana grass, possessing four bedrooms a dining-room and front and back verandah, all on the first floor, with an office and some godowns on the ground floor, costs us Rs 1,500. We began with 75 men, but I think this a mistake, and consider, that provided you are sure of the suitability of your soil, 150 men would answer far better as your first outlay in a dwelling house, a fermenting shed which costs Rs. 2,500 and tobacco-press costing Rs. 1,500 laid down here, is no greater with 150 fields or men than with half that number. The extra expense would chiefly consist of more drying sheds, which cost Rs. 700 each and are meant to serve two years.

September is the proper month to commence cutting jungle in, and in a couple of months or so a quantity of forest should be felled to allow of your arranging for 150 fields, which are generally ten depahs along the road by 150 depahs deep. The roads and drains are as a rule made by Tamils, or Klings, as we call them, but as these are scarce, and, owing to prohibitive emigration rules extant in Penang and British India, difficult to get, it is advisable to engage your coolies, Chinese, in the autumn, and set them to work at the roads, &c., on monthly wages, say, at $6, until January, when it is usual to put them in the fields under Taudils, who have 30 to 40 men each assigned them, and get them to staple the twigs, small wood and rubbish in heaps, burn same, clean and chaukul or dig the fields so as to be ready to receive and plant out the young seedlings in April. Each field will hold about 10,000 plants and in the case of an extra good cooly, when he has got through the allotted work in good time, more land and plants are given him, so that one hears of some of the fellows delivering as many as 1,500 to 1,100 plants. The planting lasts between 60 and 90 days, all depending on a plentiful supply of light showery weather or otherwise. Rain is essential for the very young plants, and often an unfortunate cooly, deceived by one or two light showers, has seen the young seedlings killed off by a week's succeeding drought, and has had to commence his work *de novo*. When once he is in the field he works on his own account, getting merely a monthly advance of about $1, and he is credited with the tobacco plants he brings into the drying sheds or *Bangsals* at the rate $1 to $3 per thousand plants, according to the length and quality of the leaf, although he gets no settlement of his account until the last of the sorting has been done. The plants take, generally speaking, a month to dry: the leaves are then made into bundles, and carried to the fermenting shed, where they are stapled in staples which go on increasing till they reach 10 to left high, and left to ferment. These staples require frequent turning over, and care is required to give the whole parcel an equal degree of heat, and not too little of it, the process of fermenting lasting about three months. The next is to sort the tobacco into shades and colours, of which the number vary on the different estates, but in baling only some ten varieties are in general use, while prior to the last process the leaves are sorted into lengths numbered 1 to 4. For assisting at this work, and indeed for everything the Chinese cooly does, over and above his planting and field works, he gets paid daily wages which amount to about $3 monthly. When, therefore, towards the end of the year, or when you are late with your crop, early in January you square up with your men, you find that your good and experienced ones have not only worked off the monthly advance of $4, besides that which they received on engaging with you, generally $30, their passage money, &c., acres, the cost of the medicine supplied them during the year, say $1 each, the $5 cost of cutting the heavy jungle of their fields with which you debit them, the cost of tools (unless returned), and the 2,000 trade-tax the Government exacts, which amounts to $3, but have a balance standing to their credit of $100 and more, although I acknowledge this is quite an exception for them to make in their first year, most of the steady workers having then realised only some $20 to $33, while the majority, through bad luck and inexperience, have been unable to square their advances and still show a debit balance in their accounts, which, however, they rub off the year following. Besides the above-mentioned $30 a man advanced to the cooly, the planter is forced to pay the broker or go-between in *Penang* a commission of from $ 0 to $12 a man, which he has simply to write off to charges account, and cannot claim from the cooly.

The tobacco, when baled in bales weighing about 1½ cwt., is put into boats or rather large dug-outs, and sent down by river to the port of shipment, and there (Rantoh-Pangang always excepted) put into receiving hulks, whence it is taken by steamer to Penang for transhipment either to Amsterdam direct or *vid* London. Insurance we pay is 3 per cent, which covers all fire risk, while in the drying and fermenting sheds, and all river and sea risk to Penang, besides risks of landing and reshipping and risk while stored in Penang, and further sea risk to Amsterdam. There is an export duty hence of one guilder per 80 kilos, equivalent to 0 per cent. *ad valorem*.

Cost of production is, roughly speaking, $40 a picul, without charges of shipment, &c., provided a planter works not on too small a scale, and has not too many casualties among his coolies, for you can readily fancy the difference it makes on the cost of your crop if you have to write off the debts of 5 to 10 deceased coolies, or of 30 to 40; while the average value of the tobacco in the Amsterdam market is $80 per picul, though of course some crops fetch considerably higher prices. Even the above rate leaves a fair margin of profit accruing yearly, and, seeing that it is a profit, it is not to be wondered that planters not overburdened with spare capital should prefer adhering to a culture which at best is but a transient one, rather than to devote themselves to other and more permanent produce, which would necessitate the locking-up of capital for so many years, besides absorbing a number of costly coolies, who would be as profitably, if not more so, employed in the tobacco fields.

I should not omit giving you the following figures, to show you the progress of this place, and the stride made in tobacco cultivation since its first year of starting, namely, 1865, when 189 bales of 1½ cwt. each were shipped. In 1870 the amount had increased to 3,114 bales; in 1875 to 15,147 bales; and this year the export will fall little short of 60,000 bales, representing a value of close on one million sterling. Last year, the crop of 1878 was realised at an average rate of 181 guilder cents per half kilo for Deli, 126 guilder cents for Langkat, and 107 cents for Sirdang kinds, or say 2s. per lb., 1s. 11d. per lb. and 1s. 7½d. per lb. respectively.

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

CONTENTS:

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

CORRESPONDENCE.

WEEDS ON COFFEE AND TEA ESTATES.

TO THE EDITOR.

SIR,—In your foot-note of NOVICE'S letter, you don't point out whether you are referring to manured land or not: and if you mean any kind of land, I beg to differ with you in that respect, I have had several years' experience planting in the hills, and I find the best kind of cultivation is, to let the jungle grow a considerable height (by no means let it seed) and then if the heavy rains are on, cut it down with the sickle and hoe it in afterwards, and my opinion is hoeing the ground too often does it more harm than good, not only does this jungle enrich the soil when it is hoed in, but it protects it through the rains from being washed away in the plains, I believe land cannot be hoed too often in the rains, because the jungle grows so strong, even if hill gardens are kept manured, hoeing them all through the rains you will find the soil deteriorate considerably,

GARDENER.

It can never be advantageous to allow weeds to grow, instead of valuing the benefit which weeds hoed in does the ground, would it not be better to induce the food plant which formed those weeds to go to the plant at first hand?—ED., *I. A.*

ABOUT PAPER FIBRES.

TO THE EDITOR.

SIR,—In my last letter I stated "that in point of fact the paper-maker if he could procure them in sufficient abundance, and at reasonable cost, would infinitely prefer 'rags' to any other material."

In making this broad assertion, an assertion I must admit somewhat at variance with my long continued efforts to induce attention to the introduction of fresh supplies of *raw fibrous material* suitable for paper-making—some explanation is required.

Although as I have stated "rags" would be preferred to any other material, practically speaking a sufficient supply can only with difficulty be procured to meet the requirements of the makers of the higher grades of paper, who consequently with but few exceptions are compelled to employ with them as an admixture so called *raw fibrous material*; the bulk of the paper now manufactured in this and other countries really containing a comparatively very small portion of "rags," *raw fibrous material* such as *Esparto* grass, wood pulp, straw, &c., &c., entering largely into the composition of the medium and lower classes of white papers.

The classification of "rags" is very wide indeed; ranging in cost from £6 up to £36 and even £40 per ton. In addition to "rags", (technically so called) but classified with them in the market or trade, we have cotton waste, flax, and hemp, tow or waste, jute waste, jute ends or butts, gunny bagging, hemp, manilla, and other rope, &c., &c.

Now the fabrics from which "rags" (technically so called) results have been originally composed of yarns, spun from the finely divided fibres of cotton, flax, hemp, and jute, the latter having since the Crimean war been largely introduced (from India) and either mixed with, or substituted for, flax and cotton, in the manufacture of so-called "cloth" especially in the class termed "domestics" *i. e.*, household linen.

All cloth fabrics from which paper-making "rags" are derived, are of vegetable origin, and in addition to the ordinary mechanical processes of scutching, heckling, spinning into yarn, and the weaving of such yarn into a web in the loom, have been more or less subjected to various chemical processes, during which they have been deprived of a considerable quantity (by weight) of the gummo-resinous, coloring and other extraneous substances, constituting a portion of the normal *corpus* or substance of all vegetable fibres.

In addition to this also, before the fabric or cloth really becomes a "rag," during its use as an article of clothing or otherwise, it has been subjected to the manipulations of the wash-tub, or to disintegration by the friction of ordinary wear-and-tear; rags, especially those of low grades are generally very foul and dirty, arising from the grease and other impurities contracted during their use as fabrics, this being readily discharged by washing, after saponification by boiling in lime or weak alkali, previous to bleaching and conversion into the "stock," half-stuff, or pulp of the paper-maker.

Hempen and other rope, flax and jute waste gunny, bagging, &c., &c., may really be regarded as "raw fibres," except that unlike "raw fibres" *ordinarily so called* they all have more or less undergone a partial process of retting previous to a mechanical treatment of sub-division, it may be well to add that ordinary "raw fibrous materials" (so called) are not, and cannot be technically termed "fibres," until or before they have been really reduced to a fibrous condition.

If any one of your readers will take up a sheet of good writing paper for instance, and hold it up before him in a strong light, he will not be able to see any appearance of fibre therein; it presents a creamy homogenous structure not unlike parchment or vellum, and again if he will tear off a strip and look at the edge of the strip so torn, he will remark the filamentous or fibrous tissue forming the structure, or *corpus* of the sheet, indeed it is not until the rag or other fibre has passed through the complicated chemical and mechanical processes of the paper-maker, that it has become sufficiently broken up or comminuted, to admit of its felting or interlacing so as to form a firm, smooth sheet of paper.

The foregoing remarks illustrating the treatment which rags, and rag material have undergone *previous* to coming into the hands of the paper-maker, will demonstrate how much their ultimate treatment for his use has been facilitated, thus fully justifying his preference and it follows that the more nearly any "new fibrous material" or fibre, either by reason of its original structure, or normal composition, or by mechanical or chemical processes of treatment, can be made to assimilate to "rag material" (so called), the more readily it will meet the requirements of the paper-maker, and therefore more readily find a market.

THOS. ROUTLEDGE.

Claxheugh, Sunderland, March 1881.

WELL IRRIGATION.

TO THE EDITOR.

SIR,—In your issue of the 1st April last, is published a reprint of a letter on the subject of "Well Irrigation in Guzerat" from the *Times of India*, in which the writer makes some very sensible and pertinent remarks. The subject of well irrigation is one which might not only engage the attention of Government, but also of all those who are desirous of advancing "improved agriculture." While the natives of India have several modes of lifting water from wells, the principal in those parts being the *jinkottah* worked by manual labor and the *kuppalay* worked by bullock, it has struck me as curious that no attempt has been made, at least I have not seen nor am I aware of any experiments being tried—to introduce the windmill, by means of which a great deal of labor might be saved and a powerful agent utilised. For the greater part of the year, and principally during the dry hot months, when irrigation for crops is necessary, there is always a steady wind blowing, and if a cheap pump could be devised, instead of the bullock power, why not attempt to have it worked by a mill. Bullocks will have to be replaced, get worn out or may die, but a mill once put up would not need much expense to keep it in working order, and would require nothing in the shape of fodder.

I would commend this matter to the attention of the eminent engineering firms which advertise in your valuable journal, such as Barn & Co., of Calcutta, Owens & Co., England; if they could hit the point off, it would bring them in large orders. I have not seen the plan of Major Steel's, R.E., pump, it was said I think that this gentleman had patented an improved water lift in the N.-W. P., but I would ask, could it not be worked by a windmill. There is also an improved water lift brought into use in the Government Farm at Cawnpore, this I think could be made to work by the mill attachment. Again I believe that some of the watering stations on the G. I. P. R. have windmills to work pumps for filling the water tanks: could not Government depute some officer to report upon their working. Though these pumps may be elaborate or costly, yet it is quite possible to modify the whole to such an extent as to bring out what is wanted, *viz.*, a cheap and simple pump or water lift worked by wind.

T. T. L.

Bangalore, April 8, 1881.

THE RIVAL PLOUGHS.

(*To the Editor of the Express.*)

AS the description given by your reporter of my plough is misleading, allow me to state that the one he refers to as having the mould-board and share in one sheet, was exhibited merely as a specimen of a *cheap* plough, the price being only Rs. 2, which will not admit of any elaboration in the construction of the share, the same description of plough is made by me with separate steel shares, which are easily renewable, for Rs. 3-8 each. The efficiency of the plough was fully demonstrated at the trial, and the taluqdars and gentlemen interested in the contest were unanimous in their expressions of approval, so favourable was the impression made by it.

The ploughs, wholely made of iron, are made with special reference to the requirements for the ryot, and I claim that they meet the wants of the Kasthkar in their present condition as nearly in every particular as it is possible to do so within the limits of their means. The ploughman has nothing new to learn to use the plough, the draught is not greater than that of a large size native plough, while a furrow averaging 5"×7" can be made and the sod completely turned over, bringing to the surface the sub-soil and exposing it to the fructifying influence of the sun and rain, a desideratum hitherto unattained save by powerful American and English ploughs, which are utterly unsuited for the cattle and the people of the country. The share is made of steel capable of being "drawn" or renewable easily, and the stilt so arranged as to give the highest effect and leave one hand of the ploughman free to drive and guide the bullocks at will. In point of efficiency and durability the plough, I venture to say will be most popular for general work; and Rs. 7 for such an implement I consider quite within the reach of all well-to-do Assamis. At the trials my ploughs maintained a high position throughout, and I was informed by very good authority that, had the price been Re. 1 lower, I should have won the first prize in the contest.

With regard to the position of the stilt, to which your reporter takes particular exception, I beg to state the angle adopted was arrived at after repeated trials, conducted *personally*, as the one most suitable, and had the author of the report consulted me on the subject, I should have been able to give him convincing proofs of this.

With regard to Mr. Martin's plough, permit me to inform you that the model is *mine*; and in the specification I filed in January 1879, I described that the stilt may be of any suitable form, and I was greatly surprised to find Mr. Martin claiming the plough as an original production, when I am informed he obtained the pattern from the Government Model Farm here, and during my absence in England brought it out as his *own invention*! When questioned by me, he based his claim to originality *solely* on the position of the stilt, as compared with the one I exhibited. Had your reporter examined the ploughs, he would have experienced no difficulty in recognising the parent of Mr. Martin's plough in the two rupee specimen exhibited by me. In justice to myself, I think it is due that the facts stated should be made public, and I trust you will be kind enough to give this letter a corner in your journal.

Cawnpore; 19th March 1881.

Yours faithfully,

GAVIN JONES.

THE EFFECT OF TREE-CLEARING ON RAINFALL.

(*To the Editor of the Melbourne Argus.*)

SIR,—Recently several instances have been brought under notice of the increased discharge of some streams in Australia owing to the destruction of trees on part of the ground drained by those streams. Some years ago, when I was giving evidence before the Water-supply Board, of which the late Mr. A. K. Smith was a member, that gentleman, when examining me, stated that in Tasmania the clearance of trees along a creek, had augmented the flow of that creek and he then asked me whether such fact would not modify my strongly expressed opinion that the destruction of trees on the Mount Disappointment ranges would lessen the rainfall thereon, and consequently reduce the supply of water to the Yan Yean reservoir. My reply to Mr. Smith's question was that such fact would not make me alter my opinion. Quite recently a very intelligent and trustworthy officer of the Lands Department, Mr. Callanan, has given instances in which the clearance of trees near some creeks has augmented their discharge; and I have been informed that the destruction of a dense growth of trees on a dry flat caused the surface of that flat to become a swamp.

Before showing that these instances are not inconsistent with the fact universally recognised by scientists and practical foresters, that

ceteris paribus, a heavily wooded tract of forest land attracts more rainfall than an unwooded tract, I may state that those tracts of country in Victoria which display arboreal vegetation of unusual magnitude, density, and luxuriance, and which consequently receive an exceptionally great rainfall, have a rich porous soil of very great depth. Ages ago arboreal vegetation must have commenced to grow in such soil more vigorously and luxuriantly than in ordinary soil, which vegetation attracted rain, whereby in the course of ages the special luxuriance of such vegetation became more and more developed, owing to the increased moisture; and the present result is that in some parts of Victoria there is, on soil of the description alluded to, arboreal vegetation unsurpassed with regard to size, density, and luxuriance in any part of the globe, and growing under the influence of a rainfall enormously great, when compared with the ordinary rate of rainfall in Victoria. Whilst the altitude of ranges of mountains in Victoria has great influence on the amount of rainfall thereon, such influence is less than that of the arboreal vegetation thereon. Meteorological observations in Victoria show that at stations of comparatively low elevation on ranges covered with lofty *eucalyptus* growing close together amidst light wood, fern trees, musk, hazel, &c., the annual rate of rainfall has been very much greater than at stations of greater elevation on high ranges of ordinary thinly-wooded forest. I may refer, as an example, to the tract of ranges and gullies between the eastern fall of the Dandenong range and the granitic range at Beenac. The average elevation of such tract above the sea is not more than 900ft., and a large portion of the tract displays rich, very deep, porous soil, derived from feldspar prophyry; it is densely wooded by very large *eucalyptus amigdalina, eucalyptus sieberiana eucalyptus goniocalyx*, and *eucalyptus obliqua*, growing amidst subordinate groves of acacia *melanoxylon, alsophylia*, and Dicksonia fern trees, musk, &c. From observations it has been found that on this tract the annual rainfall is exceedingly great, a rain-gauge at one station having shown a rate of rainfall for 1880 three times as great as the recorded rate of rainfall at Melbourne for that year. Large trees of *eucalyptus* exhale a great quantity of water, consequently, if in such a tract as that described such trees be destroyed within the watershed of any creek, on a portion of ground of so small an area as to be of almost inappreciable extent when compared with the general area of the tract, the quantity of water that was conveyed by the trees from the soil into the atmosphere would, after the destruction of the trees, tend to increase the flow of the creek, whilst, owing to the very limited area of the surface deprived of trees when compared with the area covered by arboreal vegetation, the rain clouds attracted by that vegetation would not have their general discharge over the whole of the tract arrested when passing over the very insignificant portion of such tract deprived of trees. In the tract of country to which I have alluded, I noticed that the ringing of trees on about 100 acres of land at the head of a gully had increased the flow of water in a spring at that head, obviously owing to the cause just stated, and which is also the cause of the increased flow in the creeks mentioned by the late Mr. A. K. Smith and Mr. Callanan.

Wherever the tract of country to which I have alluded, or any similar heavily and densely wooded tracts become generally denuded of trees, the present exceptionally great rainfall thereon will no longer prevail.—Yours, &c.,

February 23. CLEMENT HODGKINSON.

ARTESIAN WELLS.

(To the Editor of the Australasian.)

SIR,—Mr. Richard Bennett, in his letter to *The Australasian* of 5th March, claims the credit of being the first, in the year 1872, to publicly advocate the adoption of artesian wells. In 1858 the late Mr. B. A. Cunningham spent nearly £1,000 in trying to strike artesian water on his estate near Sale, and much was written about it in the Gipps Land Press at that time. In 1870 it was publicly proposed to bore for artesian water at Sale; in the autumn of 1880 boring for an artesian well was proceeded with by the Borough Council, and this time with brilliant success. Mr. Bennett mentions that artesian water has been obtained on the Darling by a bore which, with a 4in. pipe, gives 17,000 gallons of water in 24 hours, rising to the height of 4ft. above the surface of the ground. At Sale, the artesian water flows through a pipe only 2in. in diameter, yet it gives 46,000 gallons a day, or nearly three times as much, through a pipe only half the size of the one used on the Darling! The water at Sale rises to the unprecedented height of 43ft. above the surface. Mr. Bennett complains that his scientific friends have taken him to task for his theories. He says that the pressure of the atmosphere on the level plains will force the water up from the caverns below! This is unscientific, indeed! It is the pressure of the atmosphere that ordinarily prevents water from rising. An artesian well may be possible even when no mountains are near, but it cannot exist unless a water-bearing stratum be tapped which has its source in a reservoir of water stored at a level higher than the surface of the ground at the site of the well.

The value of the property of the selector, the farmer, and the grazier would be enormously increased in value by the possession of a stream flowing high above the surface. I firmly believe that artesian water can be found in very many places in this colony, and often in positions undreamt of by the cultivators of the soil and the dwellers in dry places. That eminent prelate, the Bishop of Melbourne struck a true keynote when he suggested that irrigation would shower down blessings on Victoria. Taking encouragement from the splendid result achieved at Sale, let us go on in our efforts to promote irrigation by means of artesian water. Our farmers will then have a powerful friend which will bring them prosperity; and if in time sounder fiscal principles prevail, and legalised robbery of the farmers by taxing all they use be abolished—for these taxes, worse than "borrowing, blunt the edge of husbandry"—then this country "will be a fine country for the working man!"—a term which should include every honest man and exclude only the greedy, trading politicians, who are at present bleeding the body politic to exhaustion and syncope.—Yours, &c.,

PUITS ARTESIEN

THOSE PLOUGHS AGAIN!

(To the Editor of the Express.)

SIR,—The *Pioneer's* "Own," in giving an account of the agricultural show recently held at this station, has the following in reference to ploughs exhibited on this occasion:—"Among the implements were several kinds of adopted ploughs exhibited by Mr. Martin, Mr. Crawley, Mr. Gavin Jones, and the Department of Agriculture, which also brought forward an adapted winnower which should in time obtain a ready sale. An essay might be written on the comparative merits of the native and the adapted English ploughs, and of deep and shallow ploughing, but a stricter test and more searching examination is required than has been possible before any decided opinion can be arrived at." The *Pioneer's* "Own" has been guilty of both *suppressio veri* and *suggestio falsi* in the version he has given in the passage just quoted, as the public will see from the unvarnished statement of facts given below. A committee had been appointed to subject the ploughs exhibited on the occasion, to a strict test and searching examination. It was composed of some of the most enlightened and independent Talukdars and native officials of the district, who, from their experience and personal knowledge of agriculture could speak with authority on the subject; and who were thoroughly disinterested and unbiassed. The following is an accurate translation of the Report of the committee:—

"Extract from the Report of the Committee which sat at Bulandshahr on the 25th of February 1881, to award prizes to exhibitors of agricultural implements.

PRESENT:

Rajah Luchman Sing,—Deputy Collector—President.

MEMBERS.

Peerji Mohabut Ali, of Kadree Bagh.
Kunwar Faiz Ali Khan, Taluqdar of Pahasu.
Ghoolam Haidur Khan, Taluqdar of Chundrow.
Syed Abdul Kasim Khan, Taluqdar of Kumarsi.
Kunwar Beni Krishna, Taluqdar, of Sikunderabad.
Khusiram, Raiess of Bhutowanal.
Mr. Crawley, of the Agricultural Department.

The following agricultural implements were exhibited at the show:—

Hindustani ploughs.	9
English do.	2
Combined English and Hindustani	6

In Judging of the merits of the above implements, and awarding prizes, the following points were taken into consideration by the Committee:—

1st. Simplicity of constrution.
2nd. Lightness.
3rd. Cheapness.
4th. Depth of furrow.
5th. Turning over the sod and rooting out grass.

A plot of ground was separately ploughed by the various implements exhibited to test their capacities and merits on the points mentioned above. The Hindustani ploughs were found totally deficient on the 5th point, and the English ploughs on the first three points; whilst the combined or adapted ploughs possessed all these advantages more or less. Of this class the Committee consider Mr. Martin's plough to be best, as it possesses all the fine qualities mentioned above in the highest degree. The next in order of merit is Mr. Crawley's plough, and the

third is the one made by the Department of Agriculture and Commerce; and prizes are awarded accordingly. The committee find that the plough exhibited by the Department of Agriculture is unsuited to the habits and wants of cultivators in this country, inasmuch as it is pulled by a rope instead of a pole; and until the driver has acquired sufficient experience and proficiency in working it, the furrows it makes are sometimes straight, sometimes crooked, sometimes deep, and sometimes shallow. The Hindustani ploughs have no particular merit, but "as Peerjee's is the best of those exhibited, it is awarded a prize."

The report of the committee speaks for itself, and any comments on it would be superfluous. How in the face of these facts the *Pioneer's* "own" did not hesitate to suggest that the ploughs exhibited at the Bulandshahr show were not subjected to a strict test and searching examination, is more than I can pretend to understand. The committee very wisely decided not to award any prize to the English ploughs exhibited at the show. I do not know what kinds of English ploughs were exhibited; but I find from an advertisement of Messers. T. E. Thomson & Co., of Calcutta, that the lightest and cheapest English plough—namely that which is known as Howard's patent iron dwarf plough, with one wheel marked D—weighs 1¾cwt. and costs Rs 45 each. Both the weight and cost of this implement make its introduction into this country an utter impossibility.

It may be asked why the plough to which the first prize was awarded this year at the Bulandshahr show, had so signally failed last year at the same place. I am not in a position to explain this fully. I find from your impression of the 16th March that Mr. Martin's plough was exhibited at Lucknow, and that the exhibitor afterwards withdrew his implement from competition. The *Pioneer's* "Own," with characteristic fairness, mentioned the fact of the withdrawal, but did not state why the plough was withdrawn. Mr. Martin had very good reasons for adopting the course he followed. The plough sub-committee of Lucknow declined to consider the question of draught, which is the most important point for consideration. You rightly think that Mr. Martin's plough was the best of those exhibited at Lucknow, and your opinion is supported by experts like the Editor of the *Indian Agriculturist*. Mr. Martin's plough was tried in some places in Bengal with other adapted ploughs, and some English ones, and pronounced a success, as you will have seen from the Calcutta papers. As the Department of Agriculture has failed to beat it down by its own invention, or by the inventions of others in which it takes a deep interest, it is time that the department should cast aside all feeling of jealousy, and recognize that Mr. Martin's plough is the best and most successful of all the implements of this kind yet invented and patented in this country. It is also time that the Government should take steps to make Martin's invention widely known among the agricultural classes who are ignorant and unlettered, and whom advertisements in newspapers cannot reach. The price of Mr. Martin's plough is so low, only Rs. 4, that it is within the means of the poorest ryot.

FAIRPLAY.

Bulandshahar, April 23, 1881.

OSTRICH FARMING.

(To the Editor of the Argus.)

SIR,—In your issue of the 1st instant is an extract from a letter of Mr. J D. Ellis to the *South Australian Register*, giving a short account of the beginning and progress of ostrich farming in the Cape Colony, and offering the opinion apparently in ignorance of what has already been done here, that "ostriches would flourish exceedingly well in Australia." With your permission, and for the information of those of your readers who take an interest in this matter, it may not be out of place to say that ostrich farming has been established for some years, if not in Victoria at least in the neighbouring colony of New South Wales, in close proximity to our own borders.

About the year 1866, through the efforts of the Acclimatisation Society of Victoria and its then President, Dr. Thos. Black, who is justly entitled to the honour of being considered the founder of this new Australian industry, several ostriches were imported from South Africa. The climate of Melbourne, however, proved to be unsuitable for them, and in May 1868, they were sent to Longerenong Station on the Wimmera, the property of Mr. (now Sir) Samuel Wilson. Here they remained until February 1874, when, at the suggestion of Dr. Black, as they had neither increased in numbers nor thriven as they were expected to do, it was decided to remove them further north to the Murray Downs Station, on the New South Wales side of the Murray River, and close to the Victorian township, Swan-hill. Of 11 kinds that were started from the Wimmera, six only arrived at their destination, five having died, either from the effects of injuries received in securing them at Longerenong, or from the confinement and hardship sustained on the long land journey.

At Murray Downs the industry has been continued to the present time under the personal superintendence of Mr. S. H. Officer, one of the proprietors of the station. The amount of success year by year has been variable, owing to difficulties inseparable from a new undertaking, but there are now in all some 56 birds, and, with one or two exceptions, these are in a healthy, thriving condition. The feathers are sold in the London market, and the prices realised compare very favourably with those obtained from the best products from domesticated birds of South Africa.

An adult returns about £10 worth annually. They are kept in closely paled paddocks, over which they roam, and pick whatever suitable herbage they can find. In addition, however, they are provided with an abundance of lucerne, maize, or mangolds, all grown under a system of irrigation. Crushed bones and quartz in considerable quantities have to be added; the former to supply the phosphate of lime necessary for, the production of good feathers, and the latter as an aid to digestion. So far the expenses of the farm have largely exceeded the profits, but it may be confidently expected that the balance will soon be on the other side of the ledger.—Yours, &c.,

Feb. 15. C. O. M.

COFFEE.

(To the Editor of the Madras Mail.)

SIR,—As I am about to invest in coffee, I should be much obliged if any practical coffee planter would kindly give me through the medium of your columns, the results of his experience on the following little points.

Often, in walking over estates of two hundred acres and upwards, you will observe single trees and little patches of coffee here and there, bearing at the rate of ten cwts per acre, and in the case of the single trees often as high as at the rate of four tons per acre. On inquiry you will find that the average crop of the whole estate is under thirty tons. The expenditure you will be told is about two thousand pounds per annum and with a shrewd guess you will know that your friend is receiving some five hundred pounds a year as interest on the money sunk in his estate, and considers himself rather a lucky man and worth (by his own valuation) some ten thousand pounds—the value of his two hundred acres of coffee. He will blandly tell you that coffee property is cheap at fifty pounds per acre. I am told that this would be a good estate. On the other hand you will often see gardens of an acre or so in extent, about bungalows in towns where manure is easily got, bearing annually at the rate of one ton per acre. Now what I want to know is whether I should buy a large estate, or whether I should buy fifty or sixty acres of the best jungle procurable, and having opened it out, begin with heavy manuring from say the second year of its growth. By heavy manuring I mean sufficient to force it to give at least ten cwts per acre. As single trees on a large estate, without manure, will give ten cwts per acre, I presume that by manuring sixty acres sufficiently heavily at least thirty tons could be produced annually, and at a much cheaper price than it could be on an estate of two hundred acres, and of course with a great deal more profit. About manure not being procurable in sufficient quantity for the above system of cultivation, I am told that any quantity of bone dust and Poonac meal can always be got on the Western Coast, and furthermore that these manures if only on account of their easiness of application, are cheaper in the end than cattle manure is.

CARA .TA U.S.

CINCHONA SEED.

(To the Editor of the Ceylon Times.)

SIR,—I think it my duty to mention a circumstance which took my attention recently in connection with cinchona seed. I observed a good number of cinchonas evidently between three and four years of age dying off with ripened seed on them. These seeds were being collected by coolies, and I am aware that the manager is at the present time disposing of cinchona seed to a number of persons who are no doubt in ignorance of the fact that they have been gathered from dying trees. Even should the seed in question germinate, the plants raised cannot become healthy trees, and my object in writing you is to enter a protest against this sale of bad seed. May not this account for very many of the early failures of young cinchonas quite as much as careless planting and bad soil.

COFFEE.

The Indian Agriculturist.

CALCUTTA, MAY 2, 1881.

PROSPECTS OF THE PRESENT TEA SEASON.

THE present is one of those periods in the tea season, at which we feel compelled to pause and take a careful look, both retrospective and prospective, and from which we should, after having carefully studied the position, take a fresh departure.

On this occasion we propose only taking up one subject—that of prices. There are doubtless other subjects which might be discussed with much advantage, but this is perhaps the most important to the shareholder. This latter unfortunate individual has had a bad time of it for several years past, and it is high time that he saw a break in the clouds. Let us therefore see whether the past and present condition of the market will warrant us in giving him any hope. We shall first look at *production*. For many years past, an insane mania for extension has existed, and the amount of damage this has done to the industry is incalculable. The drawbacks to indiscriminate extension of area are many, but we shall only observe two, the effects on the garden and on the market.

The effect in the garden has been to involve concerns in financial difficulties, which in turn re-acted in the produce and in the general condition of the garden. Money has been for a long time a scarce commodity, and gardens were worked to the verge of insolvency. Under such circumstances it was useless to look for a good outturn, either as to quantity or quality. In consideration of the extra sum spent in these extensions, shareholders were anxiously looking for returns, and to provide something in this way, managers and managing agents were forced to their wits' ends. The practical result was a lot of tea produced under high pressure, made with insufficient means, and often with

insufficient labour. Averages fell low, and every one was disappointed. In the present state of the industry we would recommend no extension, but would strongly urge a continuous effort towards making existing gardens thoroughly efficient. After a few years this success will doubtless be obtained, and then the time for extension will have arrived. After the garden is found to be in thoroughly good condition, we would recommend easy extensions *from revenue*. The capital account of most concerns is too high, and by a steady extension of cultivation from revenue, this capital would gradually be brought within bounds. We would recommend these extensions to be gradually carried out, till the capital value of each acre stood at a maximum of rupees four hundred, while we should prefer three hundred. Then we would also point out with regard to a property being thoroughly successful, that that point may generally be assumed to have been attained, when the garden produces 400lbs. of tea per acre, at a *maximum* cost of eight annas per pound, including all charges till sale, the tea to be of such a quality that it shall realize a *minimum* of twelve annas per lb., all round. We should then have a clear profit of four annas per pound, or one hundred rupees per acre per annum, which, allowing for contingencies, would admit of a dividend at the rate of twenty per cent. These figures are general, and do not of course apply in exceptional cases. Then as to the effect of those extensions on the market. We find from all sides that the good name of Indian tea is kept down, because of the large quantities of low class teas which are now made. A recent report from London, says: "The low broken proportion is considerably "in excess of the demand, and as much of it is below the average "quality, even of this class of tea, prices have further declined," and further on: "The competition for the finest teas shows no "abatement, and the few fine brands brought forward, have "fetched extreme prices."

Here then we have in a nut shell, one great cause of the low prices, we are flooding the market with rubbish, made in obedience to the demand of managing agents and shareholders for quantity. It is very easy to make quantity if quality is almost ignored. That they can both be had is quite possible, but is a question of increased outlay.

The most recent statistics at our disposal, bring the state of the London market down to the end of February, and as from the 1st July 1880 to the end of February includes the bulk of the crop, we may form an opinion from the figures presented to us. Here then are the imports for the past few years:—

		lbs.	per centage over 1875-76.
1875-76	... ...	20,357,000	...
1876-77	... ...	22,832,200	12
1877-78	... ...	29,796,800	46
1878-79	... ...	28,127,000	38
1879-80	... ...	32,906,600	62
1880-81	... ...	37,950,600	86

Thus we find that London received Indian teas in steadily increasing quantity. The imports for the eight months ending 28 February 1881, were 86 per cent. higher than for the corresponding period of 1875-76, or, at the rate of say 17 per cent. per annum on the average.

Now let us see what consumption was, during that same period:—

		lbs.	percentage over 1875-76
1875-76	... ...	16,891,000	...
1876-77	... ...	17,334,000	3
1877-78	.. ...	21,232,500	26
1878-79	... ...	23,831,800	41
1879-80	... ...	23,176,700	37
1880-81	... ...	30,653,800	81

It will be seen at once that the increase of consumption relatively to production, was less than it should have been, hence fair or remunerative prices were impossible. During the last year however, consumption took a rapid stride to the front. The following table gives at a glance the relative increases of imports and deliveries over 1875-76 calculated at per cent.

		Imports	Deliveries.
1876-77	... ...	12	3
1877-78	... ...	46	26
1878-79	... ...	38	41
1879-80	... ...	62	37
1880-81	... ...	86	81

Deliveries are now heavier than imports, and as a natural consequence prices must rise. They may not for a few months, because stocks are still abnormally high. The cause of this increased consumption is worthy of being looked into, because if it is brought about by the exceedingly low prices ruling recently, it is not a healthy sign, and may cease when prices approach a higher point. We hold, however, that while this may have influenced the increase to a small extent, the cause of the improved deliveries is to be found in a growing taste for Indian Teas. This is a healthy sign, and one which should inspire shareholders with hope. In round numbers imports at present amount to about 3¾ million pounds per month, while consumption demands about 4½ million pounds. The difference between these two quantities being equal to seven million pounds per annum. And this increase in deliveries is not a transient affair of a couple of months, but has lasted for the past nine months.

Now that the taste for Indian tea is advancing at home, it behoves planters to make an effort to encourage it by producing a good tea, and by a determined effort not to flood the market with cheap low class teas. A glance at any London brokers' report, tells us that there is much room for improvement in this respect. There we find large breaks of tea having realised an average rate of 9¾*d.* and 10*d.* per lb. which is discreditable to all concerned. That these could have consisted of low class teas is negatived by the fact that the breaks are too large. For instance, we find 238 chests, average 9¾*d.*; 167 chest; average 10*d.*; 206 chests, average 10½*d.*; 1,294 chests, average 11½*d.*, and so on. We next find broken teas selling at from 5¼*d.* to 2*s.*, 7¾*d.* per lb. Pekoe Souchongs from 1*s.*, 4¾*d.* to 3*s.* 0½*d.* per lb., showing wide inequalities, and, in the case of those whose teas are selling at very low rates, ample room for improvement. Let all extensions be stopped, and let our attention be occupied in improving the land we have under crop at present. This accomplished, will lead to steady improvement in every department of the industry.

LIBERIAN COFFEE.

MR. D. MORRIS of Coffee Leaf-disease fame, and presently Director of Public Gardens and Plantations, has kindly sent us a copy of his recent report on Liberian Coffee. We propose condensing the more practical parts of the report for the benefit of our readers:—

This variety derives its specific name from the Republic of Liberia on the west coast of Africa. This little State lies about 7½ degrees north of the equator, and exactly in the same latitude as Ceylon. This particular class of coffee, seems to occupy the same position in regard to coffee, that the indigenous variety of tea does to tea generally. It is not a bush but tree, and is frequently met with twenty feet in height. Its botanical name is *Coffea Liberica*, and it produces berries of a large size than do the *Coffea Arabica* and *Coffea Bengalensis*.

The following information regarding its cultivation in Liberia will not be without interest to planters.

The coast of Liberia is described as "low but rising towards the interior; well watered with numerous streams; the soil rich, and producing in abundance coffee (Liberian), sugar and all other tropical articles." Another account mentions, "that the climate is hot and oppressive during the dry season, lasting from May to November, with an average temperature of 85° Fahr. This falls in the wet season to 74° or 75°. The heat is alleviated by the sea breezes which blow daily from the sea. The rainfall is much the same as that in Sierra Leone, which has 189·69 inches per annum.' This excessive rainfall is no doubt made up of very heavy downpours, "tornados," during a few months in the year more especially as the dry season is said to last seven months—from May to November. An experienced Ceylon planter who visited Liberia with the object of becoming thoroughly acquainted with its Coffee and the conditions under which it flourished, speaks of the coffee as being grown "quite close to the sea, and forming magnificent trees" "and the soil as evidently volcanic." "The soil of the hills of Musardo being composed of a reddish clay and sand, with boulders of iron ore intermixed; in the north-easern side of the town are some large masses of black and grey granite." Another Ceylon planter who visited Liberia in 1876 failed to see "any great superiority in the Liberian soil as compared with Ceylon," observing

"that ironstone was everywhere present." The climate he described as "wet, stewy, and forcing."

A resident speaking of the "lay of land" most suitable, says, that "level ground suits best, provided there be no risk of an accumulation of stagnant water during heavy rains." Experience has taught us the same lesson regarding tea. Hilly steep land soon loses its strength, by heavy rains washing away the *humus*. On the other hand, on level gland, this is retained, and plants keep their pristine vigour, always provided that water does not lie.

The following is the result of experience among the local Negro planters:—

"The trees on a plantation differ in the size of their berries. Besides, while many contain berries of a uniform size, others will contain berries of various sizes. We are not prepared to say to what extent high cultivation would remedy this. In planting nurseries with the seed of a uniform size, we have not been able to obtain plants of a uniform size.

The coffee does not produce well under shade, either in the quantity or quality of the crop. When the trees are not large enough to shade the gronnd with their branches and fallen leaves, they should be mulched in the dry season; that is, their roots should be covered with dried grass, straw, shavings, or anything capable of shading them, but the leaves and branches should have the influence of the sun to elaborate a due proportion of sap into fruit buds. The Liberian Coffee being indigenous when well established, does not suffer from our tropical sun. Mulching in the dry season is generally required for very young trees on dry hilly slopes.

The trees grow to a height of twenty feet or more; we have seen one more than thirty feet in height. this was in the woods near an old plantation. Some cultivators top their trees, others let them grow up *ad libitum*. Our trees are topped at a height of five feet. trees that are topped are more conveniently picked, and other, Things being equal give a larger crop; when the trees grow up tall moreover, they are frequently injured by climbing with ladders, and pulling down the limbs, &c., and as the tree ripens its crop and blossoms for the next year, at the same time, much of the blossoms and young fruit if rubbed off the trees; whereas the low trees are picked by standing on the ground.

Manuring is not done extensively, owing principally to the fact that most of the plantations are young, although there are some that need manure. We use the Coffee pulp mixed with cattle manure, also decomposed vegetable matter, wood, ashes, the "compost heap" the earth from the hill made by the white ants (termites), &c. The coffee tree delights in nitrogenous manures. We find surface manuring best for the coffee tree here, as the fibrous roots or feeders keep always near the surface.

We have no very old plantations but we believe the plantations can be kept up permanently, or at least for a great number of years. With us the coffee plant is not a shrub; it is a forest tree. There are trees here forty years old, flourishing in all the vigour and verdure of youth, and bending down under their weight of berries. We have seen a few old trees, when cut down, shoot up more rapidly and more vigorously than when first planted from the seed."

"As may be supposed from the habit and size of the trees, the berries of Liberian Coffee are generally larger and finer than those of the ordinary Coffee. The average length of the berry of *C. Arabica*, seldom exceeds ½ in., while the average length of the berry of *C. Liberica* is nearly ¾ in. The pulp or outer covering of the Liberian Coffee berries is thick, rather fibrous, and more or less fleshy, but never succulent as in the ordinary coffee. The shell just under the pulp, the parchment or "indurated endocarp" is of a dull brown colour. The "silver skin" which comes next is strong and tough, dipping into the deep furrow in the face of the seed, and carefully investing the substance of the coffee bean. In descriptive notes on Liberian Coffee, berries and seeds, it may not be out of place to describe their character and structure with some detail, and placed before those interested in the subject facts, which may prove of some value in dealing with the propagation and distribution of this promising plant. The seeds of Liberian Coffee enclosed within their investing coats are generally two in number when one seed as is sometimes the case, becomes abortive, the other seed receiving all the nourishment of the berry, becomes large and rounded, and is termed a "pea bean." When the pulp is removed, the seed covered by the hard brittle shell (the indurated endocarp) is technically termed a "pyrene;" there are therefore two "pyrenes" in each perfect berry. The pyrene is convex on the back, flat, with a narrow, usually deep, longitudinal furrow on the face. If the hard shell investing the pyrene, the "parchment" be removed, we expose what is generally called "rice coffee," carefully examined the structures which make up the rice coffee or *seeds*, are resolved into a membraneous testa or coat of the seed, the "silver skin;" a horny folded mass termed the albumen; and embedded in the substance of the latter near its base is a small body called the embryo, the miniature Liberian Coffee tree, not more than one third inch in full length.

The comparative value of the coffee berries of this plant and of the ordinary variety, tells very most in favour of the Liberian. As a general rule it may be said to be worth fifteen per cent. more than the other, and when to this is added the other characteristic connected with, it, *viz.*, its greater productiveness, it may well be looked on as a great improvement on the *Coffea Arabica*:—

From the concluding remark of this interesting report we take the following.

The information given in the last two sections as regards the yield of Liberian Coffee trees, and the commercial value of the produce will doubtless lead to the conclusion that this coffee possesses characteristics, which according to the circumstances of a country may be utilized to an extent now unthought of. In the first place, the fact that this coffee will grow on the plains, where the preliminary expenses in the acquisition and clearing of land are naturally much lower than on the hills; where labour is cheaper, and where the difficulties and expences of transport would be avoided, gives Liberian Coffee an advantage, not only over its congener the Arabian Coffee, but also over almost any cultivation requiring the same capital and attention. In many of the rich vales of Jamaica, cacao can be very successfully and remuneratively grown, and in conjunction with Liberian Coffee, there is a vast field of enterprise open for it in many parts of the Island, but, it must be remembered that the demand for cacao is much less extensive than for coffee,* and the fact that the American market is so favourable to the large-beaned prolific coffee, gives its cultivation the aspect of a thoroughly sound investment. The robust and hardy character of the [illegible] is a point that is much dwelt upon in Ceylon, and though it actually possesses no immunity from the deadly coffee leaf-disease, it is nevertheless able to bear its effects much more successfully, than *C. Arabica*, and on this account alone it deserves careful attention in all coffee-growing countries. Though fortunately the coffee leaf-disease, is as yet confined to the Eastern coffee areas, it is the opinion of an eminent authority that the coffee areas of the New World may not ultimately escape its ravages, and it is therefore both wise and prudent to give due attention to the cultivation of a plant which may in some measure, check or modify its action.† With regard to the West Indian blight so deadly an enemy to coffee cultivation in Dominica, the other Windward islands and Brazil the Liberian Coffee appears to withstand its effects with comparative impunity. The President of Dominica writing in 1877 remarks:—"The native coffee is still suffering from blight...... The Liberian Coffee trees although in close proximity to the native coffee, seem to bid defiance to the ravages of this scourge, while the luxuriance of its foliage causes a painful contrast. Writing in 1878, Dr. Imray remarks that "while some of the very young seedlings were affected by blight he was able to report that his trees of Liberian Coffee still remained free from the attacks of that dire scourge of the coffee plant in this part of the world—the Cemiostoma Coffeellum.

* Coffee may be said to form almost the exclusive dietetic warm beverage of 100,000,000 of the human race, and the value of the world's production of coffee (over 14 millions cwts.), is estimated at more than £50,000,000 in the Wholesale Market.

† The effects of the coffee leaf-disease upon coffee cultivation in Ceylon may be very distinctly traced. "In 1869-70 before the disease had appeared, Ceylon exported 1,009,206 cwts of coffee. In 1876-77 when there were 52,000 more acres in bearing, the total exports were only 797,768 cwts." The influence of the disease has also seriously reduced the yield per acre. "Previous to and including 1871, the average yield for five years over the whole Island had been 4·5 cwts. per acre, whilst for the five succeeding years, the average has only been 2·9 cwt, a decrease in the production of somewhat more than one-third." Again the deficiency in value of crop has been variously estimated—"the average *Annual* deficiency in the whole Island has been estimated by some, as at least £2,000,000 and since the disease made its appearance in 1869 the coffee enterprise has suffered to the extent of from £12,000,000 to £15,000,000 in crops alone." Native Vol. 20, p. 358.

The prolific yield of this coffee is also a characteristic much dwelt upon. In the preceding sections the opinions of experienced planters who visited Liberia and saw the crops on the trees are fully given. There can be, therefore, no doubt that in Liberia the coffee yields, according to the nature of the cultivation at the rate of from 8 to 20 cwts. per acre. Mr. Agar who had many opportunities of forming an opinion "is confident that trees properly cultivated would give 6 to 8 lbs. each, or from 22 to 30 cwts. per acre of 400 trees." That this is not confined to the coffee when growing in its native country, but is maintained under other conditions of soil and climate, may be seen in reports which have reached us from Ceylon and other colonies. At Mausawa, Ceylon, a tree was described in 1877, when only a little over three years old, as being nearly ten feet high "while it still bore its 1,200 large cherries, of which we counted 23 in one cluster." Subsequent accounts from that colony have fully confirmed the free growing and prolific character of this coffee. Recently an estate of about 100 acres (Wellawaya), was reported in the *Ceylon Observer* as bearing from "six to eight hundredweight per acre, some of the trees being less than 2 years old." At another estate, opened in 1877, at Kalutara "an average tree was found to bear 1,500 berries, which was calculated to be at the rate of 150 bushels to the acre, equivalent to 8·3 cwt of clean coffee."

In Dominica, Dr. Imray as far back as 1876, expressed his conviction that "the Liberian Coffee will in time take the place of our native coffee, if I may so call it...... The plant must be evidently very prolific. I counted as many as 18 to 20 berries, even more in the axils of the two opposite leaves."

Hitherto, the number of plants placed under favourable conditions in Jamaica, have been too few to allow of an estimate being formed of the approximate yield per acre. The plants now at the Castleton Gardens were kept for two seasons in the uncongenial temperature of the Cinchona Plantation (5 000 feet), but after removal to Castleton (600 feet), they have made satisfactory and rapid progress. Recently they were described as "beautiful and much admired objects in their dress of stately dark green foliage, laden with the pure white bloom among which appeared the ruddy fruit from the previous year." During the year 1879-80 some seven thousand seedlings were raised from the produce of these trees, and the cultivation is being rapidly extended, both at Castleton and at the old Botanic Garden at Bath. Another peculiarity of Liberian Coffee is dwelt upon which if found generally applicable to it will greatly increase its value. The tree is mentioned as possessing the habit of sending its "strong tap-root far into the ground" and this characteristic is believed "will enable the Liberian Coffee to live and bear fruit in seasons of protracted drought, which prevent the setting of blossom on the ordinary coffee at low elevations."

We have omitted some useful hints on the cultivation of this coffee, but shall return to the subject shortly.

PUNJAB FOREST ADMINISTRATION.

READING over the above publication, we notice that the Conservator complains he has not sufficient assistants to enable him to carry on the work of conservation in a proper manner.

Why does he not endeavour to obtain European contractors, of small means, to fell, log, and launch his logs; convert his logs into sleepers and launch them; sweep the rivers annually and bring into the depôts every stick of wood they find floating about the rivers; make the necessary slides, roads, and paths; and otherwise make themselves generally useful—for a just consideration. By giving these operations on contract, the services of the officials of the F. D. would be released for the purposes of their own proper work, *viz*, demarcating forest tracts, drawing up their working plans, marking the trees to be felled, by the contractors, counting the logs or sleepers on the rivers' banks just when ready to be launched, and otherwise only supervising work which now has to be done in detail to the detriment of the work of conservation.

Or men with larger capital might be induced to buy the standing trees from the Forest Department, at so much for each one; performing all the operations beforementioned themselves, and on arrival in the plains selling the timber on their own account, and thus recoup themselves for their outlay in forest and river; of course, all expenses connected with slides, roads, &c., being paid for extra by the F. D., by whose officials the works to be coustrutced would be aligned. By adopting this plan the F. D. would be saved the necessity of keeping up depots in the plains for the sale of timber, the officials now engaged in such like operations (of petty trading, quite unworthy the notice of a ruling power) would be at liberty for transfer to arborescent plantations and other operations connected with the conservation of forest tracts. The F. D. would thus make its profit by the sale of the trees, instead of by the sale of the wood: the same income being derived from either plan, but at a less expenditure by adopting the above suggestion.

Then we notice that the conservator complains that the quasi-independent chiefs of the Hill States in the neighbourhood of Simla cannot be induced to conservate their forest, but *deboising* their territories till now very little more timber remains. And yet the Forest Department have a very strong remedy to apply to—in a great measure—put a stop to this wasteful denudation of the forest tracts of the Hill States, *viz.*, let the Forest Department establish a timber depôt at Suni, in the territory of Rajji, about 16 miles from Simla, and let them dispose of their timber there at such a rate that when it is delivered in Simla it will be 10 per cent. under the prices now obtained by the petty Rajahs, and the sales of their timber will soon cease, and thus afford rest to their forests which are now so unmercifully being destroyed.

Something must be done to save the forest tracts of those petty Rajahs from being cleared off the face of the earth; conservate they will not, so long as they can obtain rupees for their trees, and then there are so many vested interests—official and non-official—which have to be thrust on one side that the Forest Department will have all manner of difficulties put in its way in the establishment of a Timber Depôt, at Suni, and only by great firmness on the part of the conservator, personally supported by the Lieutenant-Governor of the Punjab, is it possible for the depôt to be established.

We also notice that the officials of the Forest Department, as regards the unenclosed forests are to be placed under the orders of the district officials, thus neutralising any benefits which would otherwise have ensued for the proper conservation of such tracts of country, as the Amlah of a District Court find it profitable to wink at encroachments on or destruction, of such places so long as they can find employment for relatives and friends as guardians and watchers, receive their perquisites, which they would lose were the unenclosed forests to be made over to the Forest Department; and they have sufficient influence with the district (European) officials and through them with the Government, to prevent the transfer.

For the same reason jungle fires will never be put down until the culprits are fined by the Forest Department, as the district officials take no interest in the matter, from not comprehending the mischief done by these fires, the whole subject connected with which has been repeatedly ventilated in this journal, that nothing further need be said about it here.

SUGAR-CANE.

Communicated.

SUGAR-CANE, *Saccharum officinarum* (vernacular *Parma Kamand*) seems to have been cultivated in India from a very remote period, though unknown to Europeans before the fifteenth century. In the year of Grace 1700, the consumption of sugar in Great Britain did not exceed 10,000 tons, whereas in 1875, the amount imported into the United Kingdom, was 918,727 tons. Some approximate returns prefaced for the Board of Trade showed that the total production of cane sugar of the world in 1876, amounted in round numbers to 2,140,000 tons.

Besides being grown in India, sugar-cane is largely cultivated in Brazil, Peru, West Indies, the Southern States of the Union, Egypt, Zanzibar, Natal, Mauritius, Java, China, Reunion, Central America, Mexico, and Australia.

Of the numerous kinds of cane known to the commercial world, there are perhaps not more than six or seven ever met within India. The sugar-cane had once rather a dangerous rival in the beetroot. Great exertions were made in Europe in the hopes that the root might supersede cane sugar, and eventually drive it out of the market, but the beetroot has attained its highest development.

The total outturn of beet sugar in 1876 did not exceed 1,320,000 tons, to quote an eminent authority. "The beet growers by acting according to good judgment, have devoted so much attention to the selection of the richest varieties of their plant, that they have raised its saccharine strength 8 per cent, within last fifty years. On the other hand it is undeniable that cane-growers have remained content with the gifts of Nature, and have done very little towards raising the quality and productiveness of their plant. The humble roots which rivals the cane has been doubled and trebled in richness, whilst the sugar-cane has remained comparatively stationary. It is asserted by many able to decide the question, that beetroot has now reached its maximum of sugar-producing quality, and we ought to be encouraged in our efforts to improve the cane by the knowledge that this plant *has not* reached its maximum of production."

The above remarks are as regards India only too true, both as far as the quality and quantity of its sugar are concerned. According to statistics quoted before, out of seventeen great sugar-growing countries, Cuba heads the list with a produce of 700,000 tons annually, whilst India comes only fifteenth on the list with a produce of 30,000 tons.* It is no exaggeration to say that with a proper and rational method of cultivation India might with ease (without increasing the area at present under sugar cultivation, supply one-third, if not, one-half of the amount now produced over the whole world.

In British Guiana, 8 hogshead of sugar per acre is an ordinary crop 5,000 to 6,000lbs. (53 cwts.) per acre not extraordinary, and in some instances 8,000lbs. = 73¼ cwts. have been produced. In British India the produce seldom exceeds 15 cwts on the best land. In Trinidad the produce cannot be estimated at less than 25 cwt per acre.

India like all other tropical countries is ages behind Europe and civilised America, in the development of its staples, sugar-cane, and its cultivation is mentioned in the Rig Veda, but like every other staple in the hand of the ryot, has deteriorated. It is only a question of time, and in many places its cultivation will be discontinued altogether with his cattle degenerating, his soil getting more and more exhausted, and as an inevitable consequence the percentage of saccharine matter in the cane decreasing, the unfortunate ryot will one fine day arrive at the conclusion that it will no longer pay him to cultivate this once valuable crop.

The following notes on sugar-cane cultivation as practised in the Jullundhur, Doab, and Manjha (Bari Doab) would apply perhaps to almost the whole of India, the seasons for sowing and harvesting excepted.

The kinds of cane grown in these two Doabs are known as (I.) Ekar (II.) Dhanlu, (III.) Chan, (IV.) Kanárá, (V.) Tèru, of these five kinds Ekar produces the hardest cane, marked with dark bluish streaks. The other kinds Dhanlu, Chan, and Téru are comparatively 80ft. Téru gives the thickest cane, but Dhanlu the largest proportion of juice, and the latter may be distinguished by its greenish color; Kanárá and Chan by a reddish brown color.

Chan and Kanárá yield the best "Pachhi" or fibre (after crushing) suitable for well ropes and inferior description of cordage.

Previous to sowing, the land is ploughed up ten or twelve times, and if the cultivator can afford it, he *ploughs?* in about 200 maunds of manure per acre, few however can manage to procure this amount. The manure consists of half-rotted farmyard dung, dried leaves, grass, straw, &c, in fact a *very* inferior kind of compost prepared without any care.

The cane is sown in spring sometime before the end of March. During the hot weather it is watered (*i. e.*, where well irrigation is available) about over a fortnight, till the setting in of the rains, should the monsoon cease early, as is very often the case in Upper India, the canes should be watered till the middle of the month of "Asu" about 1st of October.

The cultivator hoes the ground between the canes to eliminate weeds. When the canes approach maturity, three or four are generally tied up together to afford mutual support against the action of high wind.

The cane is harvested some time between November and the end of February, though in some parts it is not uncommon to see the cane standing in the fields in March.

The average yield of cane is about 350 maunds per acre, one-third of this is the average weight of juice.

100 (one hundred) maunds of juice will produce 20 maunds of Gur and 22 to 23. maunds of *rab*, which latter will yield 40 per cent. of sugar.

The cost of cultivation is about Rs. 30, and the clear profit varies from Rs. 20 to 25 per acre.

The diseases to which sugar-cane is liable, are called (I.) Parúna (II.) Téla (III.) Hadda (IV.) Kora.

The presence of Parúna or Ghúrnan I., may be detected by the shoots and leaves withering up, this process begins from the top, working its way down joint by joint to the very roots. If the rains are late in setting in, this disease shows itself about the month of Har (Asar) from July, and it is said that copious well irrigation only modifies but does not wholly avert the blight. It is also known to develope itself in "Asu" September to October, but then only when the monsoon ceases early.

II. Télá is also an insect blight. The insects though the same in size and shape, are of two distinct colors, black and grey, dotted with brown spots, this last is called "Chitta" or white. The blight is called Télá from Tél oil, on account of the peculiar greasy appearance presented by the cane and the leaves when attacked, which makes them look as though they had been dipped in oil or mucilage. The "Télá" generally makes its appearance in May or early in June, but is killed off or soon vanishes should the rains set in early in June, but if the blight comes in the form of the "Chitta Télá," the cultivators affirm that there is no remedy save burning linseed oil and cotton seed in open pans in the fields. This, however, is doubtful, and in either case the produce is scanty and of inferior quality.

III. Hadda from "Had," a bone. This form of disease shows itself in the total absence of juice, and is caused by cultivating cane on marshy or badly drained land, for this there is no remedy, save in a permanent improvement of the land.

IV. Kora. This can hardly be termed a disease, being in reality nothing more than the action of frost on canes which have been insufficiently irrigated the remedy is obvious.

Sugar-cane is also liable to attacks from swine, jackals, porcupines, and rats. White ants also do great damage. White ants are disposed of by extensive hoeing and liberal watering, rats by poison or smoking out by sulphur.

It is not only in the actual cultivation of the cane that the ryot is such a loser, but in his after manipulation of it. What can be more barbarous, filthy, and utterly unscientific than the "Behea," or its ruder brother the "Kolu." The Behea is a rude heavy machine, worked by eight bullocks (sixteen are required for a working day of eight hours). In plain language the Behea is a machine which requires a maximum of motive power giving out a minimum of useful effect. The bundles of cane have to be passed from ten to fifteen times between the rollers before all the juice is extracted. It costs about 8 annas per maund to extract the juice by the Behea or native mill.

The raw juice is boiled up in open pans cooled and refined, though it must be borne in mind that the finished article is not put into the market till perhaps the following autumn. The refining process being most tedious and unsatisfactory.

Sugar-cane is the most exhausting crop the ryot grows, demanding great care and attention.

The cane requires a deep tilth, and if this cannot be attained by ordinary ploughing, the soil should be worked up with a spade or phowrah, as is done in Natal, South Africa, and China. Manure to the extent of at least 15 tons per acre should be "forked in" to the soil. A very good compost, one which will answer admirably, can be easily made up from the following substances. Farmyard dung, leaves, weeds, poudrette, scrapings, vegetable refuse, slimy mud from the beds of tanks, as well as the weeds growing therein *Hydrilla verticellata, Potamogeton hisups, Vallencria spiralis*, &c. This compost should be made under cover and well rotted before application, after having ploughed or forked in the manure The field should be carefully marked off into a series of ridges and furrows ridges to be not less than three feet apart from centre to centre, x ... 3' ... x ... 3' ... x 3' x ... 3' x 3 x and the difference of level between crest of ridge and bed of furrow should not exceed 9".

These ridges can be raised by means of a native scoop or *Karaha*, or by using a ridging plough fitted up with double breast or mould board.

The canes should be planted along the crest of the ridges at intervals of 12 inches.

As soon as the plants appear above ground, the field should be well weeded, and the young shoots ought to get a dose of mineral manure, wood ashes, pounded and calcined bones, and salt mixed in the ratros of 6 4:1 respectively, will be found very effective. Each shoot should get about two ounces of the mixture, and then be earthed up about two inches.

If the field is kept well hoed, free from weeds, caked or puddled earth broken up after each watering, four waterings ought to be sufficient for the crop from 1st of April till the middle of June, by about which time the rainy season may be expected.

During the rainy season the advantages of having converted the field into a series of "ridges and furrows" will be appreciated, water will run off and not stagnate. Good surface drainage in a cane-field is highly essential.

Should the rainy season terminate early, the field should get another and final watering about the end of September. Early in November the crop should be fit for cutting.

* This means the amount exported only.

With care and good cultivation it is quite possible to raise from 700 to 850 maunds (25 to 30 tons) of cane per acre. Though it is on record that a growth equivalent to a fraction short of 50 tons per acre has been raised.

In the vicinity of towns and large cities where sewage irrigation is available, there is no reason why such results should not be realized. In such cases, however, the cultivator should see that he can ensure a thorough drainage *surface* and *sub-soil*, otherwise his canes would be weak and trashy, and utterly unfit for use.

Sugar-cane is such a thoroughly exhausting crop, that the ryot in Upper-India never attempts to grow it on the same land more than once in every two years.

Sugar-cane is as a rule followed by a *rabi* fallow, with maize or sorghum as a *kharif* crop, another *rabi* fallow, after which cane is again put down.

A very good method of preparing the ground for cane, would be to plough in a crop of young gram *Cicer arietnum* or *Sungi Melilotus Paurflora*, but here the ryots' prejudices stand in the way, as he looks upon green manuring as little short of a downright sin.

The following points are worthy of notice in sugar cultivation :—

I. Provided the canes have not been frost-bitten, they can be cut and stored away under cover for some time without deterioration or affecting the quality of the juice.

II. Salt or sea water irrigation does not affect the cane injuriously.

III. According to Professor Simmonds " 1,240 gallons of juice at 8·5° Beaumé produced on a plantation 1,048lbs. of sugar, and 480lbs. of molasses, one gallon of juice at 8·5°B = 8·76lbs. Avoridupois, ∴ 1,240 gallons of juice = 11,111lbs.

100lbs. of cane = 90lbs. of juice, then 11,111lbs. of juice are produced by 12,345lbs. of cane.

At 8·5° Beaumé juice contains 15 per cent of pure dry sugar, consequently 11,111lbs. of juice will produce 1,700lbs of sugar.

When the sugar is taken to the boiler, it is combined with water of crystallization, which being added to the 15·3 per cent. of pure and dry sugar = 17·595 per cent. of sugar and molasses ; of this three parts are sugar and two parts are molasses, and we have for the 11,111lbs of juice at 17·575 per cent. = 1,655lbs., of which 1,173 are sugar and 482 molasses.

IV. In Louisiana 13,000 to 4,500 canes per acre are produced with a length of cane varying from 3 to 8 feet, and average weight = 10 ozs per running foot.

Canes 4·5′ long would 3lbs and growing 350 per row of 100′ long would give 61,125lbs per acre, but the average outturn may be put down at 60,000lbs.

V. In the production of sugar the division of labour should be carried out as completely as possible, or in other words it does not pay the planter to convert his own raw material into the market article, and that he should devote himself to the cultivation, improvement, and development of the staple, only unless he has considerable capital, and at the same time cultivates cane to a very large extent, he cannot procure the plant requisite to enable him to turn out the finished sugar as economically as is done in a large " Usine" or Central Factory. The following is a description of sugar cultivation in British Guiana.

A sugar estate is divided into fields of from 5 to 10 acres in extent by a series of cross canals, and the method of planting the cane is simple and easy when labor is at command. The brushwood and grass having been cut down and weeded, are piled into rows 6 to 8 feet apart across the intended beds into which the field is to be divided. These beds are found by digging open small drains 2 feet wide and 2 feet deep, at intervals of every 30 or 36 feet, across the entire field beginning within a few yards of the canal in the centre of the estate, and running to the side draining trenches into which they empty themselves. The soil from these small drains having been carefully thrown upon the beds so as to raise and round them off in the middle, narrow banks or ridges of earth are made across them from drain to drain parallel to and equidistant between the rows of grass and brushwood ; and in these spaces between the ranks of earth and grass, the canes are planted in line, each line being 3 or 4 feet apart, and each plant 9 or 10 inches from the next

The plants are procured by cutting off the tops or upper points of growing canes into lengths of 10 or 12 inches, which are thrust in a slanting direction into the well-stirred ground, and in ten days or so the long-grass-like leaves begin to spring from the eyes at every joint. These young canes require to be kept well weeded, and moulded about the roots from the ridges of earth or decaying grass on either side of them, which had been previously prepared for that purpose ; and this must be repeated as long as there is room for the labourers to pass between the rows, which, according to the season, will be until all the plants have attained the age of six or eight months, after which time the spreading of numerous leaves from each stock will have covered the surface of the field with so dense a jungle as in a great measure to prevent any further growth of weeds. When about nine months old, the cane throws out its "arrow," a long reed-like stem surmounted with a tuft of waving downy blossom. At this period the plant is poor and weak, and little more than a mass of water ; it soon, however recovers, and in twelve or thirteen months from the time of planting, is considered at maturity, having then sometimes attained a length of 20 to 25 feet, but more frequently of 10 or 12 feet about as thick as the wrist, and divided into points like a bamboo. When ripe, the canes are cut down to the ground in lengths of 3 or 4 feet, and thrown into punts which are towed along the canal by mules or oxen to the wet dock at the door of the sugar mill. Immediately after cutting the large quantity of thrash or dry leaves is rolled clear of the cane stumps, and heaped in rows, there to decay and form a rich manure for the succeeding crop. In a few days the stumps throw out their shoots, and the same routine of cultivation is repeated for twelve months more, any vacant spaces where plants may have missed being carefully supplied. The canes of the first year are called " plant canes" those of the second and subsequent years being distinguished as ratoons ; and these ratoons have been known to be produced from the first plant for twenty years and upwards, the canes having been annually cut down and the stumps allowed to shoot again. But this continued reproduction from the same stocks, which is now compulsory on the planter from the scarcity of labor, of course causes the canes to degenerate and to yield less abundantly. An acre of newly planted land will give two tons of sugar the first year, gradually falling off to not more than one fourth of that quantity as the stocks become old; and were there sufficient labour in the Colony to admit of the land being replanted every third or fourth year, there can be little doubt that the present crops would be nearly doubled.

The productive power of the greater part of the soil in British Guiana, indeed appears to be unlimited. As an instance it may be mentioned that on an estate in Essequibo, the return obtained in 1851 from certain lands which had been properly worked and *perfectly drained* amounted to a fraction within 4 tons of sugar per acre."

There is not, cotton and tobacco not excepted, a wider or more fovorable field for European enterprise in India. The demand for the sugars known in Upper India as Nos. I. II. III. Shahjehanpur, is steadily increasing even amongst the natives who find that the factory-made article is cheaper than the bazaar commodity, and the day it is to be hoped is not far distant when those saccharine abominations sold in bunyas' as shops, and known by the names of misri, chini, khand shakar, &c., will be driven out of the market to give place to more wholesome commodities. Native liquors distilled from impure and filthy *gur*, toned and doctored up with kikar bark, peppers, &c., will, we may safely assume share a like fate.

Like tea, cotton, indigo, tobacco, coffee, &c., it will require European capital energy and supervision to develope this promising industry and it would be by the system of advances to cultivators. Premiums and prizes awarded for the best crops, together with the scientific cultivation of a few acres of cane attached to the factories, that the ryot would be induced to attempt improved methods of sugar cultivation.

In Upper India and the Punjab, there are numerous districts in which sugar factories would be found paying speculations Karnal, Umballa, Loodhiana, Jullundhur, Hosiarpur, Gurdaspur, Amritsar, Lahore, Muzaffarghur, Mooltan, and Shahpur, being the chief sugar producing districts of the Punjab.

In 1854, Captain Farrington, then Deputy Commissioner of Jullundhur, ascertained that the total sugar production of his district was equivalent to 600,000 maunds, valued at Rs. 9,99,000

In the same year, Hushiarpur was calculated to produce nearly 40,000 maunds, though within the last 27 years there is reason to believe that Hushiarpur has fully equalled, if not surpassed Jullundhur in its sugar production.

At Madhopur in Gurdaspur district, a large " Usine" has been started, conducted on correct principles, it should be not only a financial success, but a great boon to the country at large. In Mooltan it was reported as far back as 1854, that a " Refinery on the European system could be advantageously carried on "

Deputy Commissioners of Jullundhur and Hushiarpur in reporting on their own districts were of the same opinion.

The well-known Obaheite cane was introduced into the Muzaffarghur district, several maunds being distributed *gratis*, but the cane not being properly cultivated, died out in two or three years. In Muzaffarghur the return of sugar from country cane was 14 maunds per beegah of 6 kanals, 10 kanals = 1 acre.

In conducting the business of a refinery or " Usine,' it may be taken for granted that the conditions on which the factory would purchase the cane would be similar to those prevailing in the European colonies in the West Indies, namely, that for every 100 maunds of cane the cultivator would receive from the factory the money value of so many pounds of sugar of a certain standard (which we will assume to be that known in the Indian market as No III. Shajehanpur). In other words for every 100 maunds of cane A supplies to the " Usine," he gets

the value of x lbs of sugar: x being taken at a figure varying from 3 to 5 according to circumstances.

Let us assume x=4, and that the crop weighs 700 maunds per acre, also that the cultivator lives about 10 miles distant from the Usine.

Carriage to Usine being defrayed by cultivator, and costing him 2 annas per maund.

His profit and cost of cultivation will be somewhat as follows :—

COST OF CULTIVATION.

	Rs.	A.	P.
Government revenue	2	0	0
Seed	5	0	0
Tillage operations	15	0	0
Manure 25 tons at 12as. per ton ...	18	12	0
Irrigation during summer months ...	10	0	0
Weeding, hoeing, &c.	5	0	0
Mineral (Bone-dust ashes, &c.) Manure ...	10	0	0
Reaping the crop	15	0	0
Carriage of 700 maunds of cane to Usine at 2as. per maund, say ...	90	0	0
Add 5 per cent. for wear and tear of stock, well gearing, &c.	15	0	0
	185	12	0
Contigent and unforseen expenditure at Rs, 10 per cent.	18	0	0
	203	12	0
Receipts by sale of 700 maunds of cane. Four per cent on 700=28, and the selling price of No. III Rs. 15 per maund	420	0	0
which represents his profit per acre as ... Rs.	216	4	0

Such a crop is impossible some may say. Not at all, when we are assured that in the Bombay Presidency on a Model Farm a growth equivalent to over 49 tons of cane per acre has been raised or something like 40,000lbs. higher than the average yield of a Louisiana plantation, Louisiana being one of the best sugar-producing States of the Union.

It may also be argued would the supply of cane be sufficient to keep the Usine in full work during the season and enough to enable it to turn out about 1,000 to 1,200 tons per mensem. Judging from results which the establishment of other industries have shown, it may be confidently predicted that in such a case the demand would create its own supply, and very probably it might just happen that the Usine would be suffering from a plethora of cane.

The Usine would be a highly popular institution with the cultivators because :—

a. It could afford to be more liberal in its terms than the "Shah" or village bunnia, paying a higher price for the canes, and at the same time it could also afford to make advances *without* interest, thus cutting the ground completely from under the bunnia's feet

b. The cultivator could cut and cast off his canes at once as soon as they were ripe to the factory.

7. The great wear-and-tear of live-stock entailed by crushing out the juice with native implement would be lessened and done away with.

8 The establishment of a factory would soon result in the improvement of communications, roads, bridges, as well as tanks, &c., and the natives would soon find their interests and those of the European settlers to be identical.

Would a factory or Usine pay if established in a good sugar-producing district. On this question there can scarcely be a doubt. In the French and English West Indian colonies where labor is expensive and coal fuel equally dear, Usines have paid on an average from 25 to 30 per cent. In India, however, labor is cheaper than in the West Indies, though coal fuel is undoubtedly dear, specially in Upper India. The machinery would have to be made either in England or France, and the capital required would vary from 5 to 6 lacks of rupees.

The following figures speak for themselves and represent an average stock, after collating the account of the three largest Usines in the Island of Martinique, "La Renty." Francois "Pointe Simon" which have paid 27·33½ 48 per cent. respectively on declared capital :—

Number of lbs. of canes ground per.		Cost per Hogshead.								Net profit to Usine per Hhd. of 1,102 lbs.		
Hhd. 1,102 lbs. of sugar.	100 lbs. of sugar.	Canes.			General expenses.			Total.				
		Frs.		cts.	Frs.		cts.	Frs.		cts.	Frs.	cts.
14,305	1,300	145		57	76		68	222		26	115	73
		L.	s.	d.	L.	s.	d.	L.	s.	d.	L. s.	d.
Equal in sterling to		5	16	5¼	3	1	4	8	17	9¼	4 12	7

In a sugar factory the consumption of fuel is a most important point, as it constitutes one of the chief items in working expenses. "In the West Indies the consumption of coal has been reduced to a quarter of a ton of coal per ton of sugar produced ; but this is in addition to the megass, and triple action concentrators are in use."

Messrs Ransomes, Sims and Head, in their engines worked with vegetable refuse as fuel, steam cut off at from ⅓ to ¼ of the stroke, found the proportion of consumption of coal to megass to be as 1: 2·96 which means that from 17 to 20lbs. of megass per H. P. per hour would be consumed in an engine of this description.

There are other substances such as straw, grass, maize, and cotton stalks, which could be used as fuel and procurable at a very low price, thereby precluding to a great extent, if not wholly the necessity for procuring coal which in Upper India must always be very expensive. A factory in a good sugar-producing district could in addition to sugar, always turn out a supply of good wholesome spirit, suitable for local or native consumption, in other words the factory could take the "Abkari contract" for the whole district, paying Government a higher sum than any native contractor, and at the same time supplying the native public with a pure good liquor at a cheap rate.

If the Aryan brother is to drink spirits, it as much to the interest of Government as to the interest of the people themselves that they should drink something wholesome, instead of the trash now vended in the "*Buttall's*" shops, a mess consisting of distilled juice, mixed with peppers and bark of kikar trees, the latter substance being added to impart a "*tone* and *body*" to the liquor.

The advantages to Government and the State at large, from the establishment of such factories in various parts of the country would be immense, both directly and indirectly. It would mean a large influx of English capital into the country. It could go a great way towards developing a very important industry. It could go a great way towards introducing an important and much desired agricultural reform, and last though not least native society could "be both accelerated in development, improved in quality, conciliated in sympathy by the presence of a large number of respectable non-official Englishmen, resident in the country, and as interested in its progress as the natives themselves. Such an element must largely avail to leaven the mass to tract improvement by example. to encourage enterprise and self dependence, and to disseminate Western ideas broadcast throughout he land."

EDITORIAL NOTES.

THE "Tea Cyclopædia" which has recently been issued from the office of the "*Indian Tea Gazette*" is well worthy of a place among tea literature. It does not pretend to tell us anything new, being avowedly a compilation. It is none the less useful on that account. Much has been written on tea of late years, and a large proportion of this writing has been the result of practical experience, and the work of practical men. This is the sort of information we want, not theorising, by people who have never seen a tea plant, but who smother us, and blind our perceptive faculties with a display of scientific terms. The Editor of the *Indian Tea Gazette* has done good service by collecting the best of this information, and placing it before us in a readable form. By means of a copious index, we can now at a moment's glance turn to any branch of the subject, and find the experience of several planters on that particular branch. It is not to be supposed that, because the book is a compilation, it therefore did not cost much trouble and anxiety to the editor. This is a mistake, careful editing is frequently of more value, when it exercises itself in cutting down and rejecting, than when it results in supplying "copy to the insatiable maw of the P. W., and we have to congratulate the editor of this volume on the skill he has shewn in deleting extraneous matter from the articles he has indented on for his information. We trust that the tea planters will appreciate this effort as it deserves to be appreciated.

WE hear from Canada that a great deal of testimony in favour of growing sugar-cane, comes from various parts of the province. The cane 'will in all probability be largely cultivated next year. The crop requires less attention than Indian corn, and produces besides about 200 gallons of excellent syrup to the acre, and first-rate fodder equal to the best hay.

IF we judge by the late cattle-fair at Umritsur, we shall have reason to believe in the agricultural prosperity of the Punjab.

Upwards of seventy-five thousand head of cattle were brought to the fair, and of this number, about two-thirds were sold. As might have been expected, the majority of the purchases were for the frontier districts, which, during the last two or three years, have been swept of cattle for transport purposes. The prices ranged from fifty to sixty per cent. above those of last year. One of the most attractive features of the fair was a Norton's tube well, round which there always seemed to be a crowd of people, anxious to understand its working.

We take the following table from a recent number of the *Economist* :—

The fertility of New Zealand is very great, and for agricultural purposes the percentage recorded below would, were there no financial drawbacks, point irresistibly in favour of that country :—

	Average Yield per Acre. Mean of Six Years			
	Wheat bush.	Oats. bush.	Potatoes. tons.	Hay. tons.
Victoria	13	18¾	3⅕	1¼
New South Wales	14¼	19	2⅞	1⅛
New Zealand	27¼	33	5	1¼
South Australia	8⅜	12¾	3¼	1¼
Queensland	12	10	2⅛	1·3
Tasmania	17⅛	24	3½	1¼
Western Australia	11½	16¼	2⅝	1¼

The average of these is 15 bushels, and we are surprised to find it so low, in a new country like Australia, in India the average is 14 bushels, but this must be remembered is only the *rabi* crop. The land is beside, frequently called on to produce a *kharif* crop as well, so that compared with Australia, which only produces one crop a year, our yield must be considered better than theirs.

A correspondent *Gardener* revives the subject of the value or otherwise of weeds. The subject is of sufficient importance to warrant some further discussion. There can be no doubt that a vast amount of plant food is consumed by these weeds, and the question is, whether it is better to allow the weeds to grow—short of seeding point,—and then hoe them in as green manure, or to keep them as short as the supply of labor will admit of. We never had a doubt on the subject. The late Lord Palmerstone used to say that "dirt was matter in a wrong place." Much the same might be said of weeds, and the more encouragement one gives to his bushes by good cultivation and manuring, it is grievous to find so much of his labor running to weeds. We adhere to the plan of keeping them well down.

In another column will be found an extract from an Australian paper on the subject of artesian wells. It would seem that there is no difficulty in getting water, and that at very shallow depths. For instance, we are informed that a well 42 feet deep is yielding 10 gallons a minute, and delivering it at a height of 10 feet above the ground, when first opened this well gave 50 gallons a minute, but owing to its not being carefully made, it has become partially choked, and the flow is now somewhat restricted. By securing good workmanship this 50 gallons might have been secured as a permanency. It may be remarked that 50 gallons a minute is equal to 72,000 gallons a day, and this would supply one inch of water to 20 acres of land every week.

The subject of improved ploughs has taken a strong hold on the public mind, and several are in the market. At the present time a discussion is going on in the columns of some of our up-country contemporaries, as to what constitutes the best plough, each inventor naturally considering his the best. We would suggest that a public trial be arranged for, in order to have an authoritative opinion, the details of such trial might be subject of mutual suggestion by the parties concerned, and if the various inventors of ploughs for ordinary native use, are disposed to go into the question *con amore*, we shall be glad to undertake the organisation of the meeting. We think that a committee might be named, whose decision would carry weight. We would suggest some such constitution as the following. That each inventor shall name one gentleman to sit on the committee, and that the Agricultural and Horticultural Society of India be asked to name, say three members to be added to those selected by inventors. That the trial be under the supervision of the Agri-Horticultural Society, and that they be asked to frame issues which shall include every qualification which such an implement should possess, and that whatever expense may be incurred shall be defrayed by the inventors in equal portions.

An article on the production of a "large quantity" of good milk will be found among our selections. This is a subject which seems to be utterly neglected in India. This is the more surprising when we reflect on the fact that milk enters more largely into the diet of the mass of the people here, than in other countries. The people of India seem to be perfectly satisfied if their cattle are just able to exist. There is no desire for improvement in any shape or form. In the matter of milk, no care is taken with the food of the cows, and where milk is so valuable, this subject is surely worthy of a little attention.

We would draw attention to a rather lengthy article in this number on the subject of the sugar-cane. It is from the pen of a gentleman in the Upper Provinces, who has had considerable experience, and we can confidently recommend it to the attention of all interested in this leading industry. We say "leading industry" more referring to the portion that the sugar-cane ought to occupy among our crops, than that which it does occupy. Few crops pay the cultivator so well as sugar-cane, and we are convinced that lack of capital is the only reason why the rayat does not engage in its cultivation more largely. Let this be supplied by private or joint stock enterprise, and the face of the country will assume a new aspect, so far as cane is concerned.

A native correspondent tells us (*Civil and Military Gazette*) that Monday and Thursday have been appointed the days by the Government for the passing of travellers into the Khyber, and it has been proclaimed that it will not be held responsible for the safety of those who proceed on other than these two days in the week. But a paper published at Peshawur says, that the Khyber is again full of danger for the traveller and describes, as the first instance of breach of faith on the part of the tribes, a case in which it is said that one hundred sheep belonging to the inhabitants of Kuchi were carried away by the tribesmen from a post which is situated between Ali Musjid and Lundi Kotal. They were pursued and lost two of their men, but the sheep were not recoverable unless Rs. 100 were paid to their maliks. In another case the tribesmen made away with Rs. 1,100 and six women of a *kafila* of Badakh-shanis who had been staying at a place called Haftchah between Lundi Kotal and Dakka. It is said that Rs. 6,000 have been paid to the robbers for the ransom of these women, and that this sum is to be deducted from the allowance of the tribesmen.

The Mysore Planters' Association, among other bodies, tendered an address of congratulation to the young Maharajah, and expressed a hope that the relation which had hitherto existed between them and the Imperial Government, would receive no wrench at the change. His Highness has replied as follows :— "I feel grateful for your address of congratulations on my accession to the rule of my country under the protection of her Majesty the Queen-Empress, and for your voluntary assurance of loyalty to my throne and person. I place a high value on the importance of the planting interest to the prosperity of the province. As you rightly observe, agricultural pursuits are the mainstay of the people in this country, and an enterprize like the coffee cultivation by a body of English gentlemen possessed of science, energy, and capital, must promote the prosperity of the country, and stimulate and develope the native industry. I accordingly assure you, gentlemen, of every support and encouragement from my Government ; and I would express my hope that the planters living and working amidst the native population, with that mutual regard and respect for each other's rights which is the peculiar characteristic of the British race, will be able to raise the status of the native agricultural population, and bring English knowledge and energy to bear upon them for their benefit in a way which it cannot be in the power of any Government to accomplish. Once more thanking you for your address of congratulation, I wish every success and prosperity to the enterprize with which you are connected."

We fervently hope that the following item of intelligence from the *Indian Herald* is based on a good foundation. Few things are more urgently wanted in India than an Agricultural Department: "It is stated on what appears to be good authority, that the Indian and Home Governments are now considering the advisability of resuscitating the Department of Revenue, Agriculture, and Commerce, which Sir John Strachey, to indulge a pique on the part of Lord Lytton, abolished a little more than eighteen months ago. It is said that experience has proved that the sweeping away of the department was a decided mistake."

MISCELLANEOUS ITEMS.

Flower Show.—The annual flower show came off in the Lawrence Gardens on the 8th instant. The roses shown by Mr. Wrench were very pretty. The Arbori-Horticultural Society exhibited 96 sorts of roses, but they were very indifferent in quality. The vegetable show was a greater success. Forty-four prizes in all were distributed among thirty competitors. The show cannot be said to have been a success, neither can it be said that any great efforts had been made to make it so.

Newchwang.—Large quantities of native grown opium have arrived from all parts of the country—and the stock of Malwa (Indian), although not large, has become a drug in more senses than one, only about ten piculs having so far been disposed of. The day is rapidly approaching when opium will become an article of export from this province, and the occupation of the Anti-Opium League will be gone through circumstances over which they have no control.

The New Zealand wheat crop is spoken of as above average.

Tremendous snowstorms have suspended railway traffic in Russia.

The present harvest of Cyprus is the best that has been known for many years.

Death to the sparrows continues to be the motto of New Zealand farmers. At a recent meeting of the Brookside Club, it was announced that 6,000 eggs had been collected during the previous fortnight.

The area of England, Wales, and Scotland is nearly ninety thousand square miles. Assuming the whole of this surface to be covered with snow to the depth of one foot, and that a foot of snow is equal to one inch of rain, the amazing result follows that there must have been discharged from the heavens, in the form of snow, a weight of water nearly six thousand millions of tons.

M. Prevalsky, the Russian explorer of Chinese Tartary, is engaged in writing an account of his recent perilous journey in these unknown regions. When published, his book will doubtless afford much information of the highest interest to geographers and to the scientific world generally. In a recent letter to a European journal, he describes a rhurbarb plant which we imagine would be certain to take 1st prize at any European agricultural show. In one locality which he visited, he found this plant in prodigious quantities, and in some of the older plants the roots were of colossal size. Taking one at hazard, he found that it measured sixteen inches in length, twelve inches in breadth, seven inches in thickness, and weighed 26lbs. Vegetarians will be curious to know the exact locality of this favoured region where the root of a single plant can afford them an ample breakfast, lunch and dinner every day for a week.

A Discovery which promises to have important results, has lately been made by a scientific gentleman in the neighbouring island of Reunion. He claims to have succeeded in solving the problem of extracting vegetable fibre from the Aloe or other leaves in an economical manner, and one which can be generally adopted. The principal features of the invention are as follows:—

The leaf is first placed for 10 minutes in a bath heated to 75° Fahr., and then removed to a second bath of water at its normal temperature, in which some inexpensive chemical substance (not yet made public) has previously been mixed. The leaves are allowed to remain some little time in the 2nd bath, after which it is said that the fibre can be washed out by women or children without any trouble. A Patent has been taken out for this process by its inventor in Reunion; and it is believed that one will be secured here immediately. The object of the researches, which resulted in this invention, was to obtain a means of cleaning the Ramie fibre; but the same process can be applied to the Aloe or any other leaf.

Among the new enterprises started here of late, I may mention that one of our wealthiest landed proprietors has lately begun Ostrich farming. Three or four pairs of these birds have been imported from Arabia and located on several hundred acres of this gentleman's estates which had been previously fenced and otherwise prepared for their reception. The ostriches have lately laid 12 eggs, so it may be presumed that they are satisfied with their quarters. Monsieur Lionard, the owner of these birds, has gone to a good deal of expense for their introduction, and has, I believe, good hopes for the ultimate success of his enterprise but what is wanted here is *experienced* attention to the birds.

It is no doubt true that these two points are important, but what of draught and efficiency of working. A plough may be simple in construction and cheap, but practically useless on account of the power necessary to draw it. This is the hitch in connection with any improvement in this direction, and from some correspondence which appeared in the *Express* we find that Mr. Martin and Mr. Phillips withdrew their ploughs from competition, because the *draught* was not to be taken into account. These gentlemen profess to have overcome the difficulty of providing a cheap, light, and simple plough which can do much more work than the country *hal*, without any appreciable excess of power being required, and it is a pity that they were not afforded an opportunity of submitting their ploughs to the test of working.

The Lucknow correspondent of the *Civil and Military Gazette* has the following on the trial of ploughs at the recent exhibition:—

"The show of ploughs at Lucknow was very considerable, the chief exhibitors being "the Department," Messrs. Coen of Agra, Mr. Gavin Jones of Cawnpore, Mr. W. Martin of Etawah, and Mr. Phillips of Faizabad; but the two latter gentlemen withdrew from the competition, being dissatisfied with the conditions of trial. Our correspondent was sorry Mr. Martin's plough did not go to trial as it alone seemed to fufil one condition the Indian cultivator thinks much of, namely, that the man who holds the plough shall be within touch of the bullocks who drag it. A man is thus saved for each plough; whereas the other ploughs all required one man to hold the plough and another to drive or lead the bullocks. Perhaps, however, this would not have ensured Mr. Martin's success, for nearness to the bullocks was not one of the points taken into consideration by the judges, and two men were allowed for each plough. There seemed at first to be a good deal of uncertainty as to how the ploughs should be tested, and the soil was too light to admit of good work; but ultimately, a schedule of points, under the main heads of construction, working, and price, was drawn up, and each competing plough was separately worked and marks entered for each point in the schedule, according to the agreement of the judges. Capability of repair in this country, and price, were the main points which decided the competition, for several of the ploughs worked very well. The last sentence reveals a blot in the arrangements, and one which is fatal to any good results being obtained, or to any progress being obtained, or to any progress being made in supplying the ryot with a good plough.

Fruit Trees in Bohemia.—According to recently published statistics, the number of fruit trees in Bohemia of all sorts, but chiefly apples, appears to be 14,000,000. Of these 10,000,000 are in gardens, 1,600,000 in waste lands, and about 2,000,000 on the sides of the public roads. The number of young trees annually planted is about 1,500,000. Between 6,000 and 7,000 miles of road are planted with fruit trees, mostly of the best sorts, and the revenue therefrom is very large. The fruit is largely exported to the north of Germany and Russia.

A Freak of Nature.—In Oceana county, Michigan, a large maple tree about 30in. in diameter stands about two rods from where one about 15in. in diameter starts from the ground, and both grew solid together at a height of about 40 ft.

The largest Chestnut Tree in the United States.—This is growing on the farm of Solomon Merkle, at Berks, Pa., and is nearly 40ft. in circumference at the base. The top of the tree is reached without danger by steps that are fastened between the limbs. It is estimated that this tree contains about 17 cords of wood. It will yields about 300 bushels of chestnuts annually.

Large Cedar of Lebanon.—One of the finest specimens of this tree is to be seen in the garden of Mr. W. J. Lloyd, of Langleybury, Herts. It measures, at 4 ft. from the ground, 22 ft. 4 in. in girth, the branches extend over 105 ft., and its height is 107 ft. The weight of its branches after a heavy fall of rain or snow is such that each limb has been secured to the stem by iron rods to prevent them breaking off. Upwards of one and-a-half ton of iron have been used to secure it, and quite a network of iron is spread beneath the branches, so skilfully arranged as not to detract from the perfect and graceful form of the tree.

In Great Britain the average produce of wheat, according to the best authorities, is about 23 or 24 bushels per acre, whereas in Guernsey, Jersey, and Sark, the average is 33 to 36, and on certain farms the yield has not unfrequently been as high as 54, 56, or even 60 bushels per acre.

Cinchona bark for Venice, amounting to 47,611lbs., forms a prominent item in the list of exports from Ceylon recently.

Champion Potatoes.—In the *Agricultural Gazette*, 'W. G.' Yorkshire, gives the result of his experience in the growing of champions. On a stubble field 35 cwt. of wool manure (Stanley's patent prepared) was applied per acre. The yield was 11 tons to the acre, and there was total immunity from disease. To the presence of kainit in the manure was attributed the fact that not a single worm-eaten potato was observed.

The territorial extent of France is 132,000,000 acres, and of this 37,500,000 acres, more than one-fourth, is sown with corn; while

the area of Great Britain and Ireland is 77,800,000 acres, and the land sown with corn of all kinds is 11,000,000 acres less than one-seventh.

IRISH ESPARTO GRASS.—As foreign grasses used in paper-making are becoming scarcer than they used to be, attention is directed to the Irish product. *Nature* points out that in Ireland alone there are over 1,000,000 acres at the present moment not worth sixpence a year, each for any agricultural purpose; each acre would easily grow half a ton weight of dried melic grass, which at its lowest value would be worth £2. Would not this crop, in time, more than compensate for the loss of the potato? It seems a pity that the manufacture should have to go to the port of Mogador for what he might get with so much greater ease at the port of Dublin.

IT appears that a very great improvement in the process of breeding silkworms has been effected by the use of artificial heat. Experiments lately made in the division of Yofu, Prefecture of Hiyogo, are said to have been eminently successful, not only as regards celerity of hatching, but also in the quantity and quality of the silk produced. Hitherto the heat of the sun has been trusted altogether, and consequent variations of temperature have caused very uncertain results. A little attention to matters of this sort, supplemental by a Government edict prohibiting the export of silkworm eggs, would soon cause an appreciable increase in the export returns.

THE number of grain bags used in the transportation of California wheat, in 1880, is set down at 34,021,500.

THE total value of bread-stuffs exported from the United States in 1880, amounted to $263,295,359, against $239,201,899, in 1879.

THE grain exports from New York, in 1880, reached 107,000,000 bushels, an excess of nearly 13,000,000 bushels over the exports of any previous years.

EUROPE takes about 85 per cent. of the hog products exported from the United States. A small percentage is sent to Africa and to various islands in the Pacific and Indian oceans.

SUNFLOWER seed is recommended by some poultry fanciers as an excellent food. It is said to greatly increase the brilliancy of the plumage and also stimulate the production of eggs.

IT took only 400 horses to cultivate 24,000 acres of land in wheat, on the famous Dalrymple farm in Dakota, besides which 4,000 acres of raw prairie was broken—making 70 acres ploughed for each horse used.

The Utica, N. Y., *Herald* gives the result of converting 1,504 pounds of milk into butter by a new process, which gave 59lbs. of butter, (one to 25·5lbs., of milk), after which the skim and butter-milk gave 146lbs. of cheese.

POULTRY canning has become quite an extensive business at Dover, the capital of Little Delaware. In two days, November 22 and 23, one firm there bought 95,000 pounds, and had it all canned by the 27th, and some of it on the way to Europe. In four weeks the firm bought 240,000 pounds.

IN 1880, J. B. Bodwell, of Hallowell, Me., on a half acre raised "over four hundred bushels of nice turnips," says the Augusta *Farmer*. The land was drained bog, and had been treated to twelve and-a-half bushels of unleached ashes, spread broadcast, with a sprinkle of superphosphate in the hills. The rows were three feet apart and eighteen inches in the hills. Growing turnips in "hills" would be a novel business for a western farmer.

MR. GLADSTONE ON BRITISH AGRICULTURE.—Mr. James Howard, M.P., has received the following letter from Mr. Gladstone, dated February 28 :—'Mr. Gladstone has had the honour to receive the resolution enclosed in your letter of the 23rd instant, which was passed at the recent meeting of the Hampshire branch of the Farmers' Alliance, in reference to the claims of British agriculture to the early attention of Parliament, and in reply I am directed to say that Mr. Gladstone is very sensible of the urgency of questions connected with land in England and Scotland, and he much regrets that they have been, for the present, thrust back from the immediate front of public affairs.—I remain, &c., E. W. HAMILTON.'

THE TOBACCO DUTIES.—A meeting of tobacco manufacturers was held at 31, Moorgate-street, yesterday, Mr. W. H. Wills, M.P., in the chair, to consider the question of the tobacco duties. The following resolution was unanimously carried :—"That so large a majority of the trade as regards number and amount of duty paid being in favour of a reduction of the duties on unmanufactured tobacco to 3s. 2d. per lb., this committee desires an interview with the Chancellor of the Exchequer on the subject." It was also resolved that Mr. Wills be requested to arrange for the reception of the deputation.

THE cultivation of osier-beds is attracting considerable attention in Rhenish Prussia.

SOME people imagine that farming needs but little outlay of brain power to make it successful. But as some one has truthfully said, "brains makes the best fertilizer a man can use."

I WISH to testify to the healthfulness of fruit. I have raised a family of six children and have allowed them to eat fruit of all kinds without stint, and if there is a family that has been raised with less medicine, or sickness, I should like to make their acquaintance.—*Cor. Live Patron.*

AN agricultural society in Maine has awarded a prize of $200 to F. E. Small, aged 16, for raising 2,256lbs. of corn in the ear, on an eighth of an acre; to Frank L. Jordan, aged 16, for 1,945lbs. $50; to Wm. J. Littlefield, aged 18, for 1,841¾lbs. The corn was all weighed in the ear "when ripe." The heaviest crop allowing 70lbs. to the bushel, would be at the rate of 257·84 bushels per acre of shelled corn. This crop was planted in hills ten inches apart with four grains in the hill—width of rows not stated. Value of manure applied at the rate of £72 per acre. The second crop was planted in hills eight inches apart and one stalk in a place—width of rows three feet. Value of manure applied $128 per acre. The corn was all of an eight-rowed variety.

THE FRENCH HARVEST FOR 1880.—The provisional valuations transmitted by the prefects fix the amount of the harvest for the whole of France, including Corsica, in 1880, at the following figures :—Wheat, 17,426,599,300lbs.; meslin (a mixture of wheat and rye), 1,060,625,060lbs.; rye, 4,102,928,060lbs.

THE gross income derived from the growth of tobacco by the United States farmers is estimated at about 22,000,000 dols.

OFFICIAL PAPERS.

REPORT ON THE ORES OF GWALIOR.

(By Taj Kittirle Von Schwartz.)

THE Gwalior *iron ores* are remarkable at once for their purity and their richness. They are chiefly red iron ores and magnetite, containing sometimes manganese, but there are also brown iron ores and silliceous hematite.

Magnetites contain 70 per cent. of metallic iron (or 68 per cent. oxide, and 29 per cent. protoxcide of iron); the red iron ore from 60 to 71 per cent. of iron (or 86 to 99 per cent. of oxide of iron), the brown iron ores are from 42 to 54 per cent. and the silliceous hematites from 45 to 48 per cent. of iron metallic.

The few impurities of these ores are small quantities of quartz, clay and manganese, and exceptionally some lime; of sulphur there are but few traces; of phosphorus none: at least none have been discovered in the red iron ores and in the magnetites.

In general the European ores contain only from 35 to 40 per cent. of metallic iron. How great a value is put on rich and pure ores by iron makers may be learnt from the circumstances that vast quantities of such iron ores are yearly imported into England, France, Germany and Belgium from distant countries. In 1878, Bilbao, in Spain, shipped 1½ million tons of iron ores to Cardiff. Herr Krupp, the great gun-maker of Germany, has his own iron mines in Bilbao. France draws yearly 500,000 tons of iron ore from Moktas in Algeria, and England also imports large quantities from the same source. The exported ores of Bilbao are brown iron ores with 52 to 55 per cent. of iron, those of Algeria are magnetite and red iron ore with 69 per cent. of metallic iron, therefore from 10 to 12 per cent. and inferior to the Gwalior iron ores.

The red iron ores near Tantoro, Maesora, and Dharoly occur in enormous quantities on the surface of the ground; the erection of costly mining works is here not required.

These iron ores, containing as was said before, no phosphorus, are suitable for the production not only of bar iron, but especially of Bessemer cast steel for rails.

The ores containing manganese are especially useful for the production of that for cutting tools.

Equally the pure red iron ores containing manganese are suitable for the production of "Spregeleisen" specular cast iron), a kind of pig iron which is added to the iron in the Bessemer process, and in cast steel crucibles. America imports "spregeleisen" from Europe to the amount of 20,000 tons per annum; its sale price is in England £5¾, in America43 dollars per ton (loco New York), also Od. 50 per cent. higher than that of ordinarypig iron.

For converting these iron ores into finished iron or steel, there is ample wood available, as there is a large forest in the north-west part of Gwalior, at a distance of about 50 miles from the place, where the best and the largest quantities of iron ores occur.

This forest is bounded in the north by the river Chambal, on the west by the river Parboti, in the south by Khota, and Jhallavar territories, and in the east by the river Kunu. It lies on a plateau elevated about 1,000 feet above the level of the sea, covering 2,400 square miles. These forests may be counted upon to yield 15,000 tons of wood per square mile or about 56 millions of tons for the whole area, and would suffice to feed an iron work (one blast furnace with puddling and rolling mill) producing daily 12 tons of finished bar iron during nine hundred years, in which calculation the question of recoupment by natural growth and artificial planting has not been taken into account. If natural growth and artificial planting be taken into account, these forests can feed 40 blast furnaces with refining works for an indefinite period without being terminated.

There are great varieties of wood in these forests, about three quarters of them hard wood, which makes them more precious for smelting purposes, as the quantity of charcoal is proportional to its specific weight; and the harder the wood is, the greater is the specific weight of the charcoal made from it. The weight of the charcoal is 17lbs. per cubic foot and near the forests it may be had at the rate of as. 4 per maund. The German and Styrian iron works pay as. 12 per maund for charcoal weighing only 12lbs per cubic foot.

The chief advantage of wood and charcoal over mineral coal, as a fuel, consists in the greater purity of the former. The price of iron made with vegetable fuel is very much higher than that of iron made with mineral coal. Charcoal iron from Davemora in Sweden, has been known to fetch in Sheffield £14 per ton at the time when (iron made with mineral coal) was selling in the same place at £6 per ton. In Germany, charcoal pig iron fetches 160 shillings per ton, against 75 to 80 for mineral coal pig iron, &c.

Mr. Schwartz discovered fire clay near Girway and near Tisroon (about 35 miles, S. W. from Gwalior). This clay is not so good as English fire clay, but always good enough to make fire bricks for steam boiler masonry cupola furnaces, and such. parts of the iron refining furnaces, where the temperature does not exceed 1,300° Centigrade.

Samples of the Gwalior iron ores of the different kinds of wood, and of firebricks made of Gwalior fire clay are at hand, and can be delivered by Mr. Schwartz if wanted.

List of Iron Ores

Occurring in H. H. Sindia's territory, discovered and analysed by Mr. Schwartz:—

Name of the villages near the place.	Name of specimen.	Average contented iron metallics in per cent.	How many miles from the forests.	How many miles from Gwalior.	Remarks.
Tantow	Red iron ores	66	50*	7	Contents partly manganese. These iron ores occur in very great quantities.
Maesora	" " "	69	50	9	
Gokolpore	" " "	65	50	2	
Dharoli	" " "	63	55	8	
Bamasri	" " "	66	50	10	
Baypoor	" " "	71	50	9	
Gokolpore	Magnetic ore	70	50	2	
Gurway	" "	66	50	8	
Besides	these are others	of inferior	quantity &c.		
Binaseri &c., Baroda ...	Brown iron ores.	45	20	45	Contents manganese.
Tonilia		45	20	70	
Seeprie and Turwaya ...	Sileceous Hams, &c. &c	43	34	64	Large quantities.
Goonjars, &c., Baran ...	Brown iron ores.	52	20	50	

THE NYNEE TAL LANDSLIP.

From Her Majesty's SECRETARY OF STATE for India,—To the GOVERNMENT OF INDIA,—No. 7 (Revenue-Forests), dated 20th January 1881.

I TRANSMIT herewith for your Excellency's information, copy of a letter dated 18th October 1880, from Colonel Pearson, proposing in view of the late disastrous landslip at Nynee-Tal, that Forest Officers who may be at home on furlough, should from time to time be deputed to visit the works in the Basses and Hautes Alpes for the prevention and repair of similar landslip on the sides of the Alps.

2. This suggestion seems worthy of adoption, and I shall be prepared to sanction the employment, on deputation, of any Forest Officer on furlough whom your Government may recommend for the purpose on the terms accorded to officers visiting works at the public expense.

From Colonel G. F. PEARSON—To Her Majesty's UNDER-SECRETARY of State for India—dated the 18th October 1880.

I AM induced by the late disastrous landslip at Nynee-Tal to do myself the honor of addressing you, with a view if possible to the deputation from time to time of any Forest Officers who may be at home from India on furlough, to visit the works in the Basses and Hautes Alpes, especially near Barcellonette and Embrun with a view to the prevention and repair of similar givings-way of the mountain sides in the Alps. There are huge landslips in the Alps which have covered the vineyards and habitations for three to four kilometres along the bottom of the valleys, and have destroyed property to an enormous value, but which have been successfully treated by various works, and especially by planting the hills around and above them, thereby preventing the water, when there is a heavy fall of rain from forming a torrent which is the main cause of these catastrophes. Some of these landslips must be three or four times the size of that at Nynee-Tal, and it is impossible to suppose that the same means which have been effective in the Alps should not equally succeed there.

SELECTIONS.

CULTIVATION OF RAILWAY SLOPES.

THE project of the South-Western Railway Company to let the slopes on its line for cultivation, reminds me of the fine apple, pear, and I think peach and plum trees in full bearing I saw trained *en espaliers* to hurdles for miles along the line somewhere not far from Agen, ten years ago when I was on my way to the Pyrenees, and how I regretted the same plan was not pursued in England. Then, too, where cucumbers, melons, pumpkins, marrows, and other sun-loving plants could not be grown for fear of disturbing the soil in their culture, strawberries might be, wholesale, as their perennial roots would tend to consolidate the bank side, and the use which might be made of the now waste flats along our various line sides, to use a French idiom, "goes without saying." When hurrying past the pools and meres resulting from railway excavations, with the water hens and their callow brood mincing to and fro on them too, I have often thought at how trifling a cost these waters might be utilised as stews for pond fish, and as abodes and breeding places for more profitable fowl.—H. N. P. W. in *Land and Water*.

TO GET A LARGE YIELD OF RICH MILK.

THE "Farm," published in England, confirms our own experience in feeding milch cows with bran. "If a large yield of rich milk is desired," says the writer, "give your cows, every day, water slightly salted, in which bran has been stirred at the rate of one quart to two gallons of water. You will find, if you have not tried this daily practice, that your cows will give 25 per cent. more milk immediately under the effects of it, and will become so accustomed to the diet as to refuse to drink clear water, unless very thirsty."

Professor J. W. Sanborn, Superintendent of the College Farm, Hanover, N. H., reports experiments in feeding cows, giving full details of weights of each kind of feed, of milk and butter yield, and weights of the animals at the beginning and end of each period. In summing up, he says, "Meal will make more milk than bran. I no longer hesitate to say. The change in the butter is remarkable: in changing from meal to bran there was a loss of 17·7 per cent. in the butter-producing capacity of milk; in changing from bran to meal there was again in the butter-producing capacity of milk of 21·8 per cent. The results in weighing the cows form an exception to previous experiments, bran and middlings keeping weight better than meal in this experiment.

"Is it a chance result," asks the professor, "or is it due to well-defined causes? I will not discuss it," he answers, "but observe that it was at the season of the year when a cow needs a carbonaceous food to maintain heat, also the grass of our pastures was browned, and in different condition from June grass or properly-cut hay."—*American Paper.*

WHOLE-MEAL BREAD.

MISS YATES, Hon. Secy. of the Bread Reform League, writes from 17 St. Edmund's Terrace, Regent's-park, to *The Times*:—Will you allow me to call attention to the statement Professor Church made at the Mansion-house conference, that "the proper ratio in food for adult use was one-part of flesh-forming substance, to about five-parts of heat-giving substance, converted into its equivalent of starch, and in whole meal there is very nearly this ratio; but in white bread the ratio was 1 to 7½, even if it was a favourable specimen?"

The great superiority of whole meal over white flour consists principally in the much larger proportion of bone-forming substances that it contains. Professor Church, in his standard work on "Food," states that whole meal contains 1 7 of mineral matter, whereas white flour only contains 0·7, and Liebig states that whole meal contains 200 per cent. more phosphatic salts than fine white flour. As it is these phosphatic salts which form bones and teeth, and nourish the brain, nerves, and tissues, it will be at once understood how essential it is that poor children should be able to obtain a bred which contains them—for their parents cannot afford to give them meat, milk, and eggs, to replace the phosphates and flesh-forming substances extracted from white flour.

The ordinary processes of milling reject about 25 per cent. of the grain. Professor Church states that only about 2·6 of the grain is innutritious so that 22 per cent. of valuable food is wasted in the manufacture of white flour. When it is realised that these rejected portions would feed, as Dr. Bartlett stated, many thousands of our paupers, the necessity for bread reform is very evident.

We do not, however, simply prove our case by mere chemical analyses. Considerable personal experience among Egyptian fellaheen and Sicilian peasants (who live principally on bread) has proved to me the truth of their statement that wheat-meal bread satisfied and sustains much better than white bread does, and that a much larger amount of work can be done on wheat-meal bread alone than on white bread alone.

As any one can easily put this statement to practical proof, we confidently appeal to the public to assist us in our endeavours to procure the general use of a bread which will enable every poor person to obtain proper nourishment, and give every child a fair chance of growing up strong enough to do his work in the world, instead of being a burden to society and a misery to himself.

ARTESIAN WELLS IN THE DARLING COUNTRY.

(From the Sydney Mail, Feb. 5.)

AT the last meeting of the Linnæan Society, Mr. C. S. Wilkinson, the Government Geologist, being furnished with notes from Mr. H. A. Gilliat, Government Tank Inspector, imparted some interesting information regarding the progress of well-boring near the Darling River. Mr. Gilliat, on his recent visit to the splendid tract of pastoral country owned by Messrs. Officer & Co., was shown by D. Brown, the Manager for those gentlemen, on the Wee Wattah Station a bore down 142 feet, from which good fresh water of a temperature of 82deg. was flowing to a height of 10 feet through the four-inch pipe. [The machine employed is Wright and Edwards's Australian Water Auger.] This well, when first sunk, realised 50 gallons per minute, but owing to chokage by sand in a few days this quantity was reduced considerably, and when M. Gilliat was on the ground, the flow was not equal to one-fifth of the original yield. Wee Wattah is 18 miles north from the Darling, and is distant from Wilcannia about 80 miles. Close to the bore mentioned, there is a mud spring 40 feet in diameter, in which, although water does not flow from it, that fluid is always found. Near to this spring five bores have been put down, to depths varying from 134 feet to 142 feet. From all of these water has been obtained, but it is only the 142 feet bore, the one described above, which is now open, all the others were choked by the drift. The boring at Wee Wattah is through clay, and clay mixed with drift. At Mulyer, 14 miles north-east from Wee Wattah, and 24 miles back from the Darling, Mr. Brown recently put down four bores close to an old spring. All of these are running, although the pipes have, on account of the smallness of the supply, been drawn from three. In the last of these bores water was struck at 17 feet, and it is now flowing from a depth of 49 feet at the rate of 12 gallons per minute, its temperature being 63 deg. Fahr. The flow ceases at 4 feet above the surface; the pipes are 4 inches in diameter. At Gomery, 25 miles back from the river, on Messrs. M'Caughey & Co.'s Tourale run, there is a well bored to 100 feet which yields a small supply. Of this Mr. Gilliat has only meagre particulars. It is reported, too, that water has been struck by an artesian bore on the Gualla run, 60 miles from Wilcannia, and it would seem that there is among the lessees of the Darling country a disposition to expend large sums in thoroughly testing its subterranean water stores.

MONSTROUS FUNGI.

VISITORS to ancient wine vaults or damp coal pits are sometimes astonished by the curious fungi which drape the walls with gruesome tapestry; but every instance of this kind is thrown into the shade by the extraordinary growths which have recently been discovered in some of the deserted Mexican silver mines of Nevada, United States. The dank, warm timber galleries and drifts of these old workings, abandoned to themselves for years have silently given birth to a monstrous brood of morbid vegetation, which apparently, has no parallel in the regions of the sunlight and the upper air. In general they are all of a snowy whiteness, and some of the hooded masses rise up several feet from the ground like sheeted ghosts. Others, in the distance, take the form of bearded goats or sleeping owls. Here great bunches of long white hair hang down from the roof and there huge pulpy masses encumber the floor like bosses of brainstone corals. The latter appear to have sprung miraculously from something spilled upon the rocks in past days; while the former seems to have crystallised like hoar-frost from the atmosphere itself some of the roundd masses have actually lifted up from the floor blocks of stone weighing ten, fifty, and even a hundred pounds, to a height of three feet. In the higher levels of the mines, where the air is drier, the fungi are far less bulky than below, and much firmer in texture. The shapes here are, however, more elaborate and beautiful. One kind grows in a twisted spiral, like a ram's horn, to a length of five feet, and hangs from the rafters like a trophy of the chase or, rather, like a serpent suspended by the tail. Another sort sends out a stem the thickness of a pencil to a height of one or two feet, where it blossoms into a bulbous knob something like a flower. Nothing like the toadstool or the common mushroom is to be found, and the wonderous growths have all the aspect of being called into a special being by the peculiarties of their environment.—*Globe.*

INDIAN WHEAT.

DR. FORBES WATSON'S Report of 1879 on the samples of Indian wheat forwarded from India has now been supplemented by a second Report on the samples received at the India Office last year from the Punjab. These samples show a marked improvement in quality and condition upon those formerly received. They are less weevilled, and generally worth more money, allowance being duly made for the rise in market values last year. The 192, samples averaged a value of 46s. 10½d per quarter, as compared with the former average of 39s. 8d. for all India. Only seven fell below 42s. while 14 per cent. of the previous samples did not come up to 37s. a quarter; and of these seven all but one came from Dera Ghazi Khan and Dera Ismail Khan. Their low value was due to "dirtiness" which includes an admixture of barley or other grain. Thirty-one samples of "soft white' ranged in value from 51s, to 46s. 6d. and in weight per bushel from 59lbs. to 65lbs. One of these from Muzuffargarh, is ranked with the "very finest" Oregon wheat; eight with "very fine" or "fine" Australian, four with Chilian, one with Californian and two are described as "extra No. 1." Not one is quite equal to the best Delhi sample of the previous report. Of "hard white" there are sixty-seven samples averaging 46s. 9d. a quarter against 39s. 5d. for all India in 1879. They range in value from 50s, for the Jhang sample and 49s. 6d. for one from Muzuffurgarh down to 32s. for a very dirty sample from Dera Ghazi Khan. Their weight various from 54½lbs. to 64lbs. per bushel. The best of these are likened to pearl barley or to kuvanka, and only the five worst fall in value below 45s. a quarter. The "soft red" samples are thirty in number, ranging in weight for 58½lbs to 63lbs. per bushel, and in value from 44s. to 48s. 6d. a quarter. Many of them are likened to No. 1 or No. 2 red winter, and the dirtiest samples come from Dera Ismail Khan, but these are better than the "inferior" sorts of 1879. Of the fifty-nine samples of "hard red," as many as fifty-eight range in value from 43s. up to 48s. 6d. a quarter, whereas in the former valuation none of them rose above 39s. a quarter. Allowing 8s. a quarter for the rise of market prices, we still have "a marked and characteristic advance" in the value of the present samples as a whole. The best come from Goojerat, Rohtak, Kohat, Jhang, Delhi, Gurgaon, Rawul Pindi, and even from Dera Ghazi and Dera Ismail Khan, while the last named also contributes the worst. More than half of them are valued at 47s. and upwards, and several of them weigh from 63lbs. to 64½lbs. per bushel.—*Home News.*

NOTES ON USEFUL PLANTS.

(From the Kew Report for 1879)

(Continued from page 103.)

The supply of India-rubber, or caoutchouc, is a question that has of late years occupied the attention of commercial, as well as scientific men. It has received a good deal of attention at Kew, as the following extracts from reports from various parts of the world will show:—

1. CASTILLOA.—SINGAPORE.—Mr. Murton reports:—"The plants of *hevea* and *castillon* in the gardens are now large plants, but hitherto propagation from the strong growths they are making, seems rather difficult, whereas they used to propagate freely from the weak wood produced while in pots."

2. CEARA SCRAP (*Manihot glaziovii*)—BURMAH.—Major Seaton reports:—"A quantity of seed of this India-rubber tree was received during the latter part of the season from the Botanical Gardens, Peradeniya, Ceylon; and at the request of Dr. Thwaites, an intelligent lad was deputed to Ceylon to receive instructions in the cultivation of India-rubber plants."

CALCUTTA.—Dr. King reports:—"The Ceara rubber promise to grow well in Calcutta. The seedlings received from Kew have thriven vigorously, and some of them are now 20 feet high. The Director of the Botanic Garden in Ceylon having, at the request of the Secretary of State for India, undertaken the propagation of this species, a quantity of seeds of it were distributed by him to Indian officers during the year. Supplies were, I understand, sent to the Conservators of Forests in Burmah and Assam, and to the Inspector-General of Forests for Madras. A large supply was received at this garden, and a thousand seeds were sent at the request of the Conservator of Forests for Bengal, to the officer in charge of the forest plantation near Chittagong. The seeds received here have begun to germinate, and I expect before long to be in a position to issue supplies of seedlings for trial in different parts of the country. The plant appears to thrive very well in Upper India, and if the quality of rubber yielded by it in this country turns out to be good, it sintroduction may prove of much importance."

SINGAPORE.—Mr. Murton reports:—"Ceara scrap rubber must be omitted from the list of rubbers adapted to the climate of the Malayan Peninsula, as it has invariably rotted off during continued wet weather."

ZANZIBAR.—Dr. Kirk informs me that with him the Ceara rubber yields seed most abundantly, but the seeds are slow to germinate.

3. HEVEAH.—BURMA.—Major Seaton reports.—"At Mergui eight Para India-rubber trees, the survivors of the batch of seedlings received from Dr. King in 1877, continue to do well in the office compound, and vary in height from 8 feet to 25 feet.

They are large enough to admit of a considerable number of cuttings being taken from them."

CALCUTTA.—Dr. King reports:—"Para rubber, of which 14 plants were alive in the garden at the date of last report, continues to be as disappointing as ever. Most of these 14 plants are still alive, but they have not grown much, and; it is quite clear to me that it is vain to hope that this species can ever be cultivated to profit in this part of India. Plants may be coaxed into growing in conservatories, but the species is by far too thoroughly tropical to withstand without protection the vicissitudes of the climate of Northern India. As I have before reported, I believe it is useless to try it any where in India, except in the south of Burmah or the Andamans, and perhaps in Malabar. I learn from Dr. Thwaites that in the Botanic Garden at Peradeniya, in Ceylon, there are plants of *hevea* of about 30 feet high, and that these are of the same age as the plants here, the highest of which is barely 6 feet in height.'"

JAMAICA.—Mr. Jenman reported:—"I regret to say that there are only two plants of the Para rubber in the garden, one which I brought with me, and which is now a vigorous young tree 10 feet high, the other, the only one saved out of a case of 16 plants sent from Kew Gardens over two years ago, but which unfortunately on its arrival on Kingston, was locked up in the Custom house for over a fortnight to the influence of which, after the voyage all but the one succumbed. The atmospheric conditions of this district appear favourably adapted to the successful cultivation of the Para rubber."

ZANZIBAR.—Dr. Kirk states:—"The Para rubber is a less quick grower than the Ceara, and does not branch. It is 10 feet high."

Like India-rubber, Liberian coffee, about which so much was written and expected a few years since from its introduction and acclimatisation into many of the British Colonies, has received a considerable amount of attention in the present report. In Burmah, it is said to be thriving and showing signs of flowering, so that it is hoped some opinion of the economic value of the coffee may soon be known.

From Dominica, the late Dr. Imray wrote as follows:—

"I am glad to say that the Liberian coffee cultivation may now be fairly considered as established in this island. The fine, healthy, luxuriant trees on my small plantation, with a crop of berries on many of them, afford sufficient evidence of the climate being congenial to the plant. The cultivation is successful, and only awaits extension by others taking it up. I have several thousand seedlings planted out in the open, and thriving well. I lost a good many seedlings, however, by putting them out when too small. To ensure their rooting they should be pretty well grown before they are transferred to the field. Protection of some kind or other is also advisable at first, as well from the scorching rays of the mid-day sun as from strong winds. When fairly rooted and growing, the plants are hardy enough, and will bear a good deal of exposure and neglect."

Dr. Imray further remarks on the coffee-leaf disease of Dominica (*Cemiostoma coffeelium*), which had succumbed in clearing off the old *Coffea Arabica* plants, but which it was hoped would not find a resting place on the new plants, that it really had attacked the plants in their very young state, and only on the cotyledonary leaves. The leaves were cleared by killing the larvæ, and brushing off the chrysalis wherever it appeared; after this the seedlings steadily increased in size, throwing out fresh leaves, after which most of them were planted out in the field, and were thriving well, with not a speck of the blight on them. Dr. Imray says:—

"This, however, is not the only attempt the insect has made to gain a footing on the Liberian coffee. On carefully examining the large trees some six or eight months ago, a few leaves were found where the insect

really had established itself, but in a very feeble manner. Some of the larvæ were lively enough, but others small and weak, and the skeletons, if I may so speak of others that had died, were found in the brown patches of the leaf, when the upper and under cuticle were separated. Very few cocoons were observed, and these were smaller than usual."

This report from Dominica, which is given *in extenso* in the Kew report, concludes with advice as to the absolute necessity of protecting the seedlings from the ravages of the white fly, without which protection very few of the plants will be saved.

In Jamaica it seems there is a great demand amongst planters for this kind of coffee, but attempts on the part of private persons to import either plants or seeds have failed. The plants, however, in the Jamaica Botanic Garden, have ripened their seeds, which have been sown to increase the stock.

From Seychelles, Mr. E. S. Salmon, the Chief Commissioner, writes:—"About 150 plants of Liberian coffee—mostly raised from seed you sent—have been planted at Mahe Island, at elevations varying from the shore to 1,500 feet above sea-level. It comes best, apparently so far, in the open without shade. One plant at an elevation of about 300 feet, without any shade and close to a granite rock giving out considerable heat, has about 100 strong looking flowers on it. This plant is 18 months old."

From Singapore:—

Mr. Murton reports:—"The Arabian coffee here is severely attacked by the disease (*Hemileia vastalrix*), which has destroyed all hopes of our being able to supply seeds for plantors in the Peninsula. The Liberian coffee has not yet shewn any signs of being attacked, although some Perak planters have been scared by yellow blotches on the younger parts of the branches." (They appear to have no connection with the disease.) "The species is evidently very impatient of deficient drainage. The plants raised from seeds received from Kew in May, 1878, are now blooming profusely. Eight hundred fruits from our plants have been sent to Government Hill, Penang, and 500 sent to Perak. Very favourable reports have been received from the Native States regarding the progress of the plants of this species there, and there can now be no doubt that the Liberian coffee has found a congenial home in the Malayan Peninsula and adjacent islands, and its future propagation may now be left to planters."

In Queensland, Liberian coffee is said to have become thoroughly established on the Herbert river, where it promises to attain complete success; while from Zanzibar the plants are reported to be in flower.

THE RECENT PLOUGHING MATCH.

MR. W. R. ROBERTSON, M. R. A. C., Superintendent, Government Farms, has submitted to the Board of Revenue, Mr. Benson's report on the ploughing matches recently held near Madras. The general arrangements of the competitions in the field were carried out by him and afforded general satisfaction. Mr. Robinson remarks:—"The match, which is an annual one, has hitherto been held on land belonging to the Farm at Saidapet, but at the time when it was thought desirable to hold the match, there was no suitable land available at the Farm. The land was well suited for showing the working capabilities of the ordinary and improved ploughs. An opinion was expressed by some of the visitors that the work to be done was too severe for the capabalities of native ploughs; but such land has not unfrequently to be ploughed, by these ploughs; however, instead of endeavouring to produce the necessary degree of tilth by one operation of the plough the ryot is content if, in dealing with such land, he can effect the tillage required by half a dozen ploughings. It is in the marked superiority of its work, and the low cost at which this is effected that the improved plough excels to greatly that in ordinary use, it has been contended that to economize the time of the ryot is a matter scarcely worth consideration, but such reasoners lose sight of the importance of *expediting tillage operations* in ordinary seasons in this country, when even a day's delay in getting in the seed may cause a difference of 30 per cent. in the yield of the crop. And it must be remembered that during the past twenty years, the price of labor has increased fully 30 per cent. and that therefore even though a ryot may farm on such a small scale as not to require the aid of employed labor, his own labour is nevertheless of greater market value, for such men not unfrequently supplement their form of earnings by the hire they obtain for their own labor. It will be observed that the country ploughs did not penetrate the ground to a greater depth than about 3 inches, while the improved ploughs, the draught of which was very little greater, worked the soil on the average to a depth of about 4½ inches. The section of the furrow made by a country plough is a triangle with the apex downward, while that made by the improved plough is a rectangle. Assuming that the furrow of a country plough was 4 inches wide at the top and 2 inches at the bottom, in ploughing a mile the plough would move only about 12 cubic yards of earth, and this be it remembered is only stirred and loosened after the manner of a cultivator, and not raised and inverted. In an ordinary day's work, the country plough would probably travel 16 miles, loosening and stirring only about 196 cubic yards. The improved plough, working to the depth of 4½ inches, would turn a furrow 8 inches wide, the section of which would measure 36 square inches against 9 square inches, the area of the furrow-section of the country plough; while in a mile the improved plough would turn over 49 cubic yards of earth, or in a day's work of 12 miles 587 cubic yards; thus performing as much work as three country ploughs. In these calculations I have made an allowance for time wasted at the headlands. Ryots, therefore, whose holdings are above 50 acres in extent could readily obtain the means required for purchasing an improved plough or ploughs by selling one or more of the pairs of cattle the services of which the adoption of the improved plough would enable the ryot to dispense with. The extra cost attending the employment of the improved plough would be met by the lesser expenditure on labor and cattle-keep from fewer labourers and cattle being required than when the holding is cultivated entirely by country ploughs. It is a matter of importance, I think, that I should point out that six of the improved ploughs engaged in the match have been regularly at work for more than twelve years, and are now almost as good as when they were purchased. The *durability* of these ploughs should be taken into account when their comparative high cost is considered."—*Madras Mail*.

MANILLA HEMP.

MR. LIOTARD, of the Agricultural Department of the Government of India, has this year (1880) reported on the materials in India suitable for the manufacture of paper. Several of the fibre-yielding plants are mentioned by him and, amongst others, various species of the genus *Musa*, of the plantain or banana tribe, many of which have been grown in the East Indies from the most remote times. At pages 54 to 56 he describes the introduction, in February 1858, of the Manilla hemp plant, direct from the Philippines, into the Madras districts, by Colonel (now Sir George) Balfour. Nevertheless, the Import Trade Returns of the United Kingdom show a large and continually increasing delivery of hemp from the Philippine Islands, now averaging yearly about 20,000 tons, valued about half a million sterling. I have ascertained from the London Produce Brokers, through Dr. Birdwood of the India Office, that this imported article is the true Manilla hemp from the *Musa textilis*, that the bulk of it is delivered in London, where it is made up into cordage and ropes for ships, especially for yachts running rigging, being very light, strong, and clean, and also for clothes lines. But there is no doubt that the Manilla hemp plant, *Musa textilis*, grows as well in British India as other species of the plantain or banana genus, and that British India could, in a couple of years, supply the London market with all that it could take of Manilla hemp fibre. The prospect of benefiting British India by creating an export trade from it of the extent and value above indicated might well incite to considerable efforts to attain success. In 1861 to 1863 the Madras Revenue Board made continuous efforts* to secure the naturalisation of the plants which Colonel Balfour had introduced; but their efforts seem to have been effectual only in the Wynaad,* from which, by 1877, the Conservator of Forests replied that the Philippine variety had been introduced on several of the coffee estates where it grows remarkably well, and no doubt is felt there as to the value of its fibre. The attention of of the Boards and Commissioners of Revenue and of the Agri-Horticultural Societies might be redirected to this plant.

Year.		Cwt.	£
1877	..	332,3·4	488,069
1878	..	491,160	651,856
1879	..	337,687	484,087

* 1861,	24th April,	No.	2,128.
„	31st May,	„	2,785.
„	1st June,	„	2,847.
„	21st „	„	3,226.
„	25th „	„	3,301.
„	5th August,	„	4,212.
„	5th „	„	4,219.
1863,	18th February	„	894.
„	16th „	„	988.
„	24th September	„	6,098.

EDWARD BALFOUR, SURGEON-GENERAL.

2, Oxford-square, Hyde-park,
London, 15th October 1880.

BRAZILIAN COMMERCE IN 1880.

THE *Journal do Commercio*, which undoubtedly stands at the head of the Brazilian Press, in its issue of January 9th, published (as has long been its custom) a voluminous retrospect for the preceding year. As illustrating the growing importance of the mercantile, agricultural, and industrial movements of progress in the great South American Empire, we will place some of the more significant facts and figures marshalled by our able contemporary and very admirably summarised in a special supplement of the *Anglo-Brasilian Times*, before the readers of our own journal.

The agricultural interests of Brazil,—the broad and stable basis of its national prosperity—has naturally received perferential consideration. Indeed, the prospects of agriculture in Brazil is at present a subject of serious discussion. The actual situation has given rise to a feeling of anxiety, in some minds amounting to positive apprehension. By a noble effort, the Brazilian people have struck a mortal blow at the institution of slavery, and in the course of a few years servile labour must cease to be available for agriculture. In view of this imminent change in the labour conditions of the country it is of course necessary, more particularly on the part of the public authorities, to adopt measures of timely precaution. It is the duty of the Government to provide against any evils that might ensue from a sudden cessation of slave labour before its substitution by free labour has been secured; and as we have every reason to believe, Brazilian statesmen are fully awake to the requirements of the situation, we may hope that they will be prepared to meet the demands of a proximate future. "Trade," remarks the *Jornal do Commercio*, alluding to this subject, "is anxiously awaiting the results of individual initiative and of the energetic action of the public powers, because the development of commercial business is intimately bound up with the development of agriculture. Without looking upon Brazil as essentially agricultural, we must acknowledge that agriculture, or coffee growing, will for many years yet form the fundamental basis of our commerce.

As a producer of coffee indeed Brazil occupies the first place; no other country, in this respect, coming within what may be called "measurable distance" of the Empire. The following figures, showing the comparative production of coffee in 1855 and in 1878 is interesting. They are derived from a German source:—

		1855.	1878.	
Brazil ...	...	163,400,000	225,500,000	Kilos.
Dutch possessions	...	71,832,000	91,404,000	„
West Indies ...	...	29,300,000	41,800,000	„
Ceylon ...	...	28,315,000	53,422,400	„
South Africa ...	...	22,815,000	35,890,000	„
Arabia ...	...	6,176,000	2,779,200	„
Africa ...	...	4,000,000	4,000,000	„
Central America	...	3,500,000	32,500,000	„
Philippines ...	...	1,358,720	3,396,800	„
Oceania ...	...	—	150,000	„
		330,151,980	490,843,200*	

With regard to exports, we find the following:—

It will be seen from this statement that Brazil sends to market nearly half (49·1 per cent.) of the entire coffee production of the world, but it may also be observed that in several of the countries abovenamed a notable development has evidently taken place since 1855. In this sense the most remarkable example is Central America, whose production in 1878 was 32,500,000 kilogs., against no more than 3,500,000 kilogs. in 1855. Thus, though the Brazilian supremacy is indisputable, the planters of Brazil will do well to remember that they cannot afford to neglect any means of maintaining the honourable position they now hold in the coffee markets of Europe and the United States. They have of late been favoured with abundant crops, that of 1878-79 having been 3,705,980 sacks of 60 kilogrammes, and that of 1879-80 about 2,909,038 sacks, whilst, on account of that of 1880-81, for the first six months ending December last, 2,337,067 sacks had already been exported. With regard to the next crop our contemporary states:—

* This estimate is a good deal below the mark for the world's production—see our Handbook.—ED., C. O.

"We now know that the flattering hopes aroused by the first florescence have not been realised; still, though the old trees may not give all they promised, the new trees are affording more than was expected, and our information leads us to estimate the next crop at 3,000,000 sacks."

We concur with the *Jornal do Commercio* in believing that the agriculture of Brazil very materially depends, for its continued and permanent development, on the opening up of cheaper and more rapid means of communication from the interior to the seaboard ports, but it is only fair to add that the Imperial Government has, in this direction, done all that its revenue resources would permit, and has never failed to give legitimate countenance and support to every suitable enterprise calculated to stimulate into productive activity the vast territories still devoid of locomotive or other adequate transit facilities. The establishment of hypothecary banks, for the assistance of agricultural industry, is at present a topic of earnest controversy in Rio de Janeiro. Presumably, such institutions might be advantageous in promoting agricultural effort, but it is questionable whether, as is proposed, the Brazilian Government ought to grant a guarantee of interest on the capital engaged.

The year 1880 was not favourable to coffee exportation. The movement was always irregular, some days of great activity being followed at once by long periods of paralysation. The European markets remained apathetic during the first half-year, and the prices were constantly low there, whilst in the United States the presence of large cargoes, presumed to be for account of the Brazilian Government, kept speculators away. Here the holders and the buyers found agreement difficult, as the latter could not go above certain limits in accordance with the situation of the markets the shipments were for, whilst the sackers were unwilling to sacrifice the article, by selling at a low price, and made the greatest efforts to sustain their pretensions. In the last months of the year, when coffee fell considerably in the American markets, some New York and Boston merchants, unable to meet their losses thereby, suspended payments. But the case did not produce the impression feared here and the fortnight in which the news of the failure came was that of greatest sale here.

In tobacco the year 1880 was unprofitable, if not, indeed, one of the losses and liquidations for all the classes depending on the manufacture of Minas tobacco. The low prices which prevailed almost unchanged throughout the year, despite a considerable decrease in the harvest, was attributed by the interested parties to the perturbation produced, in commercial relations by the new taxes. But, whilst we acknowledge that the taxes contributed to the evils pointed out, we believe that the principal cause of the decline in prices to the point of being unremunerative consisted in the narrowness of the circle of our foreign customers. And thus the three years of abundant crops prevented the expected reaction after the suppression of the imperial taxes, by permitting the supply to exceed the consumption.

The liabilities of the Empire on December 31st, 1880, were about £70,000,000.

On the whole, the commercial record of Brazil for 1880 is not unfavourable, and presents many features of encouragement for the future.—*South American Journal.*

AN IMPROVED KAISARI PLOUGH.

THE first time I saw one of these implements was in January last, when it was tried in the Government garden, there seemed to be two defects in it. I: The beam was too short. II. The angle the beam made with the handle was too obtuse. At the suggestion of the Deputy Commissioner W. Coldstream, Esq., C.S., defect No. II. was to a great extent modified. A fresh hole was drilled in the handle about four inches lower down. At the second trial better results were obtained, the plough did not wabble or evince such a strong tendency to get out of the ground, and turned up a furrow much deeper than anything the native plough could show, but at the same time there was still a chance of laming the bullocks by running the pointed "share" into their heels—moreover the rope which ran through the eye or hook at the end of the beam and terminated in the yoke, had to be tolerably long, or else the upward strain drew the plough share out of the ground. Here again in remedying one defect we encountered another—the length of rope was such that practically the bullocks were out of control—and for this defect there was but one remedy, that being, to discard the short beam once and for all, and put in a beam which should be fastened with a loop and pin into the yokes on the oxen's necks.

This was done, and the results obtained most gratifying. A deep furrow and complete inversion of the soil was effected, the driver or ploughman had his animals completely under control, he could twist their tails to his heart's content, the motion was very even and regular, and at the same time, there was no fear except in unskilful hands of the animals being lamed by the sharp-pointed share.

The same plough was tried afterwards on rough ground which had never been ploughed within the memory of man, it answered very well, nothing could have done better. A native plough was tried on the same piece of land, and was nowhere. Natives like it, *ordinary* cattle costing Rs. 50 a pair, will drag it with ease, and under *ordinary* circumstances will give a furrow about six inches deep, though by the exercise of considerable physical force the ploughman *can* loosen the soil to a depth of 8" or 9."

There is every season to hope that the natives about here will take to them in time, as they admit their superior performance and consequent economy.

Another plough was made up here.

Wooden *vertical* handle, wooden beam, bolted to handle, and capable of being regulated to suit any sized bullocks from the largest to the smallest, to enable it to do this, a wrought iron "skife" is bolted to the angle iron slade, through this skife are drilled four or five holes, and into any one of these holes the beam can be adjusted to suit the size of the oxen.

Slade is of angle iron 2¼"×2 ¼"×¼." Share is of steel breast of ¼ plate worked out to the proper shape, at its lower end rivetted to the slade and at its upper end secured to it by a strip of plate 1"×¼." rivetted half way between handle and skife to the vertical flange. It is somewhat heavier than the "kaisari," but in my humble opinion more effective. On Thursday last I gave it what may fairly be considered a good test, a field of old canes or more strictly speaking young ratoons had to be ploughed up, work was commenced in the morning, by evening one beegah of land had been ploughed. I should add, however, that the bullocks had been to the slaughter house in the morning for bones and had made two trips before being set to the plough. The old roots were cut through and torn clean out of the soil bringing out clods of earth weighing about 20 to 30lbs. Crowds of natives assembled to see the *tamasha*, and admitted that with their implements they would have had to plough up their soil *six to seven times* before they could have produced the same effect.

In carrying out the modifications of the kaisar plough as detailed above, Messrs. Ransomes, Sims, and Head, Primitive Plough, P. I. L., *vide* their catalogue No. 1420E, page 28, was taken as a standard, their ploughs weigh as much as 98lbs which is very heavy, and cost in their shops at Ipswich £1-10s, extra "shares" cost 11 shillings per dozen.

The kaisari and its modification do not cost more than Rs. 4 to Rs. 4-8, and each "share" costs 2 annas, or Re. 1-5 per dozen.

There is one advantage about these ploughs, *viz*: that should you wish to prepare that soil before the rains, say early in June, these ploughs will turn up its surface however baked, and hard it may be. Whereas the native plough cannot do anything of the kind, in fact the chances are it would break to pieces before you had done one kanal of land—(1 kanal 1/10 of an acre)

A light though at the same time very effective ridging plough might be made on the principle of the kaisari by substituting a ridging share for the ordinary triangular piece now made up, and constructing two moveable breasts to be adjusted to any angle. For turnips, maize and wheat, an implement of this sort would be found very desirable.

THE VALUE OF SAWDUST MANURE.

I AM glad to see that Mr. Westland has put the question as to the value of sawdust manure. The same thought had occurred to me more than 12 months ago in regard to its usefulness or otherwise for horticultural purposes. My experience here, amidst so much market-garden farming, had previously fully established its reputation as a highly-fertilising medium for fields and field-grown crops. As, however, from some cause not yet explained this material did not appear to be so popular as it should be, and knowing its value from personal observations made during my frequent visits to farmers around, I determined upon having a wagon load, and to test it for myself, as I am so frequently asked questions in regard to a manure readily obtainable for the use of amateurs. The load which I got came direct from the London General Omnibus Company's yard. It was quite fresh, and was very hot from fermentation. I had it shot in a convenient place for a day or two, and then began to test it. It would take up too much of your space for me to give in detail what I consider to be the complete success of my trial of this material with all kinds of crop, not excepting grass sward, vegetables, fruits, &c., especially raspberries, the canes upon which are now half as large again as they were previous to its use. I will give but one fact in regard to it, which I think speaks loudly in its praise. At the time I commenced to test it I had living in the greenhouse two dozen each of hyacinths, narcissi, and tulips, which had not yet been planted, though it was getting late in the season for so doing. To test this material I had a large box filled entirely with the material, and without even the addition of soil of any kind. The bulbs were then pressed firmly into it. First a row of dwarf tulips, then a row of tournesols, another of hyacinths, and at the back two of polyanthus narcissi. These made a wonderful start. The roots seemed to run rapidly into the sawdust, and fine breaks were made. When the leaves with flower spikes were some 4in. long, I had an intention to pot them off into very small pots for our Whitsuntide church decoration. Imagine my surprise when I found the roots so matted together that I could not separate the bulbs in any other way than by cutting them out in squares about the size of the bulbs. I tried to pull some up, but the stalks, flowers, and all, parted from the bulbs rather than lose their hold on this free, open material. The half which I left to bloom undisturbed in the box garden gave exceptionally fine spikes, &c. No greater proof is wanting that this manure is perfectly innocuous, and most valuable. I think it has received a most undeserved bad name from the fact that "sawdust manure" was at one time only to be had at the Zoological Gardens. Doubtless this mixture was too powerful for direct application to any vegetable growth. Those who now use it say little for or against it, because, as it is got very cheaply, it is to their interest to do so. It is in great demand in the neighbourhood of Manchester.—WILLIAM EARLEY.—*Gardeners' Chronicle.*

THE CONSUMPTION OF CAOUTCHOUC, OR INDIA-RUBBER.

FROM the report of Messrs. Hecht, Levis, and Kahn, on the trade in India rubber during the year just passed, we gather some idea of the importance of this commodity from a commercial point of view. It seems that larger supplies of most kinds of rubber came into the markets than in the previous year, and there was a largely increased consumption, especially in the United States of America. High prices ruled throughout the year, fine Para realising as high a price in April last, as 3s 9d. per lb. The total export to from Para to all parts are estimated at 8,500 tons, being an increase of 640 tons against 1879. The imports into London and Liverpool were 8,768 tons against 4,651 tons in 1879, showing a falling off 888 tons. The United States have therefore absorbed 1,400 tons more than in the past year.

INFLUENCE OF THE INTENSITY OF LIGHT ON THE DECOMPOSITION OF CARBONIC ACID IN PLANTS.—The last number of the *Annales des Sciences Naturelles* to hand contains a translation of an article on this subject, which originally appeared in a Russian publication. We extract the summary:—1. For a whole series of plants there is a maximum intensity of light favourable to the decomposition of carbonic acid: and if this maximum is exceeded, the plant never decomposes more carbonic acid, though in some cases the energy of decomposition is diminished under an excess of light. 2. A jet of gas equal to 56 candles is able, if the dark rays be carefully absorbed, to cause an extraordinary decomposition of carbonic acid, the quantity of oxygen liberated being in relation to that obtained under the influence of the sun as three to one. This indicates the existence of a favourable maximum intensity of light. 3. The existence of a maximum is probably intimately connected

with the changes of position and size of the grains of chlorophyll. 4. This maximum is of the utmost importance in studying the influence of the coloured rays on the decomposition of carbonic acid, and it also partly explains the contradictory opinions entertained by different writers.

PERPETUAL FLOWERING CARNATIONS.—Year by year the number of growers of these beautiful sweet-scented winter-flowering plants seems to increase, and those who do grow them can seldom get enough. It is also very satisfatory to know that they are easily raised from seeds. Some time ago it was recorded that Mr. Charles Turner of Slough, sowed some seeds in January, and flowered the plants in the autumn following. The variety from which the seeds were saved was the rather recently introduced variety, A. Alegatiére. The habits of this variety is all that can be desired when dwarf bushy plants are in request, and its bright scarlet flowers are very showy. It is is not likely that any light-coloured flowers would be raised from this variety without crossing them, but it would be well to do this; it would not be easy to say what would be the result of crossing with dwarf white or flesh-coloured flowers. Although these dwarf forms are well adapted for some purposes, the height of many varieties is not objectionable. Of these may be named King of the Belgians, a fine rich rose; La Belle, white; Miss Jolliffe, pale pink; Rose Perfection, Scarlet, Defiance, and one or two others. There seems to be a craving for dwarf plants of everything, but in many cases this does not improve them, and sometimes it is the other way. The moderately tall forms work well in amongst other plants, and are at all times effective.

CONCERNING THE PLOUGH.

THE journal of the Anthropological Institute lately contained an interesting paper by Mr. E. B. Tylor, on the origin of the plough and wheel carriage. We propose to give our readers a sketch of several of the earlier stages by which the former of these useful implements has arrived at its present state of perfection. To some of Mr. Tylor's readers, who have never left the shores of England, it may have seemed that several of his conclusions were rather conjectural. From the pointed stick to the steam or electric plough, there is certainly a vast gulf, which requires a considerable effort of unaided imagination to bridge over. As a matter of fact, however, the imagination is not left without the help of solid facts. Those who have travelled among primitive peoples, and in Eastern lands, will have met with numerous intermediate forms actually in use at the present day. It is thus that a knowledge of the different stages in civilization of the men now living, affords us the means of ascertaining the steps by which the race has progressed in the past.

The primitive agricultural implement is the pointed stick. Here we seem to have the original whence have sprung, during the long course of ages, and by many curious modifications, all the principal implements of modern agriculture. The spade, the plough, the harrow, the roller, the sowing machine, can all be traced back to one and the same lowly origin. The natural laziness or intertia of human nature is so strong that we can well conceive how the beginnings of agricultural life might have been indefinitely prolonged had the primitive man been compelled first to invent an implement for the purpose. This, however, he had not to do; for the pointed stick had already been his daily companion, for probably thousands of years before he began to till the ground. It was both a weapon and an implement. With it he was wont "to dig up eatable roots, knock down fruits or dry branches for fuel, and even, if need were, break an enemy's head." In Lichtenstein's time the Kaffirs used the assagai or spear, and the kirri, both as weapons and as implements of husbandry: the kirri being a stick about two and-a-half feet long with a knob at one end, which served the double purpose of a club in war, and a dibble and clod-breaker in peace. The pointed stick, either by itself or along with more improved implements, is of amost universal use at the present day among those semi-savage tribes who have made the first rude beginnings in agriculture. It is in use among the Veddahs of Ceylon and the Hill Tribes of India generally, in New Guinea, Fiji, and the South Sea islands, and to a less extent in Africa and America. It is usually assumed that the spade is the predecessor of the plough; which is doubtless true if we look at their actual introduction into modern agriculture. But this must not be supposed to mean that the spade was one of the steps by means of which men came a length to invent the plough. For, as Mr. Tylor points out, it does not appear as if the plough was developed from the digging-stick by passing through the transition stages of the spade. Rather it would seem as if the plough and spade were divergent branches from the same parent. Like certain variations in the vegetable and animal kingdoms, which soon reach the highest devolpment of which they are capable, the spade would appear to have undergone at a comparatively early period almost all the improvement of which it was susceptible. The plough, on the other hand, when it diverged from the original digging-stick in long bye-gone ages, and before the dawn of history entered upon a career of progressive improvement, the end of which we do not even yet see. Let us recall a few of the intermediate stages.

The primitive pointed stick, implement, and weapon in one, seems to have undergone two modifications; its point being in the one case flattened like a paddle, and in the other bent. The former diverged in the direction of the spade, the latter in that of the hoe and the plough. Here again we are not to suppose that primitive man set himself deliberately to invent an implement which would combine the advantages of a digging stick and a hoe. Nature herself has filled the forest with sticks of every variety of shape, and a lucky accident suggests to the savage's uninventive mind how they may be used to satisfy his few and simple wants. Mr. Tylor gives figures of several implements which illustrate the early forms of the digging-stick. One of these is a hoe or pick from New Zealand—a pointed stick curved so as to resemble a side view of the Indian mamoty, which by the way has more affinity to the hoe, or pick, than to the English spade. The next figure is that of an implement from an opposite quarter of the globe. In Sweden tradition points to the use of the hack in tilling the soil and "within a generation there was still to be seen in use on forest farms the 'hack' itself, made of a stake of spruce-fir, with at the lower end a stout projecting branch cut short and pointed." When sticks with the requisite bend or projecting branch could not be found, invention would show itself in fastening a pointed bit of wood at the proper angle to a handle, as was done by the North American Indians. The next and a real step in advance is seen in the substitution of something harden than wood for the pointed part. Thus we find the shoulder-blade of a buffalo, or elk, fixed to a handle in use among the Mandans of North America; elsewhere a piece of shell takes the place of bone. All this prepares the way for the introduction of metal blades or points, which at once puts us in the way leading to the most improved forms of the modern hoe.

A word may be added respecting the prevalence of the hoe. It may be regarded as being in a special manner the agricultural implement of the African continent, appearing in a variety of forms, such as the simple hoe, the pick, and the mattock or mamoty. It is used by the tribes on the North-Eastern frontier of India, and occasionally by the more settled races of North and South America. Few who have intelligently studied the structure of Indian ploughs, and seen them at work, will question Mr. Tylor's conclusion "that the primitive plough was a hoe dragged through the ground to form a continuous furrow." Divest it of the stumpy handle by which the ploughman keeps the point in the ground and it is easy to see that the native plough is a huge hoe or pick, the pole by which it is dragged representing the original handle of the hoe. This opinion is borne out by historical and pre-historical research as well as by the pictures on ancient monuments. In Sumatra, says Marsden," the soil is either turned with a wooden instrument between a hoe and a pickaxe, or with a plough, of which they use two kinds; their own, drawn by one buffalo, extremely simple, and wooden share of it doing little more than scratch the ground to the depth of six inches; and one they have borrowed from the Chinese, drawn either with one or two buffaloes . . . turning the soil over as it passes, and making a narrow furrow." In Sweden the wooden hack already described "was followed by a heavier wooden implement of similar shape which was dragged by hand, making small furrows; this 'furrow crook' is still used for sowing. Afterwards was introduced the 'plough-crook,' made in two pieces, the share with the handle, and the pole for drawing. The share was afterwards shod with a three-cornered iron bill, but the implement was long drawn by hand, till eventually it came to be drawn by mares or cows." It is interesting to find our theory supported by facts drawn from countries so far apart, and so dissimilar in character as Sumatra and Sweden. In additon to the hoe and the plough, both countries possess an intermediate form of implement (part hoe, part plough), which helps us to understand how the the former has by gradual modifications been tranformed into the latter. Mr. Tylor calls attention to the parallelism between these transformations in comparatively modern Sweden and what took place in ancient Egypt.

The study of Egyptian monuments cannot leave a doubt in the mind that the hoe and the plough are the same implement, modified in the former case to be worked like a pick, and in the latter to be dragged by men with ropes. Mr. Tylor gives a copy of one of these ploughing scenes where "the man who follows the plough to break up the clods is working whith ordinary Egyptian hoe remarkable for its curved wooden blade longer than the handle, and prevented from coming abroad by the cord attaching the blade to the handle half-way down. This peculiar implement, with its cord to hold it together, re-appears on a larger scale in the plough itself, where the straight stick is lengthened to form the pole by which the oxen draw it, and a pair of handles are added by which the ploughman keeps down and guides the plough." Italian monuments present a variety of form of the plough, all in suggesting that they are merely enlarged and transformed hoes. All of them have the long pole more or less straight for dragging them, and the share fastened to it at varying angles. Some have a handle for the ploughman to hold by, others not; while others again are provided with both a handle and a projection for the ploughman's foot. Along with these more primitive forms there existed in Pliny's time ploughs resembling our modern plough, and provided with coulter and wheels. This fact is interesting as showing how inferior forms of implements may exist for centuries side by side with those of superior construction. By those who expect great and sudden results from the establishment of model farms and agricultural colleges in India such a fact ought to be taken to heart. We are apt to assume that the native ryot is one of the most singular of beings, because he persistently adheres to his time-honoured plough, notwithstanding that superior implements are forced on his notice. But we expect more from the ryot than we have any right to look for. If the primitive plough could hold its own for centuries in the ancient world against all comers, what right have we to expect, as we often do, that the Hindu ryot is in the course of a single generation to abandon his venerable plough (enlarged and transformed hoe though it be), for the more finished productions of Saidapet? In the end, no doubt, the native plough must succumb to the modern implement, but this can only be by a process so very slow as the lead ardent reformers to despair of agricutural future of India.—*Madras Mail.*

THE *SURGOOJA* PLANT.

From F. B. Peacock, Esq., Officiating Commissioner of the Presidency Division,—to the Secretary to the Government of Bengal, Financial Department.

REFERRING to your letter No. 241, dated 1st December, with enclosure, I have the honour to submit, for the information of his Honor the Lieutenant-Governor, the following report on the cultivation of *surgooja* plant in the district of Nuddea.

2. This plant is cultivated in the sub-divisions of Chooadanga, Jhenidah, and Meherpore, and bears different names in the different sub-divisions. In Meherpore the Hindoos call it *surgooja* and the Mahomedans *gunja*. In Jhenidah it is known as the *guji* or *surguji*, while sukargoojari is the name given to it in Chooadanga, which is apparently a corruption of the word *surgooja*. Mahomedans from the chief element of the population of this district, and as they have a prejudice to pronounce the word sukar (swine), they omit the first two syllables and call the plant *goojari*.

3. This plant is not an indigenous product of the Nuddea or any adjacent district, but is reported to have been brought originally from Chota Nagpore, where it is said to be in extensive cultivation. The Sub-Divisional Officer of Chooadanga reports that the cultivation of *surgooja* was introduced into the Nuddea district about 30 years ago by one Siboo Boona of Barribonha in thana Gangani of the Meherpore sub-division, and has gradually extended until, in the sub-division of Chooadanga alone, it is estimated to cover an area of 4,000 beeghas. The Sub-Divisional Officer of Jhenidah, a sub-division of Jessore, writes to say that the plant has been known in his sub-division for many years.

4. The plant is generally grown as a second crop following rice, tolerably high lands being preferable for its cultivation. The seed is sown in October, three seers to a beegha, and the plant flowers in December. In January the seed-pods form and mature, and by the end of the month, or early in February, the plant is cut and the seeds gathered. The method of cultivation is comparatively simple. Two ploughings only are given before the seed is sown, and no weeding is needed.

5. The cost of cultivation amounts to about Rs. 2 per bigha:—

	Rs.	A.	P.
Ploughing and sowing	1	5	0
Cutting and thrashing	0	9	0
Seed from mahajun	0	2	0
	2	0	0

The outturn from a bigha of land is from 2 to 3 maunds of seed, or on the average 2½ maunds. The value of the seed is Rs. 4 per maund. Thus an average crop gives a profit to the ryot of about Rs. 8 per bigha, from which, however, has to be deducted half the rent of the land, the crop being a second crop.

6. The Small Cause Court Judge of Chooadanga in his report to his Honor, which forms the enclosure of your letter under reference, stated that a maund of *surgooja* seed yielded about 14½ seers of oil. This proportion is considered by the Sub-Divisional Officers of Jhenidah and Chooadanga as rather high. The former puts it at 10 seers, and the latter at 18 seers 2 chittacks. One maund of mustard yields about 14 seers 1 chittack of oil, but this difference is compensated by the fact that the *surgooja* is a more certain and easily grown crop, and its yield for the same area larger.

7. The *surgooja* seed is rarely used unmixed in the preparation of oil, but generally in combination with mustard and linseed, in the proportion of one to four. The oil expressed from the *surgooja* is thicker and less palatable, and is used chiefly to adulterate lamp oil. Some of the poorer classes used the adulterated oil in the preparation of curries, but the flavour is not liked, and all who can afford it use pure mustard oil, keeping the mixed oil for lighting purposes only.

VANILLA.

THE genus vanilla, says Mr. G. W. Septimus Piesse, *is* indigenous to Peru, Brazil, and Mexico, and some of the species have been successfully cultivated in the West India Islands, Ceylon, and Mauritius. From the last-named, wonderful fine specimens were sent to our inter-colonial exhibition of 1862, for which the jurors awarded a gold medal.

The vanilla will produce saleable pods the third or fourth year after propagation, and they may then be gathered annually in September, in increasing quantities, for thirty or even forty years. Two good specimens of the plant may be seen in the Orchid House at Kew.

When the pods are gathered, which should be done before they are quite ripe, it is most important that they be properly cured, otherwise they rapidly become mouldy, and lose their scent. Parcels in this condition may often be found in the Mincing-lane drug auctions. The curing of the pods is best effected by drying them in a moderate heat, pressing them with the thumb and finger from end to end and then brushing them over with an oil that does not itself become rancid, such as that of cocoa or cashew nut. It is at the apex of the pod that the mouldy parasite first appears, the pods then quickly become soft and flabby, or dry and chippy. On the other hand, when vanilla pods are in good condition they become covered with an efflorescence of needle-like crystals of vanillic acid; the interior of the bean is then soft, unctuous, and balsamic. These crystals may be sublimed by heat of a sand bath. Few objects are more beautiful than this when viewed by a microscope with the aid of polarised light.

I. F. H. Johnston states that the fruit of this plant when ripe is said to yield from two to six drops of a liquid which has an exquisite odour, and bears the name of "balsam of vanilla." This balsam is, however, never seen in Europe, consequently it has never appeared commercially in the market. The pods are dried in the sun, and afterwards slightly fermented, for the purpose of developing their odour; when fresh, they are said to have no perfume. Physiologically, the fragrance of vanilla acts upon the system as an aromatic stimulant, exhilarating the mental functions, and increasing generally the energy of the animal system. About two centuries ago vanilla may be said to have been unknown in this country; it is, however, stated that Morgan, apothecary to Queen Elizabeth, showed her Majesty a sample, but he knew nothing more about it than that "it was brought from abroad by some Spanish merchants."

A few years back the average importation of this article was about five or six hundredweight, which arrived, from some unknown cause, very irregularly, and as a consequence caused great fluctuations in the price. At the present time the total annual average crop of all the varieties of vanilla from the several countries which produce it may be estimated at 80,000lbs., representing a value of not less than £150,000.

In order to obtain the perfume, or essence, half a pound of the pods are slit from end to end, so as to lay open the interior; then cut them up in lengths of about a quarter of an inch, and put into one gallon of pure alcohol of 60° over proof, and macerated with occasional agitation for about a month, at which time all that is worth extracting will be found in the spirit, which may then be strained off quite clear and bright. It is then suitable as a flavouring agent, or when blended with other scents it makes compound odours or bouquets. Those sold under the titles of clematis, heliotrope, wallflower, &c., mostly contain about one-half of vanilla extract.

The following gives a good

ESSENCE OF WALLFLOWER.

Extract fleur d'orange	1 pint.
,, ,, vanilla	½ ,,
Esprit de rose	1 ,,
Extract of orris	½ ,,
,, cassie	½ ,,
Essential oil of almonds	5 drops.

This should be prepared for two or three weeks prior to putting up for sale.

The odour of heliotrope resembles a mixture of vanilla and a'monds, and is well imitated thus:—

EXTRACT OF HELIOTROPE.

Spirituous extract of vanilla	½ pint.
,, ,, French rose pomatum ...	¼ ,,
,, ,, orange flower ,, ...	2 ounces.
,, ,, ambergris ,, ...	1 ounce.
Essential oil of almonds	5 drops.

—*Monthly Magazine.*

HOW TO USE BONES AS MANURE.

OF the various ways to make use of bones as manure, crushing to bones dust, or converting them into superphosphate of lime are the two best; and burning to ashes or converting them into charcoal the worst.

The dust can be either harrowed or ploughed in as circumstance warrants.

The superphosphate can be spread broadcast and harrowed in, or, what is better, drilled in with the seed, or with potato sets. It can be made at home with the exercise of a little care, and it will reward the trouble better than burning the bones to ashes, the benefit from which might be much more economically obtained from a few pounds of lime direct, seeing that only a small percentage of lime is all that is got by burning bones; and as for converting them into charcoal, all the goodness or virtue of them is lost, changing them into an imperishable substance of no use whatever.

If all the bones that collect on a farm were systematically preserved, it is astonishing the quantity that accumulates in a year, but which are usually allowed to lie about slovenly and untidy. Sometimes they are spasmodically gathered and dug under a tree in the orchard, but not with that judgment that is displayed in other ways on the farm. Let three or four oblong holes about 18in. deep be dug round a tree, at a distance from the butt equal to the spread of the widest branches. Here probably will be found the extreme rootlets of the tree; if not, try another hole a little nearer; then throw in bones to the depth of 6in. or 8in., and fill up with earth. This method of applying bones to trees will be found of more avail than using them in the form of ashes dug into the surface round the butt, which last method is only serviceable so far as loosening the surface, giving better facilities for the absorption of rain in summer.

It is not generally consider ed that the roots of fruit trees and vines are far below the reach of spade manuring, and consequently the digging in of farm-yard manure is labour absolutely wasted, particularly on ground trenched 18in. or 24in. deep.

ON THE PREPARATION OF TAPIOCA (*MANIHOT UTILISSIMA POHL*) IN THE EAST.

THE granulation or coagulation of various speculent or gummy extracts, has frequently been stated to be brought about, or at least expedited by the addition or instrumentality of plants or parts of plants added thereto.

That the addition of the bruised stems of *Calonyction speciosum* to the milk of the *Castilloa elastica* of Niycaragua brings about the more ready coalescence of the contained India-rubber there seems to be no doubt, the effect being analogous to that of rennet in the case of milk. Dr. Seemann, speaking of the preparation of rubber in this way, adds, "I saw a similar process for thickening sago in Singapore."

In his narrative of the voyage of H. M. S. *Herald*, Dr. Seemann also remarks that in the preparation of Gambier, a piece of wood is dipped into the watery extract, which becomes, by means of this wood, quickly inspissated (*vide* vol. ii., p. 250).

The same remark has also been made as to the cause of the agglutinated measures of tapioca, but with regard to this latter substance and sago, our opinion has always been that the agglutination was caused by part of the starch being changed to dextrine by the application of heat.

A recent traveller in the East thus writes us on the subject: "In the case of Gambier, I only saw a part of its preparation. It was in Malacca near a Gambier, plantation, where I saw two or three Chinese coolies just boiling down the freshly gathered plant in a large shallow iron pan of 'kwali' in the open air. Their stirring apparatus consisted of *two* or *three* different kinds of wood, and a long handled iron shovel flat in the blade, somewhat of the same shape as that used by bakers. The latter seemed to be the most priz ed. Either from jealousy, or because the coolies understood little Malay, I could not ascertain whether any *particular* wood was used or prized.

"As to sago, although I took many a journey purposely, I never saw the whole of the preparation from beginning to end. What I did see, however, left me no grounds for the belief that the granulated kind owed its form to the use of any particular wood. Moreover, I was assured by European planters and native operators that various wood were used as stirrers, but none for possessing any particular properties, and that iron stirrers were much perferred.

"As to the preparation of tapioca, I was more fortunate, seeing the whole process from the fresh root stock to the finished product in the process of packing for market.

"Being in Malacca, I ascertained that there were two or three large tapioca plantations some miles up-country, and a friend kindly offered to make arrangements for my visiting them. Travelling in the East, by the way, is no easy matter, and moreover, very costly. Unless one accepts the lumbering springless bullock cart, and is satisfied to spend a night or two in some filthy native hut (if he can find one), he must often employ six horses in relays to travel under thirty miles. In our case, to accomplish a journey of thirty-seven miles, we changed ponies five times; of course three of them were left at various intervals on the outward journey to rest and be used again on our return. Having seen to our provisions and weapons, we started by moonlight, the time being about 4 A.M. daylight, as is the rule in the East, coming suddenly and swiftly about 6 A.M.

"As to our ride and what we saw on the way, I need not dwell on here, suffice it to say that we visited three or four plantations all conducted on the same principles, and it will be sufficient if I describe what I saw of the largest and best.

"The factory which we entered was well and substantially built of stone and brick, and belonged to a wealthy Chinese. We were soon ushered into the owners presence, and received with that courtly ceremony, for which the well-educated celestial is remarkable. Refreshments were quickly served, consisting of tea, 'tigers's milk, *i.e.*, the milk of young cocoanuts with a dash of braudy, various fruits, &c. We had to learn it we had never yet learned, that an Eastern must not be hurried, but at last having really made our host understand that we could not partake of more, we wended our way across a court laid out in real Chinese style with goteaquely cut plants and fountains, and found ourselves in the busy manufactory. Here, above and around us, were endless bands and shaftings, driven by a large horizontal engine of English make, and in charge of a European engineer. The streams of water led hither and thither sounded like some gigantic water-fall, and the natives with but a loin cloth, and that of the scantiest dimensions, with the glowing fires playing on their well oiled bodies, added interest to the scene.

"Taking our station at the far end, we saw droves of Chinese arriving from the fields with baskets slung on poles, and filled with the fresh tapioca root-stocks. These were at once taken by another gang to large tubs fed with a constant stream of water, and the root-stocks thoroughly cleansed from adhering mud. Thus cleansed, they were passed on to a 'paring' table, where the dark outer coat was peeled off, just as one would treat a turnip, and all discoloured or bad parts cut away. Next the cleansed root stocks were passed on to a machine furnished with

knives, and sliced, and then passed on to a crushing machine, by which it was reduced to a pulp. After being thus treated, the pulp was removed in cane baskets to the 'strainers.' These strainers were large wooden frames with calico bottoms, and were filled with pulp from the baskets. Above these strainers were tanks, giving off a powerful stream of water which impinged on the pulp, and by means of the shafting, motion was communicated to the strainers exactly the same as that given to the sieve in hand-sifting.

"As the starch became washed out, it was received into inclined troughs and allowed, whilst in suspension, to run into settling 'vats.' Here, after well stirring, the starch was allowed to settle, and the now dirty, water, drawn off. Fresh water was next pumped in, and the process repeated two or three times, till the starch became clear and white. In this part of the building, which was on a lower plane than the rest, the smell of hydrocyanic acid was by no means faint. The starch was next drained, and whilst still moist removed to the drying department.

"The machinery I have mentioned occupied the central line of the first half of the building, and on either side next the wall was placed the drying apparatus.

"On the one side tapioca flour was prepared, and on the other the granular forms. The flour was prepared by simply spreading the still damp starch on a long iron table or slab, heated *slightly* by fires underneath, and constantly stirred and turned over with iron shovels till perfectly dry.

"The granulating was done as follows:— There was a long range of "kwallies," or shallow iron pans, standing on ledges of brickwork and slightly tilted forward. A wood fire was under each, so that each operator had a fire and 'kwali' to himself. Taking up a quantity of damp starch it was placed in the 'kwali' stirred constantly with the iron shovel, and the heat being greater than that employed in the simple drying of the flour, the starch soon became agglutinated together by the formation of dextrine. I could not but admire the dexterity with which the operation was performed to a 'turn,' and how well the open fires were managed.

"Such, then, is the operation as seen by me, and when I asked (although a disbeliever) whether the use of any particular wood would bring about the same change, or ever hasten it, I was told no. The only reason wood was occasionally used was because iron was dearer, and no one would use the former who could produce the latter.

"The Chinese and Malays are very superstitious, and their Materia Medica filled with most grotesque things, yet some of our own books of the last century would not yield the palm in absurdity. The wonderful affect of certain woods, &c., finds, too, its parallel in our own 'divining rod,' which, if made of hazel, peeled, cleft, and held in the orthodox way, would, aided by the pixies, discover hidden mines and springs. But to conclude. After seeing all that was to be seen, we found a varied table spread for us, consisting of soups, fish, fowl, curry and rice, pork cooked in twenty different ways—in fact, a regular, mixture of European and Chinese fare. After enjoying our host's kind hospitality we took our leave."—*Ceylon Observer.*

LOSSES WHICH FARMERS MIGHT AVOID.

PROFESSOR WRIGHTSON, writing to the *Squire*, one of the latest additions to our stock of monthlies, says:—

'Every mickle makes a muckle,' is an old Scotch proverb. It means, as readers of the *Squire* know, that a number of trifles, which singly might appear unworthy of attention, may when added together form a very considerable aggregate of loss or of gain. It points in the same direction as our well-known sayings, 'Take care of the pence and the pounds will take care of themselves,' and 'Every little helps, as Jenny Wren said,' &c., &c. In no place more than in the field and farmyard is either proverb applicable.

I proceed to amplify it, by pointing out a few of those numerous ways in which trifling sums are lost in farming. Firstly, attention might be called to the fact that on a large farm money is lying about in all directions Here lies a trough worth three half-crowns, and there is a heap of old iron and other rubbish worth 30s. A visit to the simplest sheds, or even a cursory look along the backs of hedges or behind walls, reveals the presence of implements, logs of wood, old carts with good iron work still clinging to rotten wood, and numerous worn-out or broken tools. A low valuation of these sundries would probably astonish their owner. They might be converted into several shining sovereigns, while at the same time the general tidiness of the farm and buildings would be greatly enhanced. In these times, when farmers are short of the sinews of war, such a source of ready cash certainly ought not to be lost sight of.

In looking around many farms, a source of profit is to be seen which has been long neglected. On the sides of roads, accumulated about the buildings, and by hedges and ditches, are to be found large quantities of rich vegetable mould often covered with grass. This soft black soil is peculiarly rich: it has received constant additions of straw, rubbish, lumber, barn refuse, refuse from heaps of mangel, &c., &c., and it would pay to get it up and cart it on to the neighbouring pastures, and spread it thereon. This is a source of fertility which many farmers never dream of utilising.

A glance at the stock-yards of nineteen farms out of twenty reveals a dribbling loss which might be converted into a profit. Large yards, surrounded with big-roofed, old fashioned buildings, are found shooting their rain-water into the quadrangle. The farmyard manure is literally swamped. It is veritably under water; the cattle stand contentedly enough knee-deep in slush. This may satisfy certain old-fashioned ideas, but it does not meet the requirements of modern farming. A reduction in the size of yards, abundant shed room, and sufficient troughing or spouting to carry off the rain, should be insisted upon by every would-be tenant and granted by every good landlord. It is impossible to carry out a system of high feeding with profit unless premises are made suitable for the preservation of farmyard manure.

A source of profit wilfully neglected by the average farmer is the poultry. He actually thinks this branch beneath his attention, and as in some cases he leaves it to his wife, conceding the profits thereon, we hear that he actually grudges the food which, in the long run, is destined to appear in the shape of ribbons and laces on his wife's person. This is short-sighted policy and mean, we are sure our lady readers will think it to be. The fact is, poultry are coming to the front, and a well regulated poultry yard is a very desirable adjunct to the farm buildings. If poultry are attended to, new blood imported, goods breeds adopted, and the [illegible] kept sweet, they will pay well. If the farmer, then, is too much occupied to [illegible] the [illegible], perhaps an arrangement might be come to [illegible] wife, by which the funds accruing from the sale of eggs and chickens should be devoted to more solid and useful functions than that of buying bibs and tuckers.

The feeding of animals is a profitable pursuit, but unless reasonable care is taken a great deal of food is wasted or rendered unpalatable. How often do we see a stupid lout serving pigs, and throwing 10 per cent. of the rich barley-meal porridge on the litter! and a glance into the cattle troughs often shows a disgusting accumulation of fetid matter, which must be injurious to the animals which feed from them.

Hay and straw are wasted every day in ways which a little care would easily prevent. Every straw rick is worth thatching. No large 'cuts' into either hay or straw ricks should be allowed, and care should be taken to prevent loose litter from getting wet and useless.

It must, however, be said, in justification of the farmer, that the crass stupidity of the labourers in this particular is most aggravating. They will not see the importance of taking care of straw, and in this careless state of mind they are encouraged by the traditions of the past, when, as long as straw was trod under foot or got crushed down into some semblance of manure, it was thought a good end for it.

I would also draw attention to the evil consequences of allowing implements to stand out in the fields month after month and year after year. Carts, wagons, rollers, ploughs, troughs, bodkins, and 'tackle' of various kinds are often to be seen exposed to the heat of summer and the rains of winter. No wood work or ironwork will stand such treatment. A very definite depreciation must be recorded at the end of a year in all such cases, and the bill for repairs and replacements must be greatly increased. And the larger and more expensive implements fare but little better. Farmers' portable engines, steam cultivating apparatus, thrashing machines, chaffcutters, horse gears, &c., fare but badly. Clotted with old oil and rust, left unpainted from first to last, insufficiently protected from the weather, worked with but little care or judgment, these implements soon deteriorate in value and do not last out a reasonable time.

ARTIFICIAL POULTRY RAISING.

A PROMINENT dealer in poultry, Mr. H. W. Knapp, of Washington Market, New York, gives a discouraging opinion of the probably success of chicken-raising by artificial means. He said recently when questioned on the subject:—

I went to France to study the matter, for if it can be made to succeed it will make an immense fortune, as it has already done in Paris. I was delighted at what I saw there, and the matter at first sight seemed to be so fascinating that I do not wonder that new men here are always ready to take hold of it. Even clergymen and actors are bitten with the desire to transform so many pounds of corn into so many pounds of spring chicken. The now successful manager, Mackaye, spent about a thousands dollars in constructing hatching machines and artificial mothers in Connecticut, but he found that the stage paid better, and his expensive devices may now be bought for the value of old tin. Enthusiasts will tell you that by the new discovery chickens may be made out of corn with absolute certainty. In Paris this has been done; but the conditions are entirely different here. There the land is valuable, and they cannot devote large fields to a few hundred chickens; the French climate is so uniform that the markets of Paris cannot be supplied from the South with produce which ripens or matures before that of the neighbourhood of Paris; the price of chickens is so high and labour so cheap that more care can be given with profit to one spring chicken than one of our poultry raisers could give to a dozen. Here we have plenty of land, the climate south of us is so far advanced in warmth, that even with steam we cannot raise poultry ahead of the South, and the margin of profit is so small that one failure with a large batch of chickens sweeps away the profits from several successful experiments. When persons wanted me to go into the project I declined and was called an 'old fogey.' One man spent a fortune on the enterprise in New Jersey, and at first was hailed as a public benefactor. What was the result of all his outlay and work. He managed to hatch quantities of our chickens every February; but although he could fatten them by placing them in boxes and forcing a fattening mixture down their throats, he could not make them grow; they had no exercise; they remained puny little things, and another defect soon appeared—though fat, they were tough and stringy. The breeder sent lots of them to me, and they looked fat and tender; but my customers complained that they could not be young, for they were tough and tasteless, and that I must have sold them aged dwarfs under the name of spring chickens. It was found absolutely necessary to let them run out of doors as soon as the weather allowed it, and by the time that they were ready for market, the souther nchickens were here and could be sold for less than these. The upshot of the business is that this breeder has sold out, and another man has now taken hold of a small part of his old establishment to try other methods of making it a success. As to raising turkeys in that manner, it will fail more disastrously than the chicken business. Size and weight are wanted in turkeys; and that reminds me, continued Mr. Knapp, that the newspapers ought to impress the country people with the necessity of improving their poultry stock; breeding in-and-in is ruining poultry; every year the stock we receive is deteriorating, and this is the cause. I could give you some striking examples from my experience of forty years in the business. Some years ago we poulterers thought that ducks were going to disappear from bills of fare altogether; they were tasteless, worthless birds, which people avoided. On Long Island a farmer made experiments in breeding with an old Muscovy drake, tough as an alligator and the common duck. The result was superb, and has changed the whole duck industry. If the farmers of Northern New Jersey, the sandy country best suited to turkeys, would bring from the west a few hundred wild turkeys, we should have an immediate improvement. I see no such turkey now as we had twenty years ago. The breast is narrow and the body runs to length; it is all neck and legs, and can be bought by the yard. Rhode Island sends us the best turkeys, but they are not what they used to be. If instead of attempting to beat Nature at her own game, the rich men who have money to spend would vote it to better breeding, there would be an improvement. I do not yet despair of seeing immense farms wholly devoted to raising better poultry than we yet have.—*Home and Colonial Mail.*

THE DEFECTS OF INDIAN AGRICULTURE, AND HOW TO REMEDY THEM.

ENGLISH people of late have been taking a great deal of interest in India and her people. To show this, some of the leading Anglo-Indian officials have been giving lectures and speeches in different places on Indian subjects. A few weeks ago, *Dr. Hunter* gave a

lecture in Edinburgh, which he took two evenings to complete, and he supplied much interesting information to the Scotch people which, they never had heard before. Some few weeks ago Sir Arthur Hobhouse gave two lectures on India; and Sir Richard Temple, the late Governor of Bombay, gave a lecture for the National Indian Association on Education in India, and a second lecture, at the Society of Arts, on Forest Conservancy in India.

Now what does the giving of all these lectures show? Surely and clearly, that the English people are perceiving the wants of India, and are anxious that some one should inform them more on the subject and enlighten them on India—the chief possession of her Majesty's dominions.

Little has been said in England on the Agricultural practice in India, so I will take this opportunity to try to give some information on this subject. The more so, because agriculture is the chief industry of India, and that on which the Indians live. There is no other industry worth speaking of at present. It is true, they have started many cotton mills, jute factories and others. But we must remember that these industries are but started, and not developed; but some mill-owners have already given up their new industry of cotton-spinning, because the repeal of the cotton-duty has given them a death blow, while it has seriously injured others. What other manufactures or city industries exist in India but those connected with the cultivation of the soil? Moreover, it is easily perceived that where agriculture is the sole industry, and where an average population of 212 persons to the square mile has to be maintained on it, the improvement of that industry ought to be prominent above all other considerations. Even in crowded England they have not got to feed more than 200 persons to the sq. mile and then look at the industries England possesses!

But to give some information on Indian agriculture, it is necessary that I should give a brief account of (1st) the agricultural population, (2nd) the agricultural products.

Every one in this country, who is interested in India, is aware of the fact, that caste prejudices in India are ruining the country. They throw obstacles in the way of everything; for instance, one who is a blacksmith by caste cannot follow any other profession, but that to which he was born. He cannot be a carpenter, neither can he be a weaver; but he must, if he wants to live by honourable means follow his hereditary profession. But the greatest drawback is, that he must follow it, whether he likes it or no, or is proficient in it or the contrary, for every profession requires proficiency and a knack to do the thing. I have heard of many families ruined from this, and have seen a few cases also. For when a man is unable to carry on his business, he must fall back on the money-lenders, who are the greatest curse of a country, and especially the way in which the Indian money-lenders do their business is very bad. They take the meanest advantage, and as they are generally a clever set of men, they easily entrap the poor man in their snares, and the borrower soon finds that he has borrowed a few annas to live that day, at an exorbitant interest, which will in all probability ruin his future prospects. In course of time, this very man will most likely turn out a beggar, and he can no longer face the money-lenders; and the family is ruined. I can give many an instance of this; many a family has been impoverished. And not only is it so with the blacksmith or the ryot (cultivator), but with every caste; they must all follow their respective hereditary profession. If any venture to deviate from this general rule, he is soon outcasted, and he has no society for the rest of his life.

This will plainly show that caste prejudices do a great deal of mischief, hindering people from prosecuting what they think they can best do. These prejudices stop travelling too on the part of many of the Indians to different countries, and thus prevent their gaining the knowledge and civilization which can only be derived from travelling in foreign lands and mixing with the society of people of different countries.

I have said that cast prejudices have done, and are still doing a great deal of mischief in various industries; but in all these is not it a providential escape for agriculture, that noble industry, that it brings no dishonor to him who pursues it! It is true that agriculture has its enemies in the caste system also, but those are but few and insignificant. The Brahmins among all their intrigues, and when they used their power so unworthily, have kept the art of agriculture free from this pollution, because they well knew the inevitable result of not doing so. It is open to all, whoever wishes to pursue it and no one is outcasted for following it. There are sundry things which a Ryot of a certain case is prohibited from doing, for instance, a Hindu ryot cannot rear pigs or poultry, and a Mahomedan ryot cannot rear pigs. But these are, as I have said, few and insignificant restrictions. A man can easily farm without keeping either poultry or pigs. A farmer has only to keep them where there is a great competition. And this idea we never get until we come to see England. In the South of England, the farmers go in a good deal for pigs, which is a favourite thing with them, and they keep poultry in small numbers; but in the Lowlands of Scotland the practice is just the reverse, and a farmer there keeps a lot of poultry for home consumption as well as for market, and keeps one or two pigs solely for home consumption.

The people who form the agricultural community in India are poor in capital, generally uneducated, ignorant of the practice of other countries, and consequently without the knowledge of improvements which might well be adopted. But last and not least, they are without a leader who would devote his life to the well-being of the agriculturists, and to the improvement of agriculture in general. We all know very well that nothing can be done without experiments, and more especially among the Indian ryots, it is next to impossible to advise them to do a thing in a different way to what they have been accustomed to do. You must show the ryot by experiments that a certain thing can be done in a certain way which way is far superior in every respect to his own. Well, and this is what we want in India. But this is not the only or greatest want; the Land-law has many faults. I am not a lawyer, so I will not trespass in the province of the law; perhaps some of our lawyer friends will inform us on the Indian land-laws hereafter.

The holding of a ryot is very small indeed; it is generally about two or three acres, or it might be five acres. For a holding like the last the ryot must be rather rich. His land generally adjoins the village. His capital consists of Rs. 10 or £1, or might be as high as Rs. 20 (£2). The ryot lives in the village, and works day after day in his plot of ground, getting the help of his family during the harvest. But let us see what he does in his plot of land and what he grows there. We will suppose that it is a piece of arable land. The first thing he does is to plough the land with a wooden plough and a pair of bullocks. The plough has a triangular section; the body is made of wood, and just at the point which digs into the ground, there is an iron ploughshare, about 12 inches in length and about an inch and half in breadth. This is fixed to the plough lengthwise. There is no coulter, neither is there any skim-coulter. Now, supposing the ground is weedy, or has a thick swathe of natural grass, it is evident that the plough must proceed very slowly indeed and the pair of bullocks will have to exert an extra amount of strength to draw the plough. But after all, the want of coulter or skim-coulter is not of such importance as that which follows. The body of the plough has, as I have said, a triangular section, so of course the furrow made by it will have the same section. Now here is the problem: when the ploughman has thrown up the first furrow he turns round and follows one of the borders of the previous furrow, and next time he follows that border, and so he proceeds with his work. When the work is finished, what will a section of the field show? It will look like a saw, the hollow parts of which would represent the furrows, which are, of course, dug into the soil, and the teeth of the saw will show the parts on either side of the furrows, which are always left unploughed. Thus it is evident that only half of the field is really stirred, mind you, not ploughed, because in ploughing you bodily turn up the stratum of earth upside down, and then let the bottom layer, which is now exposed to the sun, be acted on by the weather. Now if we even want to stir the land, we effect this only in half of the field, though the operation is done over the whole field. The English drag-harrow will do it much better, it will stir the soil thoroughly over the whole field, at the same time collect weeds and break clods, and do the job more effectually than the Indian plough does. This will also do away with separate harrowing and collecting weeds. We will assume that the land is ploughed after the Indian fashion it is then left for a few days, when the sun dries up the clods. The ryot now comes with a wooden mallet and breaks the clods. The weeds are collected in a rather ingenious way. The implement used for this is very simple, and consists of a wooden or bamboo ladder, about 12 feet in length and 18 inches in breadth generally pulled by two oxen. This collects the weeds, as well as breaks the small clouds which might have escaped the eye of the husbandman. The weeds collected are burnt and the ash spread. In 98 cases out of 100 it is the sole manure applied to the land. When the land is ready the seeds are sown and left to Nature's care. The harvest time comes, and the crop is cut with a sickle, a light thing, smaller than the English sickle, which does the work slowly. There are various systems followed at harvest time, but as it is needless to pay more attention to this point, I will only notice it by saying that the ryots help one another in this important operation of their industry. The crop is carried to the stackyard, and there stacked round a tall tree with hardly any branches, which is generally planted for the purpose. I do not think the Ryot knows why he follows this practice, but this is the real reason. The tree acts as the centre-piece of his stack, and however compact the sheaves may be laid, there is always a certain portion of the space round the tree unoccupied by anything, and consequently this allows a current of air to pass through the stack, and prevents its overheating and fermenting. When the weather is favourable, the sheaves are taken out from the stack and laid on a firm circular piece of ground, and trodden by four or five bullocks in a line, tied horn to horn. There is always a great loss in this operation, as however firm the ground may be, a considerable quantity of the corn sticks into the ground, which would not pay to dig out besides, when the animals get the chance, they do justice to their appetite. The winnowing process is a very old one indeed, and for this the ryot must wait for a favourable wind, but if there is a shower of rain or a gust of strong wind in the meantime he must bear the consequence. The corn is heaped up after thrashing. A framework, generally made of bamboo, and after the fashion of a sieve, about 2 feet by 18 inches is the next article resorted to. This is filled with a quantity of the corn, held up towards the wind, and then let the grains drop down gradually. The plump, heavy corn drops immediately near the operator, while the light husks, &c., are blown away from him. We will suppose that the winnowing is done thoroughly and under favourable circumstances, the corn stored up and taken to the market whenever convenient, and there sold. Here we will stop from following the produce of the farm as the moment it is sold in the market the farmer has no more interest in it. We cannot say anything with accuracy as to his profit; this is really a difficult thing in India. The value, of course, depends on the market price; and besides, India is a bad place for statistics and especially to deal with the ryot for the statistics of his farm why you might just as well ask a baby to give an account of the quantity of milk he had when he was three weeks old, and when he was seven weeks old, respectively.

We have followed the crop from the time it was sown to that when it was sold, and now it remains for me to notice some of the crops the ryot grows. In this he follows no regular course and he grows year after year the crop, which his land yields best. Has any Indian Ryot or his landlord asked himself what will be the result of the continuous growth of the same crop, year after year? Neither of them know it nor, do they care to know it, though it is the most important thing in farming. But I pity the descendants, who will inevitably sorely feel the ignorance of their forefathers.

Under the present exhausting system of corn-cropping the land is sadly and slowly being deprived of the elements of plantfood, and if this system be not at once checked and some new system introduced which will restore to the soil its exhausted fertility, the Indian soil will as a matter of course be unfruitful; and this is not only theory, but it is a fact, and there are many parts of India where they are feeling it already. Whence arises this poverty of the soil? Surely from its having been exhausted. This exhaustion of the soil is one of the chief sources of those Indian famines which are annually looked for in that country with dread and awe. The crops grown in India differ in different places, but for all that they are doing the same work in the soil: some are taking away from the soil something, and others taking away other things. This exhaustiveness of the Indian system of husbandry has been even shown experimentally. In Madras, places where they used to grow the fine tobacco some years ago are quite barren now, and will not produce the crop. And here I will mention one thing. Tobacco is one of the most exhausting crops, and carbonate of potash is one of its chief elements of food; consequently when tobacco is grown year after year in the same land, of course the land will lose this important element. Some of the Madras tobacco soils have been analysed and found to be in want of carbonate of potash, and consequently they do not grow any tobacco now. These experiments were made by the Madras Government, and they have discovered the mistake of the ryot. In the North-West Provinces wheat-land, which during Akbar's time yielded 1,140lbs. to the acre, now only gives 840lbs., and that very land would be made to produce 1,800lbs. in some of the eastern counties of England. But still, how few of the landlords are aware of the fact, still less are their tenants!

To notice some of the chief crops grown in India we will divide India for convenience, as follows:—(1) The Brahmaputra and Lower Gangetic basins, (2) the Upper Gangetic and Indus basins and Central India, and (3) Southern India, which will comprise the Eastern and Western Ghats, Mysore and Hyderabad, &c.

In the first division, where the Ganges and Brahmaputra flow into the Bay of Bengal, rice is the principal crop. The ryot mainly depends on it to pay his rent and to provide his family with food; indeed, the rice grown in Barissal and the delta of the Ganges has a world-wide fame,

and much of it finds its way into the English market under the name of Patna rice, though Patna grows but little rice. But it matters very little to the Bengalee cultivator what the English people like to call his produce, as long as they consume it. The potato is another thing which forms the staple of the Bengalee ryot. Tobacco is largely grown in Northern Bengal while Cayenne pepper forms one of the chief industries of Eastern Bengal Maize, melons, and sundry other things are also grown. Patna is the chief place for opium.

In the second division wheat forms the chief crop for cultivation. Barley is also grown in some places. Maize is largely grown all over this division, and in rainy weather it supplies a great want of the ryot. A good deal of it is used roasted when green. Water melons and other melons are also grown here, and in the Punjab and higher up the country the apple, the grape, and other articles of luxury are grown. It is from these places that the Bengalee is supplied with his apples, cinnamon, grapes, and the various spices.

In the third and last division wheat again forms the staple food of the peole. Here tobacco is grown somewhat extensively, and the tobacco from Trichinopoly and its district is made into the Trichinopoly cheroots, well-known among the Anglo-Indian smokers. Here in some places coffee plantations are to be seen, but this again is taken up by the English cultivators only. Various experiments have been tried by the Madras Government on the growth of exotic tobacco, but they have as yet not been successful. But the Madras Government has done one thing; it has established a Model Farm at Saidapet, and lately an Agricultural School was opened in connection with it.

Besides the crops noticed above, there are some others which are grown pretty nearly all over India, such as millet, the various varieties of peas, beans, onions, and sundry others.

We have now noticed briefly the present state of Indian agriculture. We have seen how the ryot holds his land, how he cultivates it, and last of all, what he grows in it; and I have also touched on the future of the present system of husbandry. Now I will make a few suggestion as to howwe might remedy the *impending ruin of our country.* These can only be carried out by the Indians themselves. They are as follows :—

1. The establishment of Agricultural Societies for the general improvement of agriculture and the agriculturists. These institutions must be in various districts, because of the variations in climate, soil, and produce. We at least ought to have four principal societies, and they must co-operate with one another. And these societies ought to start with (*a*) breeding of stock, for improving the native breeds, (*b*) trials and introduction of seeds and improved implements, (*c*) encouraging agricultural education for which prizes should be offered, (*d*) introduction of local rotation of crops, as this want is of utmost importance at present in Indian agriculture, (*e*) holding of annual shows for agricultural produce with gifts of implements and prizes. There ought to be local Agricultural Societies established, which can only be done by the Landlords themselves and not by the Government.

2. The Indian Government ought to help the Societies, by (*a*) providing them with seeds from other countries, (*b*) giving full consideration to any suggestion which the Societies may make as to land-tax, or any other thing concerning the ryot. (*c*) re-establishment of the Agricultural Department apart from the present combined Department of Agriculture, Revenue. and Commerce. The Indians should rejoice to hear that the Famine Commissioners strongly urge this. (*d*) Extensive irrigation-works and less irrigation rate on forage crops, which will enable the cultivator to keep a certain number of stock and consequently to procure manure for his land, (*e*) elements of agricultural education given in the village schools.

3. Landlords ought to take a more lively interest in their land and ought to spend some more money in its improvement than they have hitherto done. They ought to introduce new implements, seeds, and improved breeds of stock.

4. Forest conservancy more widely followed, by which the moisture in the land will be reserved, and we shall not suffer so frequently and dreadfully from those famines, which every year devastate districts after districts. This (forest conservancy) will also yield fuel from the underwood and prevent the dung from being employed for fuel. The importance of dung as manure cannot be too highly recognised. It contains everything that the plant requires.

There might be many more suggestions made in connection with the improvement of Indian agriculture, but I believe the four that I have mentioned are the most important ones.

Rajah Jaggut Singh of Bijnour has established an Agricultural Institute which he has endowed with a building and a large sum of money in Government Securities. He has done a noble work in not only setting example of this kind in India, but investing his money for the welfare of the ryot. Who can say what wonders the Bijnour Agricultural Institute might do in time! Why do not the other native Princes follow the noble examples set by this Rajah?

The Madras Government has been trying several experiments for the last 10 or 12 years at its experimental farm at Saidapet, and is doing some very important work, little appreciated by the ryot, because of his inability to do so. Let us hope that the other Governments will follow the example of the Madras Government.

I will close this article with a few words of Mr. Hunter's, in his "England's work in India," where he says, "English writers who tell our Indian fellow-subjects to look to the Government for every improvement in their lot, are doing a great dis-service to the Indian races. The permanent remedies for the poverty of India rest with the people themselves." I quite agree with what Mr. Hunter says. If we want to remedy our poverty we must try to do so ourselves and not leave it to others. The Indian Government is willing to help us, but we must let it see in what way it can help us, and consequently we ourselves must first begin the improvement of our agriculture.

GOGENDRA NARAYAN, Jr. (of Kuch Behar).

—*National Indian Association Journal.*

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The Monthly General Meeting was held on Thursday, 17th March, 1881.

W. H. COGSWELL, ESQ., *President, in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected Members :—

Major, the Hon'ble E. Baring, H. H. Shewaja Rao Holkar, Messrs. C. E. Pendall, Edward. Poppé, R. Williamson, Baboos Lalit Mohun Raya, Hemchunder Gossain, and the General Manager Indian Glenrock Gold Mining Company.

The names of the following gentlemen were submitted as desirous of joining the Society :—

The Manager Rajmai Tea Estate, Assam,—proposed by the Secretary, seconded by Mr. J. E. Maclachlan.

Col. A. W. Twiss, RA, Commanding R. A. Morar,—proposed by Lt-Col. E. L. Hawkins, seconded by the Secretary.

C. G. R. McWilliam, Esq., C.S., Deputy Commissioner, Luckimpore, Assam,—proposed by Mr. F. St. C. Grimwood, C.S. seconded by the Secretary.

E. A. Roussac, Esq., Deputy Postmaster-General, Dinapore,—proposed by Mr. T. M. Francis, seconded by Mr. R. Blechynden.

CONTRIBUTIONS.

1. Wardle on the Wild Silks of India. From Government of India.
2. Proceedings of the Agricultural and Horticultural Society of Madras from May 1880 to February 1881. From the Society.
3. Report on the progress and condition of the Government Botanical Gardens at Saharunpore and Mussoorie, for the year ending 30th June, 1879.
4. Transactions of the Asiatic Society of Japan, Vol. 8, Part 4. From the Society.
5. Journal of the Asiatic Society of Bengal, Part 1, No. 4, and Part 2, No. 4 for 1880, and Proceedings for December 1880, and January 1881. From the Society.

PATRON OF THE SOCIETY.

Read the following letter from the Private Secretary to his Excellency the Viceroy, dated 24th February :—

"I have submitted to the Viceroy the Resolution passed at the monthly meeting held on the 17th of the Council of the Agricultural and Horticultural Society of India, soliciting his Excellency to allow himself to be named Patron of the Society; and he desires me to request you to inform the Council that it will give him great pleasure to comply with this request.

I am to add that his Excellency will have much pleasure also in subscribing Rs. 250 annually towards the funds of the Society, and I accordingly enclose that sum on account of the subscription for this year."

Resolved.—That the best acknowledgments of the Society be tendered to his Excellency for his kind compliance with the Council's request and for his handsome subscription to the funds of the Society.

GARDEN.

A report from the Superintendent of the Garden was submitted, of which the following are extracts :—

1. The garden labour has been kept well employed in clearing up the garden, removing aloes and other plants that had got too thick for ornamental and other purposes—transplanting, manuring, cleaning up the drains, and other general routine work.

2. Rose plants from Mr. Bull received on 7th December 1880. Of these the final loss has not exceeded 5 per cent. 136 have been planted out in an open spot, adjacent to, and south of west tank: another plot to north of same tank is being prepared for the remainder.

3. Rose plants received from Mr. Bull on 1st March current. These have not unfortunately reached in such good condition, as the lot received of 7th December 1880—fully half of them being dead or unlikely to recover.

4. Several new varieties of Crotons, Begonias, and Coleus have been added to the garden and propagated from.

5. 40 Rose plants have been received from the Kooshroo Bag, Allahabad, 20 of Rein des Violets, and 20 Princess Adelaide; these have been planted out to east of, and adjacent to, west tank.

6. *Peas.*—The following varieties were sown in the latter part of November :—Woodford Marrow Peas, Rising Sun, Maclean's little gem, Yorkshire Hero and Blue Prussian, in a biggah of land, the plot where it is purposed to carry out manure experiments for the Bengal Government; the seed is now being gathered, and a fuller report will be submitted hereafter. The germination was very good, and a fair outturn is anticipated.

7. *Annuals.*—The result of sowings have been successful, and they are now making a good show, in beds prepared on the large grass plot. Notably Antirhinums, Phlox, Petunia, Portulaca and Verbena; these will probably continue in flower for another month, and will yield a plentiful supply of seed in duecourse.

8. *Water.*—In consequence of the unusually dry season we have experienced, not even one shower of rain for upwards of four months, there has been a great demand on our labour force for artificial watering. The tanks are, however, tolerably well supplied with water, especially that to the west, and we may hope to tide over our annual difficulty in this respect.

9. *Propagation.*—The stock of fruit grafts, Roses and other ornamental plants that were propagated during the rainy season is tolerably large. We have succeeded in disposing of a good number of Roses, but still the supply is not equal to the demand. A large number of Rose cuttings were put down in January. A great many have struck root, and if they survive through the season, the garden will have a fair quantity for issue to Members.

10. The garden has a large quantity of Red Pumelow, Avacado Pears (*Persea gratissima*) and Citron plants ready for issue. Also Liberian and Arabian Coffee seedlings.

11. Caladiums are being potted off.

12. Seeds of trees and shrubs are being now gathered which will be useful to meet applications from Members.

13. *Manure.*—A large quantity has been received from Mr. H. A. Firth of Garden Reach and others at no cost to the garden. The garden carts being employed in conveying the same.

14. There has been full occupation for the two garden carts, delivering plants purchased by Members, carting manure, &c.

15. A specially fine lot of *Araucarias* of different varieties are now at the garden for sale, some being well grown and of fair size.

5th March 1881.

Supplementary Report.—At 6-45 P.M., on the 5th Instant (just after my first report had been sent in), there was rather a heavy fall of rain accompanied by hailstones of considerable size. The damage to the glass houses, propagating, and leanto, was 234 panes of glass broken. The Mangoe and other fruit trees have been entirely stripped of this season's crop, which, before the storm, promised to be abundant. Some Araucarias have been slightly damaged, also several other plants of no special value. The rose cuttings mentioned in report of 5th instant have suffered likewise, and I very much fear ¾ths at least will be lost.

Out of the lot of Rose plants received from Mr. Bull on the 1st instant, 50 arrived dead, 55 very poor and unlikely to recover, 97 promise well.

The acclimatised peas have been gathered, the quantity being 44 and-a-half seers. The outturn would have been better, but the hail and storm of the 5th destroyed fully three times the quantity collected.

The annuals have suffered very much, and the quantity of acclimatized seed that will be gathered will not be as large as anticipated.

The Garden has, on the other hand, benefitted by the rainfall; the draw off from the tanks of water for some eight days being almost entirely suspended, and the garden labor being deviated to other pressing work, one of the bamboo sheds for plants being entirely repaired and renovated during this period.

The Pineapple bed has got very thick, transplanting will be taken in hand as opportunity offers.

Special arrangements have been made for the different kinds of manure for farming experiments.

A large quantity of Poinciana regia seedlings ready for issue.

16th March 1881.

The Secretary called attention to the large collection of cutflowers on the table, consisting principally of Verbenas, Petunias, Phlox Asters, Pinks, Antirhinums, Browallias and Heartsease which have made a good show in the garden during the last two months, but have suffered considerably from the recent severe hailstorm. The Verbenas, Petunias and Snapdragons have been especially good.

REPORT ON FIBRE OF THE "BURRIÁRA."

(SIDA RHOMBOIDEA).

Read a letter from the Secretary to the Government of Bengal, forwarding some specimens of Burriara fibre received from the Rajah of Balihar, in the District of Rajshahye, for the favor of a report "on the quality of the fibre and its commercial value and suitability for the Indian and home markets."

Read also the following reports thereon by a section of the Fibre Committee :—

Mr. W. H. Cogswell.—I have been called upon on several occasions, and through various channels, to express opinions on samples of similar fibres submitted to me, and as these alluded to by the Government of Bengal in their letter No. 467/61 forwarding now under consideration, are identically the same, *viz.*, the "Sida rhomboidea," I think I cannot do better than preface my present remarks with the following report which I made to the Secretary of the Economic Museum in January of last year :—

"Replying to your No. 2901 of the 13th instant, I beg to say that I have carefully examined the sample of fibre prepared from the Sida rhomboidea, and which I return herewith. I am of opinion that none of the samples have been steeped a sufficient time; those subjected to 2, 3, and 4 days' submersion, particularly the former ones, are very imperfectly done, and the best sample subjected to 5 days' treatment, proves insufficient. There is much hard, harsh, barky, gummy substance adhering to the fibre which would have been removed under a more lengthy process. There is also much of what I term croppy ends about some of it which would not be apparent if the plant had been better matured before it had been cut. I would suggest that some of the longest stems of the plant should be taken, prepared in the usual way, and steeped for 7 to 10 days, about the same time as jute is steeped, care being taken that the steeping or retting process be not carried beyond the above period, as the fibre may become very weak, and towy in consequence. A large sample should be prepared, and I will get it tested in one of the Jute Mills, to see what percentage of warp yarn can be spun from it, and a correct value shall be arrived at. There is much in these samples of a soft, bright, glossy, clean fibre, but it is very short in comparison with Jute, barely half its length, the value being very materially reduced in consequence."

These samples now under review are from Rajshahye the same district as those alluded to in my foregoing report, I imagine, and probably from the same source; for whilst in those of the former, I pointed to deficiency of steeping, I have now to remark that some portions of these new samples have been kept too long in the retting process, the result being that some of the fibre has suffered in strength, and is somewhat towy, or to use a Scotch expression, most pregnant with meaning, it is "fosie," *i.e.*, the fibre is wanting in body, in substance, weight for weight, with that of a similar quantity of Jute. To a few, even experienced men, this fibre might be mistaken for that of fine Jute, though not one-fourth of its average length, when deprived of the root ends, as this has been. Its colour is glossy bright in the extreme, and of a very high order. The fibre is strong, fine, round, and of excellent spinning properties, and is well suited for the finest yarns of Jute manufacturers; some of it is so silky, as to render it in my opinion fit for higher purposes. I value it at about Rs. 4-8 @ 4-12 per bazaar maund. I think the flax manufacturers at home would be ready consumers of it. The fibre is somewhat more irregular, in staple than that of fine Jute, due in some measure if not entirely so, I think, to its treatment in the duration of steeping, drying, and bundling afterwards.

I believe this order of plant, the Malvaceæ, is to be found growing wild. Its cultivation, and treatment, and preparation of the fibre is exactly like that for Jute, and I think it is to be regretted that no data have been furnished as to the cost of its production, and the yield per beegah. It would be necessary to have this, to arrive at its correct commercial value in comparison with that of Jute, when a full opinion is required as to its spinning capabilities, &c., and a reliable commercial value has to be arrived at, it is necessary that very large samples should be submitted for experiment, if proper justice is to be done. Of its suitability for the Indian and Home markets, there can be no two opinions and the following remarks fully endorse my own views. I am indebted to the courtesy and kindness of Mr. Alexander of Messrs Macneill and Co.'s "Ganges" Jute Mill to whom I gave the samples, to be passed through his reparing and spinning machinery, and the following is the result with the specimens I now submit :—

"I send per bearer the samples of 7½ lbs. yarn one warp, and the other weft, made from the sample of fibre you handed to me last week. There is also a sample of sliver from the drawing, and to allow of better comparison I send you a sample of our Hessian Sliver taken of the same drawing. The sample we had was so very small, only 3½ seers, that it was with the greatest difficulty we got it made into yarn, which accounts for it being so unlevel. We could, however, judge that there would be no more difficulty in working it than the usual country Jute. There is more gum in the sample than is usually found in the common Jute. It is not quite so strong apparently, having been oversteeped in preparing, and the fibre rather coarser. There is no reason why it ought not to be largely used."

I forward the three samples in question.

Mr. W. Stalkartt.—Mr. Cogswell has given such a very full report on these samples of Sida fibre that I have nothing more to add. The question is, can it be produced as cheap, or nearly as cheap, as Jute.

Resolved.—That the specimens of the yarns above alluded to be forwarded to the Government of Bengal with copy of the reports.

In connection with the above the Secretary called attention to a report in 1851 on this Sida fibre which was submitted by the then Fibre Committee. The specimen was sent by Col. Hannay, from Assam, and most favorably reported on. Subsequently, a further and favorable report was given on specimens raised in the Society's Garden. These were forwarded to the Chamber of Commerce at Dundee, who intimated that the quantity was too small to admit of a definite opinion being given. (*See Journal of the Society, Vols. 8 and 9 old series.*) Since that time this fibre has been occasionally brought to the notice of the Society.

COTTON FROM THE CAWNPORE EXPERIMENTAL FARM.

Submitted a letter from the Assistant Director, Department of Agriculture, North-Western Provinces, forwarding certain specimens of cotton raised on the Experimental Farm at Cawnpore, and requesting an opinion thereon.

Submitted also the following report by a Section of the Cotton Committee (Messrs. Cogswell and Mosley) on these specimens :—

Mr. Cogswell.—No. 1. (Kulpahar)—Color good; staple short but strong, containing a little seed, and some leaf and stain, would class with "good" Bengal, worth ... ... 5¼*d.* per lb.

No. 2. (Bamia)—Color brown; staple long, strong and fine; free from seed, but containing a little leaf, and much stained and perished staple; would class with "good fair" brown Egyptian, worth ... ... 7⅝*d.* „

No. 3. (New Orleans)—Color fair; staple short but strong; containing a little seed, leaf and stain; would class with "middling" Orleans, worth ... 6½*d.* „

No. 4. (Tree)—Color good; staple irregular; free from seed and leaf, but containing a little stain; would with "good middling" white Egyptian, worth ... 6¼*d.* „

No. 5. (Upland Georgia)—Color good; staple fairly long but irregular; containing a little seed and leaf, and some stain; would class with "good middling" Uplands, worth ... ... 6 13/16*d.* „

No. 6. (Farm Bamia)—Color very good; staple poor, being short and weak; containing much seed and some leaf and stain; might pass as "middling" white Egyptian, worth ... ... 5¼*d.*

Mr. Mosley.—Replying to your circular letter of 2nd instant I now return the six samples of *cotton* said to have been grown on the Experimental Farm at Cawnpore, and which I find to be very fully described in the Report by Messrs. W. Haworth & Co., the several specimens representing useful qualities for the European, and/or China markets. Their indifferent condition is evidently the result of a want of proper care in the gathering of the bolls and subsequent separation of the fibre from the seeds, and it would have been interesting to know some particulars of the nature and extent of cultivation, as also whether the produce was raised from imported or acclimatised seed.

CROCODILE OIL.

Read the following letter from the Secretary of the Eglington Chemical Company, "Limited," Glasgow, in continuation of previous correspondence :—

We duly received your favor of 7th December last, and printed copy of Transactions of your Society, in which reference is made to Crocodile Oil. We are very much obliged for the extremely courteous manner in which our communication has been entertained and attended to, and we should feel ourselves still further indebted to you if you could procure and send us a small sample of the oil (any convenient size) and give us some idea of the price at which it could be obtained.

Our attention has been drawn to Crocodile Oil as being likely to be of use in *dressing* leather which is *tanned* by a new process in which we are interested, and we should like to make trial of it. We are sending you by this post some pamphlets and trade journals containing information as to this new tanning process which dispenses entirely with vegetable substances, and which we venture to hope may be of interest to your Society.

We shall of course, be ready to pay the whole cost of transmission of the sample of oil.

Agreed.—That the Secretary of the Company be requested to communicate direct with the parties mentioned in former letter, the Society having done their part.

Letters were read—

From J. McGibbon, Esq., late Director, Botanical Garden, Cape of Good Hope, offering to exchange plants and seeds with the society. (Agreed to.)

From the Superintendent of the Public Garden Allahabad, advising despatch of some Rose plants (Received).

From Mrs. Walker, Purneah, expressing her satisfaction with the flower seeds, received last year Mrs. Walker adds—"I have grown potatoes yearly from the genuine Darjeeling seed with very great success both as to size and quality. May I send some specimens this season to the Society when the bulbs have been dug up. I think they will compare favourably with any kind grown in India. (Accepted with thanks.)

THE KHARAGORA SALT WORKS.

THE salt-tax is one of the largest sources of revenue to the Indian Government, (and the salt from which the tax is raised is manufactured chiefly, as might be supposed, along the sea coast near Bombay, by Tanna and Bassein, and in many other parts of India; but one of the largest and most important of the works is on the lesser salt Runn of Cutch, near the village of Kharagora, and it is of these that we propose to give a brief description. They were opened in 1872, all other works north of Bassein and on the Runn being closed at the same time, a branch line of the B. B. & C. I. Railway being laid to Kharagora from the great cotton station of Veerumgaum, distance of twenty-nine miles. In order to ensure the efficient collection of the salt tax, the works are all under the control of Government—that is to say, they are superintended by Government servants, and the salt is bought by Government from the native manufacturers at a fixed price, and is then resold with the amount of the tax added on, to wholesale and retail dealers. The cost of production is only a few annas per Indian maund of lbs. 82, but with the tax it is sold at about Rs. 2-13 per maund, and at this price tax does not come to more than three or four annas per head of the population. In order to prevent smuggling, the inducement to which is necessarily very great, it would be well if the Government could get all the salt manufacture of Guzerat into its own hands; but unfortunately several of the native chiefs have long exercised the right of manufacture, and though many of them have come to terms with the Government for a consideration, there are others who cannot be induced to yield their privileges, and these are a source of considerable inconvenience. A cordon of police has to be kept round each obdurate State, in order to prevent the entrance of untaxed salt into British territory, and this, it need hardly be said, cannot be done free of expense.

Ordinary sea-salt is obtained simply by allowing sea-water to evaporate in large shallow pans excavated near the sea-shore. After the water has evaporated the salt is scraped off the bottom of the pans in a powdered state, and is necessarily much mixed with earth and other matter in the wrong place, so that to make it like the driven snow it has to be put through process known best to the *babarjee*. But Kharagora salt is turned out in beautiful large crystals of the size of an almond or thereabouts, so hard that the wastage caused by removal is quite insignificant, and all that is required to make it fit for *sahib'* table is to crush it like ordinary sugar-candy. No wonder, then, that Kharagora salt is in high repute in Kattywar and the regions round about.

The Runn of Cutch is one of the most desolate and forsaken of places. It extends for miles and miles presenting nothing to the eye but brown, barren waste without a living or even a dead thing to vary the scene. In fact, it grows nothing but cracks, and these grow larger and larger as the hot weather advances. Perhaps the great deserts present a somewhat similar appearance, but with this difference that desert sand is loose and drifting while the Runn is all "hard-bake. It is supposed at one time to have been an arm of the sea, but the earth had indigestion, and there was an upheaval, and the unfortunate sea lost its arm. The whole Runn is permeated with salt enough to make it keep for ages, and if wells are dry in almost any part of it, there filters through the sand a brine of such saltness that sea-water is sweet beside it. It may be said almost any part of it, because there are three or four kinds of soil in the Runn, all lying in different layers, and it is only through one of them that brine percolates. This layer if found at a very great depth, and sometimes, however deep the men dig it, is not found at all. It must be very trying to the patience to have to dig so deep and get nothing for one's pains, but there is no possible means of ascertaining or even guessing which are the likely spots and which the unlikely. It must have been in some such spot that the Israelites found the wells which they called Marah. The site which the Government has chosen for its salt works is close to Kharagora, a small village lying on the outskirts of the Runn. One of the reason for the choice was that Kharagora is in British territory, whereas other sites that might be suitable are in native territory. Another reason is that it has a moderately good water-supply—an important consideration in a land where aerated waters are not in vogue; thirdly, it is the most convenient point to which the B. B. and C. I. Railway could lay a line; and fourthly, the Agrias, or salt manufacturers, can be most easily obtained from the surrounding villages. As the salt manufacture only lasts from the beginning of October to the end of April, these Agrias transform themselves into cultivators during the rains, and it is expedient that they should not have to travel too far between the works and their fields, or, once off, they might never be seen again.

The works consist of between three and four hundred pans in ten rows, with a railway siding running between each two rows, and the whole is surrounded by a cordon of *chowkies*, so as to prevent the possibility of theft. Each pan is 250 feet in length and 60 in breadth and has at one end a well: and very often, where for some unknown reason, the water in the well is not of the right strength, a shallow reservoir is built by the side of the pan, and in it the water from the well is allowed to stand for two or three days that it may purify and thicken before it is poured into the pan. The pan is a work of labour, if not of art. As the value of the salt depends much on its purity, there must be no soft mud left in the pan. The Agrias therefore work up the mud with their feet into a stiff paste, and then beat it down with heavy wooden mallets until it presents a smooth, hard, or rather tough surface, and this is a process which takes two or three months. The sides of the pans have also to be lined with grass, so as to prevent loose earth from falling in. The sides of the wells have likewise to be protected, only a firmer kind of matted basket work is used. The mode of raising water is primitive and ingenious. In a region which is swamped for four months in the year, it would be useless to get up any costly contrivance which would be destroyed by wet, and which could not be easily removed. The son of the soil, therefore, has hit upon a device which, while it laughs at the rain, can also be removed with the greatest ease. It consists of two long rafters resting near and on fulcrums fixed by the side of the well, and the short arm of each is heavily weighted with hardened clay, so as to bear it down and send the other end towering up over the well. Earthen chatties are suspended from the higher ends by ropes, and two men standing on planks above the well draw down the chatties until they have gone down into the depths and been filled; then letting go the ropes, the beams fly upwards, the chatties come up with a rapid swing to the top of the well, and are emptied into an earthen channel which communicates with the pans. It seems unaccountable that the earthen chatties, which are within a few inches of each other should not, like John Gilpin's bottles of wine, get "shattered at a blow," yet so it is. The great speed with which they ascend seems to protect them and the men at the top lay hold of them in an instant without allowing time for vibrations. It is not known whether the man who invented the process took out a patent. When the pans have been filled with water and allowed to stand, the formation of minute crystals soon begins to take place, and from then until the crystals are fully formed, or, technically speaking, until the "salt is ripe," the pans must be raked from end to end and fresh brine passed through them every day. If this is not done, all sorts of salt, such as Epsom salt and Eno's fruit salt, gets mixed with the table salt, and the result is a mixture with which the Government does not know what to do. The raking is done by a man with a rough wooden rake, the spikes of which are made of common jungle twigs which are too pliable to injure the bottom of the pan. A foot or two of each twig remains on the upper side of the spar, and as the lower end gets worn down or broken off, all that is required is to knock through another inch or two from the top. During the earlier hours of the day, before the heat is great, each Agria trudges up and down his pan with this instrument behind him until no crystal has been left unshaken. So far the operations have been conducted according to primitive methods, but by the end of March the salt is ripe, and its removal takes place according to English ideas under the eye of some magnate of the Salt Department and it is therefore, of course, quite uninteresting. To state it briefly, the salt is piled up by the side of the pans; from these it is removed along the sidings in railway wagons to the great godown which has been built for its storage during the wet months; and from thence it is distributed as fast as it can be sold and the railway can carry it over the length and breadth the land until it has gone so far that it comes into competition other salt, which it cannot undersell owing to the cost of carriage.

A cultured and critical Englishman, sitting in the seat of the corner and viewing the scene, may say within himself:—"What a way of doing work is this? The pans should be of the best English make—if possible the agency of steam should be invoked—and then the outturn would be twenty times as large." It is highly improbable. Considering the extreme cheapness of labour, the indigenous plan is the best, and the introduction of exotic systems would probably only ruin several seasons' salt without, in the end, producing any improvement. Experience, after all, is the surest guide and cannot be successfully transferred from one country to another.

Towards the end of June, when the works have all been deserted and the sounds of labour have past ceased, and nothing remains to remind one of the past but have hardened pans and drying wells, suddenly one evening the south-west monsoon is ushered in with whirling sand-storms and howling gusts of winds, and heavy black clouds which come rolling up darkening the sky, and then burst in one universal torrent of rain over the whole land, filling the heart of man and beast with joy and gladness. During the hours of darkness the downpour continues and next morning—what a change? The Runn and salt works have disappeared, and in their place is one wide watery expanse, which soon teems with storks, sandpipers, and flamingoes and every form of aquatic life, and for the burning tropical heat of yesterday a soft damp balmy breeze blows over the face of Nature. Such is the variety which Nature furnishes to take away the monotony of our lives.—*Bombay Gazette*.

MINERALOGY.

AN official paper on the ores of Gwalior, points to a good opening for capital in that direction, the quality seems good, the quantity large, and wood for smelting purposes abundant, all that is wanted therefore is capital, and *that* will surely not we wanting long.

GOLD IN NORTH WYNAAD.—We have just received from a friend in North Wynaad, whose position and respectability preclude all doubt of its authenticity, the following information:—"Extensive auriferous reefs, more valuable than any yet found either in Devala or S.-E. Wynaad, have been discovered in Terriout, containing visible gold in large quantities, the pebbles (?) all over and through the ore being as large as raggee seed, and some even nearly as large as gram, justifying an estimate of over one lb. a ton; and another reef near to Manuantody, bearing gold, but in which silver predominates. This last favours the idea that silver also may become one of our great productions. Mr. Thomas' opinion, therefore, which you alluded to in one of your late editions, seems likely to be verified sooner than was expected."—*Athenæum*.

FUEL IN AMERICA.

THERE are 26,887 square miles of coal deposits in the State of Missouri, and a "calculating machine" has demonstrated that they can supply 100,000,000 tons a year for the next 1,800 years, and still leave a handsome margin for future generations. There is also an iron mountain in the State 228 feet high; its base covers 500 acres, and it is computed that the quantity of ore above the surface is 280,187,875 tons. Adjacent to the mountain is a "knoll" 581 feet high, with an acreage at the base of 360, and the iron ores in it are estimated at 13,972,773 tons. Large as this supply seems, it is said that in several provinces of China the supplies far exceed the quantity available in the whole of the coal fields of Europe. There are also large quantities of metals, and everything requisite to enable China to become a great centre of manufactures.

FORESTRY.

ACCORDING to an American contemporary, a giant of world-wide renown has lately been laid low, a victim to the levelling spirit that rules the present age. "Old Moses," one of the mightiest Sylvan patriarchs of California, was mercilessly cut down a few weeks ago, and the greater portion of his venerable remains have already been sold to the timber merchants of San Francisco. This colossal tree, judging by the number of rings contained in a sound section of its trunk, had attained the amazing age of four thousand eight hundred and forty-one years, when the fell fiat was issued for its destruction. The hollow portion of its huge and massive stem afforded standing room for nearly three hundred full-grown men. Its term of existence was a longer one than that of the world's known, or at least authenticated, history, and it must have been a "brave green tree" when Noah built his Ark. That so extraordinary a relic of the dim pre-historic past should have been thus ruthlessly made away with—unless its sacrifice were the outcome of some imperative necessity—cannot but be a source of universal regret, and we can readily imagine what the feelings of Professor Wendell Holmes, the true lover and chivalric champion of giant trees, must have been when the dread tidings reached his ear that "Old Moses" had fallen before the axe.

OUR FORESTS AND CLIMATE.

AT frequent intervals during the last quarter of a century our forests have been the subject of discussions in the columns of the Press and of legislation within the walls of Parliament. We do not remember that any objection has been raised to forest conservation on the ground of its being uncalled for; but, in spite of all the discussions, and the measures adopted by sucessive Ministries, forest conservation, it is needless to say, is as far off accomplishment as ever. Outside of the colony, Victoria is credited with having exhibited a great deal of energy in this direction, but we who live within it know that it has no claim to any such distinction. Not only has every stick of timber been cut down in certain districts that has reached a size fit for props underground, but even the saplings that would in time have furnished other props, or have reclothed the area with timber, have been wilfully and wastefully destroyed. Throughout the whole of the diggings areas evidences of a most prodigal use of our forests may be seen. The little area around many a hut is rendered goat-proof by the use of thousand of saplings from the thickness of the finger to that of the wrist. These if left where they sprung would, ere this, have furnished supplises of the timber that is now said to be so much needed for mining. Our sympathy with the classes that are now declaiming against the proposed elimination of portions of the Bullarook country, formerly afforested, would be enlisted more strongly had not the miners themselves been the principal transgressors—the chief agents in bringing about the scarcity of timber of which they now complan. But, in the interests of the common wealth, these features of the case must be overlooked and attention be turned to the consideration of the best method of preventing further mischief, and of remedying, as far as possible, the evil that has been wrought. Hitherto, whilst we have legislated against forest destruction, we have taken no steps to give effect to the law. We have seen boards possessing no powers, or those so overriden by political considerations as to render them merely nominal. Beyond collecting licence fees from sawmillers, splitters, cutters, and owners of Jinkers employed in the forest, nothing has really been accomplished. The wasteful cutting still went on, nor did Mr. Casey's plan of handing over the forests in sections to local boards prove a better method of management than that it had superseded. The clearances continued, and local bodies reaped the pecuniary benefit instead of the State. Victoria is indebted to its Agricultural Department for having augmented the area of forest reserves by great many thousand acres, and for having inaugurated a somewhat better system of management. It has, however, been unable to obtain such new legislation as would enable it to effectively control the reserves; one bill after another has been drafted and presented to Parliament, only to be disposed of in the general slaughter, at the close of the season. The department whose well-directed energies have thus been wasted gains an undeserved reputation for doing nothing, and the forests remain, as before, a means of perpetrating electoral bribery. All this has been presented from time to time in our columns, together with the natural deduction that no effective conservation of forests can ever take place until those portions of the State property be taken from under political control, and placed in the management of an independent board. It is such a course only that the forests can be conserved, and, at the same time be made to produce a grand revenue. These immediately financial matters are, however, of secondary importance, in comparison with the effect a proper system of forest management would have upon our climate. The denudation of our mountain ranges means nothing less than permanent sterility and the ultimate reduction of the whole of the adjacent country to the condition of a desert. Of the effect of trees in modifying climate, the results of ringbarking on the ranges in New South Wales afford striking examples. Whilst the heights were clothed with timber small rivulets trickled down to the lowlands; but at certain times they ran nearly dry. After the timber had been destroyed the streams, when rain fell, become swollen to a great size, rushing rapidly down and carrying away to the sea the water that formerly was absorbed by the roots of the trees, and held partly by the leaves and vegetable matter on the surface of the soil, whence it was gradually evaporated, and thus exercised a modifying influence on the aridity of the atmosphere. The death of the timber is soon followed by the loss of the surface vegetable matter. As no fres layers are supplied, the soil is eventually laid bare, and as the climate of the locality has also become drier, the growth of grasses on the adjacent lowlands is lessened in vigour. When graziers ruthlessly destroy the whole of the timber by ringing in order to produce grass instead of trees, they do not calculate the mischief they are doing to the climate, or the effect their proceedings will ultimately have upon the grazing capabilities of the very country on which they have operated. In the interests of grazing some clearances may be necessary; but it is obvious that if every temporary occupier (Crown tenant) exercises the rights of a proprietor, by clearing the timber off the land he has taken up as a grazing run, the interests of the State will suffer in a manner that statesmen do not as yet appear to have realised. It may not be possible to prevent freeholders from "doing as they choose with their own;" but each colony can, at all events, prevent its property from being despoiled of its most valuable crop by its tenants.—*Australasian.*

CULTIVATION OF CAOUTCHOUC TREES IN INDIA.

IN Mr. Markham's recently published "Peruvian Barks," there is an appendix on the above subject, and from this and other sources the following account has been drawn up by Mr. James Collins:—

In January 1868, a paper appeared in Dr. Seemann's "Journal of Botany, on "The Commercial Kinds of India-rubber or Caoutchouc," by Mr. Collins. This paper was, for the most part a *résumé* of what had been written on the subject, and also contained the results of personal observations on the preparation and commerce of that article, together with an endeavour to fix the botanical source of the various varieties.

At the instance of Mr P. Le Neve Foster, and the distinguished botanist and traveller, Dr. Seemann the author of this article followed up the subject, and the result of his further researches were given in a paper entitled "India-rubber: Its History, Commerce, and Supply," read before the Society in December 1869. The concluding remarks in this paper are as follows:—

There is one subject which I would more especially recommend to the attention, not only of those present, but also submit to the attention of her Majesty's Government, that is, the acclimatisation of the different species of *Hevea* (and also incidentally, I would mention the species of *Isonandra*, which yield gutta-percha) in such of our own eastern possessions, as will be found best suited."

Owing to the prominence thus given, the subject of the introduction into and cultivation of, caoutchouc trees in India was not allowed to drop, and through the representations of Mr. Markham, Mr. Collins was commissioned to prepare a report on the subject for the Secretary of State for India. This "Report on Caoutchouc" was published in 1872. The following passage from it may be quoted here:—

"The cultivation of economic plants, and the acclimatisation in localities where the various conditions, which are so many elements of success, are more controllable than in their native habitat, has a very important bearing on the commerce of a country, and becomes the more necessary for the sustentation and improvement of trade and manufactures, as the march of civilisation and colonisation or the recklenssness of native collectors reduce the area and number of spontaneous forest products. It may be taken as an axiom beyond all controversion, that we cannot long rely on the spontaneous products of the forests but that recourse must be had, sooner or later to conservation, cultivation, and acclimatisation in order to keep up supplies of all necessary vegetable products."

The recommendations were that the (1) *Heveas*, yielding Para caoutchouc; (2) the *Castilloas* Central American caoutchouc; (3) the *Vaheas*, Madagascar caoutchouc; (4) the *Landolphias*, African caoutchouc; and (5) the *Urceola elastica*, Borneo caoutchouc, should be introduced into India, and that the cultivation of the indigenous *Ficus elastica* should be forthwith attended to. Of the various plants mentioned, the relative values of their products were taken into consideration, the *Heveas* and *Castilloas* being specially mentioned.

These views were adopted, and steps taken to carry them into effect. Meanwhile, Mr. Collins sent out full instructions to a correspondent on the Amazons, and was fortunate enough to obtain seeds of the *Hevea Brazilionsis* and plants raised from those seeds at Kew, were taken by Dr. King to India, in 1873. Thus India obtained her first Para caoutchouc plants. A still larger supply was collected and brought home by Mr. Wickham in 1876.

Still, not only were seeds and plants to be obtained but, as was pointed out, there were many questions to be cleared up. Further information was wanted on the physical and climatic conditions under which the trees best flourished, and the best methods of preparing the caoutchouc, &c., and for this purpose observations on the spot were absolutely necessary. In the selection of a proper person, Mr. Markham was so fortunate as to secure the services of Mr. Robert Cross, whose previous travels in search of cinchona plants, and his knowledge of the country and languages, eminently fitted him for the task.

Mr. Cross left England for Panama Isthums, in May, 1875, and first searched for *Castilloa* plants, yielding the well-known Central American caoutchouc. The species which he first met with proved to be the *Castilloa Markhamiana*, so named by Mr. Collins in honour of Mr. Markham. This species grows to a height of 160 to 180 feet, with a diameter of about fies feet and a full grown tree yields about 100 lbs. of caoutchouc. The wood is soft and spongy and rapidly decays. Some caoutchouc prepared from these trees by Mr. Cross was reported to be superior in quality to that yielded by the historic *Castilloa elastica.* The range, too, of these trees was so wide that in certain districts part of the year is dry. Of the plants collected, 134, flourished at Kew, and of these a goodly supply was forwarded to India in 1876.

Mr. Cross again left England in 1876, this time to procure seeds and plants of the Ceara caoutchouc tree, and further supplies of the *Heveas*. In both efforts he was successful, resulting in the establishment of 1,000 plants of *Hevea Brasiliensis*, and a goodly number of Ceara plants, all in fine condition at Kew.

The tree yielding Ceara caoutchouc till this time was unknown, and to Mr. Cross is due the honour of clearing up its origin. In trying to get up young plants he could not move them, till digging round the roots he

found them furnished with tubers of the size and shape of kidney potatoes and from materials brought home, the plant is recognised as the *Manihot glaziovii*, a near relative of the tapioca plant. Quotations from Mr. Cross's report on this journey have already been published in this *Journal* (July 12th, 1878), and the report is full of practical information of the utmost cultural value.

Mr. Markham sent the bulk of those plants to Ceylon, from whence, as he says, they can be distributed to suitable spots in India as soon as the Government are less luckewarm on the subject, and fully recognise the importance of the scheme. In Ceylon, the *Heveas* grew remarkably well, and some trees have reached a height of nearly 30 feet, with a girth of 14 inches. The *Castilloas* also do equally as well. Later information from Ceylon shows that private planters are taking up the question, and Dr. Trimen, the newly appointed Director of the Peradeniya Gardens has published for their use a series of instructive notes on the cultivation, based on the reports of Messrs. Collins and Cross.

As to Madagascar caoutchouc plants very little information is to hand. Mr. Markham mentions (*Journal of the Society of Arts*, April, 1876) that seeds of *Vahea* have been sent to India.

With regard to African varieties, Dr. Kirk has displayed much interest, and has procured many plants of the Landolphias. Mr. T. Christy has procured several plants of *Landolphia* S. Mr. T. Christie has procured plants of *Landolphia florida* and *Urostigma Vogeli*, as well as plants of an apparently new kind from East Africa yielding an excellent quality of caoutchouc, and some fine and healthy examples of these are now in that gentleman's nursery.

Thus of the various introduced kinds it is pointed out that the *Heveas* produced the choicest and best caoutchouc, and are well fitted for the moist zones of India. Castilloas will grow over the largest area, and new homes can be found for them in the Western Ghâts. Ceara kind thrives on drier ground and may find a fitting home in the hot dry plants of India.

In the efforts to introduce these exotics into India, the primary recommendation to cultivate and conserve the indigenous *Ficus elastica* yielding Assam caoutchouc, has not been lost sight of. The first attempts commenced in 1873, were comparative failures; but since that date the superintendence has been placed under Mr. Gustav Mann, and under his able management the experiment begins now to assume some importance and, roughly speaking, there are now 1,000 acres in Assam under this cultivation, and the trees are making vigorous and excellent progress.

One other plant deserves notice—a Burmese one—as likely to prove of great utility as a source of caoutchouc. It is the *Chavannesia esculenta*. This plant, of a climbing habit, was always looked upon as a pest by the Forest Department of British Burmah, and every means taken for its extirpation, as it injured the teak trees. Mr. Strettell, one of the officers, however, discovered that it contained caoutchouc, and seems to have proved conclusively that it will repay cultivation. If this turns out to be the case, it will only be another exemplification of the fact that "a weed is an unutilised plant."

Thus, although but yet in its infancy, the subject of the acclimatisation and conservation of caoutchouc-yielding trees has arrived at such a stage that its practicability is placed beyond all doubt, and the Society may well congratulate themselves that the warm support accorded to the idea when first brought before them, has proved an important factor in the present state of affairs. Nor must the action of Kew be forgotten. The valuable aid and support given to Mr. Collins by Sir Joseph Hooker, and the great care he has bestowed on seeds and plants sent to that establishment, have been of the utmost practical moment.

As Mr. Markham says:—This if intelligently and continuously followed up, will thus ensure in the future, as the demand increases, a regular and large supply of the best kind of caoutchouc from British India."

GARDEN.

THE DECIDUOUS MAGNOLIA.

IN presence of the ruin caused by our recent winters, we were pleased to notice at Sion the other day that the two sturdy trees of the Chinese magnolia were quite uninjured, and bristled with bold flower buds, ready to open in March. What a noble tree this is, and how worthy of our best attention! No doubt our hard springs sometimes disfigure it; but then, the beauty of the bloom is so fine when the season is at all fair, and the bloom is also so constant, that no trouble is too much to secure the tree a good position. At Sion the tree struck us as being very happily placed, not shaded or approached by others, but with some friendly shelter near; and the alluvial soil of the Thames valley seems to suit it well. The large evergreen magnolia, which forms so noble a tree in the west and south of France as well as in its own native country, is unhappily not nearly so valuable as a standard near London, though it survives here and there. With us it can only be usefully grown as a wall tree, and as such it is often very fine; but for the open there is nothing like the large deciduous magnolia.—*Field.*

PLANTS BLOOMING WITHOUT EARTH.

M. ALFRED Dumesnil, a son-in-law of Jules Michelet, and the editor of the first edition of Edgar Quinet's works, claims to have made an interesting and useful discovery—how to preserve plants in a perfectly vigorous state without any earth. Since November 1880, the date at which his researches proved successful, he has, with the exception of a six weeks' stay in Paris, been continually taking plants from the ground and applying his process to them; has never found the least interruption in their vegetative functions; on the contrary, winter and spring plants have blossomed with a vigour which, as an experienced horticulturist he has never seen in his garden. With the shelter of a glass, hellebores, taken up at the end of November and the middle of December have remained from two and-a-half to three months in blossom. Other plants, primroses, daisies, violets, auriculas, &c., have not only been in bloom for three months, but have thrown out new buds. Bulbous roots, small shrubs, exotic plants, such as azaleas and cyclamens, take equally well to the process. M. Dumesnil exhibited some specimens of plants, blooming without earth, in the Square Solverine, in Rouen, last December; and at his home at Vascœul, about fourteen miles from that city, any one may have ocular demonstration of the results he has obtained.

In any light, the discovery is an interesting and an important one, as its applications are numberless, and the fresh scope it would give to the floral decoration of interiors delightful to contemplate.

FRUIT GROWING IN THE UNITED STATES.

CONSUL Cridland, in a recent report, states that East Florida has very great natural advantages for fruit growing, and especially for the orange and lemon fruits peculiar to warm climates. Large districts in the countries situated between the latitudes of 27° and 29° 40′ north, and longitudes 80° 30′ and 82° 40′ west, seem to be particularly adapted to the orange and lemon tree, and little else is profitably grown on such land. Formerly, in Florida, as in most of the cotton States, the whole time and attention of the people was engrossed in the cultivation of the cotton plant and the sugar-cane. Fruit-growing was looked upon rather with contempt, and no value was attached to the wild orange groves in the States any more than to the same quantity of other timbered lands. In fact, very frequently the wild orange trees were, cut down and destroyed to make room for cotton and sugar. Of late years, however, the people have found out the importance and profits of tropical fruit culture, and the old wild orange trees are highly prized, and are converted into sweet oranges by grafting. The difficulty in regard to orange culture is the impatience for immediate results. The orange, if cultivated from the seed, requires from seven to ten years of attention before it begins to bear, and the lack of patience and confidence deters people from starting an orange grove, and presisting in its care. Experience has proved that there is no fear of frost south of Pilaka. The quality of the Florida orange, and the excellent condition in which it reaches the northern markets, renders it a most profitable crop. There can be no fear of an over-production of the orange or lemon when it is considered what a vast country has to be supplied. In 1879, 4,000,000, dollars' worth of oranges and lemons were imported into the United States and the orange crop of Florida was valued at over 1,000,000 dollars. From information lately published in the United States, it is estimated that the orange crop in Florida next season will be 100,000,000 of oranges, for which the dealers will give the growers 1,500,000 dollars. The orange crop will double itself every three or four years; and considering the reports to the Governor show that there are over 20,000,000 of trees in the orange groves of Florida, in future years the crop will be enormous, and exceedingly profitable, and if the 20 per cent. *ad valorem* duty continues, it will stop the importation of oranges from Sicily, Spain, and the West Indies. Persons who engage in the cultivation of an orange grove in those parts of Florida where frost is almost unknown, proceed there and purchase from five to ten acres of land. Suitable land for orange culture costs from 15 to 20 dollars per acre. The land is then fenced in, which can be done for 6 dollars per acre. Clearing the trees and grubbing the roots, if done thoroughly, will cost 20 doollars per acre. This work takes some months to accomplish. Persons are found who undertake not only to clear, grub, and plough the land, but to purchase the orange trees and set them out. Most people purchase and replant trees three years old. From 60 to 80 trees are planted per acre; to plant and set out 800 trees would cost 200 dollars. In two months after being set out, which is generally done in January or June, the trees are fertilised with guano: the ground ploughed heavily once a year, and lightly six times a year. A crop of of Southern peas is raised between the trees, and, when ripe, ploughed in to enrich the soil. The trees receive two applications of guano a year. They grow little the first year; after that they become firmly established in the soil, and grow faster. There are no serious diseases of the orange, in good soil, in Florida. There are a great variety of orange trees but none so good as the Florida seedlings, or native trees. In starting an orange grove, the land should be cleared of everything and well broken up. The holes for the orange seedlings should be 30 feet apart, and 18 inches deep, and four feet in diameter. Consul Cridland states that for a total outlay of 1,030 dollars, a person can have an orange grove in Florida which will, after the fifth or sixth year, beg in to yield a good income.

A BIG MELON PATCH.

MISSOURI boasts of possessing one of the largest and most productive melon patches in the United States. It is situated on the borders of Scott and Mississippi counties, and equals if it does not exceed in size and adaptation of soil and climate the famous melon patches of Georgia Indiana, and the eastern shore of Maryland. The St. Louis *Republican* describes it as a tract of sandy prairie, four miles wide and ten miles long, with a thin warm soil, just adapted to the cultivation of the melon, and such melons as are raised nowhere else in that region. There is much richer and deeper soil all around there, but it is not adapted to melon culture. This land is capable of producing 1,000 melons to the acre. At a place called Diehlstadt, in Scott County, there were shipped the past season 439 car loads of 1,000 to the car, and Bertrand, in Mississippi County, shipped 180 car loads, mostly to Chicago. The melon county was visited by 25 commission merchants from Chicago, who paid as low as 40 dols and as high as 140 dols. per car load, being an average of 70 dols. per car, the market price varying with the advance of the season and the number of melons ripening at the same time. Most of these melons were shipped over the Cairo and Vincennes and Illinois Central Railroads in fruit cars, properly ventilated and arranged for the purpose. These melons found their way not only to St. Louis and Chicago, but to most of the lake cities, and even to New York and Philadelphia.

Melons are getting to be such a staple of production that the cultivators are asking for increased railroad facilities to move the product at the proper season, and recently the Hon Henry J. Deal, the newly-elected member of the Legislature from Charleston; Mississippi County, applied to Superintendent Soper, of the Iron Mountain Railroad, with a petition numerously signed, representing that they would plant 700 acres more next year in melons if the railroad will give them a side track and station at a point on the Iron Mountain Railroad three miles north of Charleston, to be called Melon Station. Mr. Soper gave assurance that he would comply with the request of the petition. Col. Deal estimates that 700 acres ought to produce 700 car loads, at the rate of 1,000 melons to the acre, making 700,000 melons. One man can attend to 25 acres of melons. The variety of seed used is that of the Georgia melon, which is very luscious and grows to a great size, some weighing as high as 60 pounds. The hills are planted 14 feet each way apart, and from three to four seed are put in a hill. They commence shipping melons about the 20th of July, and continue to the end of August.

ON THE MANAGEMENT OF THE CHINESE PRIMROSE, SINGLE AND DOUBLE.

THE single-flowered sorts of the much favoured China primrose are raised annually from seed which should be sown from February till May as according as they are wanted early or late. They should be reared in a temperature of 60 degs. night to 75 degs. day. The sowing must be very carefully done, as regards the point of covering. The seed must not be buried deeply, but yet should be covered sufficiently. Perhaps the best plan that can be taken with them as regards this point is to make the soil in the pot or pan in which they are to be sown perfectly even and smooth on the surface. Let the seed then be sown evenly and regularly, and pressed down level with the soil by means of a circular piece of board. A thin strewing of moss may then be laid on the surface to prevent excessive evaporation, and the pot or pan may also be covered with a piece of glass the better to prevent evaporation. The soil should be loam and leaf mould or well-rotted manure; a good portion of sharp sand should be added, to render the mass porous and thoroughly permeable to water. Drain the pot or pan thoroughly. If possible give bottom heat; indeed, there is no better place in which to start the seedlings than an old-fashioned hotbed or dung frame. Keep them close to the light, so that they may not become drawn and leggy. Pot them off singly as soon as the plants are fit to handle: let the first pots be 'thumbs,' and the soil the same as that recommended for the seed pots. They must never be allowed to become stinted or pot-bound till they occupy the pots in which they are to flower. The size of these must be determined by the size to which the plants are to be grown. Excellent blooming plants may be grown in six-inch pots, but if wanted for the purpose of exhibition they must have larger pots. For the latter purpose the seed should certainly be sown in March early. When the plants have filled their blooming pots with roots they should be well supplied with liquid manure, and never be allowed to become dry, as they will not in that case throw up their flowers vigorously and well. The best strains only should be cultivated, and these can only be obtained by dealing with thoroughly trustworthy houses.

Double primulas originate in the first instance from seed, but they can only be propetuated by means of cuttings after they have been raised. There is, however, a class of semi-double flowered sorts which may be raised from seed, and they are only second rate in value for the purpose of cutting to the full double kinds, as they last much longer in that condition than the single-flowered sorts. These require the same treatment as the single-flowered sorts, and are not worth the extra trouble of rearing by means of cuttings, except anything really good and worth perpetuating should be discovered among them. But those indispensable kinds named the old double white, fimbriata, Mrs. Eyre Crabb, delicatissima, and the old double red, and many others can only be raised from cuttings. The cuttings require to be taken in spring when the plants are in full growth, the shoots being cut as low down as insure a portion of the hardened old growth at the base of each. These should be put in small sixty sized pots in sandy leaf mould and loam well drained, and plunged in bottom heat of 75 degs. to 80 degs. Much care and watchfulness requires to be exercised to prevent damping, to which they are particularly liable if kept very close and moist. If they are done in an ordinary hotbed or dung frame, and with care they can be done in such with excellent success, they must have a little air night and day left at the top of the lights to let the superabundant vapour pass off. The only difficulty to be anticipated in doing them in the ordinary dung frame, besides the tendency to damp alluded to, is that of maintaining an equable temperature. But the strictest attention must be paid to this point if failure is to be avoided. When the cuttings are rooted they must be gradually inured to more light and air, and the potting should be attended to as the plants require more pot room. The compost should be rich but mellow, that is it should have been laid up in store some time before being used.—*N. B. Agriculturist.*

SPIRŒA JAPONICA (HOTEIA).

THE popularity which this plant has attained in this country within the last ten or twelve years, is a proof at once of its merits as a decorative plant and of the quick appreciation of a good thing by the lovers of flowers, among not only gardeners but the now gardening public. The plant was grown in gardens for a period long preceding its general popularity, but proved unfit for use in many parts of the country on account of its liability to be cut off by late frosts in spring, which destroyed its beauty for the remainder of the season. Only in the most favourable seasons or in the best parts of the country does it appear at its best out of doors. But the discovery of its adaptability to forcing for winter decoration in pots, brought it into requisition to a degree that no plant previously used for that purpose had attained. The demand quickly exceeded the supply, and for a time the plant was scarce and dear; but this was soon rectified by the Dutch and Belgian nurserymen, who now send us millions annually, at a price which little exceeds the cost of the carriage even in these days of cheap and rapid transit of goods from all parts. Some idea of the enormous numbers that are grown annually in this county may be gathered from the fact that many of the large growers for the supply of Covent Garden Market turn over upwards of a hundred thousand each. It is, in fact, one of the most popular of winter flowers, and one of the secrets of its popularity is its cheapness. It is easily produced at small cost on the Continent, where the climate is favourable and land and labour are cheap. Another recommendation that has contributed largely to its universal adoption for winter flowering in conservatories, greenhouses, and rooms, and for the no less important purpose of supplying cut flowers on a large scale for trade or home consumption, lies in the extreme simplicity and ease with which it may be pushed into flower as much as six months before its natural period of flowering in the open air. Home-grown roots have neither the vigour nor the quality to force early. They make late growth, which, as has already been said is liable to be checked if not utterly destroyed by late frost, or by the hardly less destructive influence of east winds, which are a characteristic in spring of our general climate: and in consequence imperfectly matured crowns are a result which operates against doing well when any attempt to force them out of their natural season of rest is made. Such roots may do fairly well for late forcing, but will not stand being pushed with the view of bringing them into bloom in January or February. By those who grow largely for market supply, the roots are destroyed if they happen to remain on hand over the forcing season, they are not reckoned worth the labour of keeping, nor would they pay the rent of the ground they would occupy to keep them, even if they have not been forced; while forced plants are simply regarded as rubbish, and treated as such.

When the roots are received from the dealers in late autumn, no time should be lost in getting them potted up; or if the number received happens to be beyond the power of the available labour at the time to pot up the clumps should at least be covered with soil sand or ashes, or any other protecting material, out of doors, still it is convenient to attend to the potting. They should on no account be allowed to lie about exposed to drought, or it may be also frost, which would injure them even in a dormant state. The pots should be no larger than what will easily accommodate each clump, and the quality of the soil is a matter of small consequence, provided it is open and porous. Sustenance during the course of growth under forcing must be provided by means of abundant and stimulating waterings, rather than by a concentrated compost, for the small amount of soil that can be got into any of the few sizes of pots usually employed along with the bulky clumps would give them little to depend upon. The plant is also so greedy of water after it has formed its fibres in the soil and started to grow, that it will imbibe almost inexhaustible supplies of water, a peculiarity which presents to the cultivator the readiest means possible of feeding and stimulating to any degree hardly possible by means of even the richest soil mixtures. In fact, as soon as the pots have become fairly filled with roots, they should be put in saucers, which should never be allowed to become dry, and the contents of which should be largely mixed with cow's urine or manure water made from cow or sheep dung. The plants should be placed as near the light as possible while growing, so as to ensure short stubby growth. They should also be so placed as to have abundance of light and air on all sides, otherwise they are liable to become top-sided and disfigured. The neat, nicely porportioned habit, the elegant foilage and flower spikes, and the fact that it stands in need of no such thing as stakes render it one of the most desirable subjects for decorative purposes that could be desired at any season of the year, and guarantees that its popularity will not be soon abated, for it has no rival in its way, and is never likely to have one in which all its merits will be combined and excelled at the same time.

Spiræa plumata, this is another Japan plant of rare decorative excellence, but being later in flowering than the preceding, it is not possible to force it so early into flower. Yet it is so choice in its tint of deep crimson rose colour, and its inflorescence is so dense yet graceful in style, that it is welcome at any season of the year, indoors or out of doors. The plant is hardier in constitution and less liable to be injured by late frosts in spring than the preceding, but it also in districts that are liable to visitations of late frosts, becomes disfigured by them, though not quite destroyed for the season. A sunny position and moist cool bottom suit it best out of doors, and in pots it requires similar treatment to the preceding but with somewhat less moisture.—*North British Agricultural.*

JAPANESE GARDENING.

JUDGING from a paper read at a recent meeting of the St. Petersburg Society of Gardening, the Japanese must be allowed to have distanced us altogether in at least one branch of education. Enthusiasts in gardening would fain live to see the day when every householder will have his plot of garden, and will know how to cultivate it. The universal spread of such knowledge seems to be almost as hopeless as the possession of plots for its exercise in our large towns. But the Japanese, M. Grigorieff tells us, are all taught gardening in their schools, and all have their little plot of ground. They are instructed in practical horticulture, and in the artistic arrangement of bouquets, and all classes, from the palace to the cottage, manifest a passionate love of such humanising and healthful occupations. Nowhere in Europe, we are assured, are gardens so numerous, or the love of floriculture so extensively developed. One very curious art they seem to have brought to great perfection. Their gardens often being small, and their taste leading them to take pride in the possession of trees of the bigger species, they have gradually developed the art of dwarfing them without in any way sacrificing their general shape and proportion. Father and son and grandson will grow an oak, for instance for fifty years or more, and will take means of preventing it ever attaining more than eighteen inches, or a couple of feet in height, though still presenting all the characteristics of the full-grown tree in trunk, branch, and foliage. Among their family treasures to be handed down from one generation to another, may often be found a well-arranged garden, established in some antique specimen of Japanese pottery in the shape of a capacious bowl. Within this receptacle will be walks and trees and flower-beds, with a great variety of floral favourites all dwarfed to the proper proportions. One further development of this odd manipulation of natural objects, is the patient training of the minified trees and shrubs into the forms of birds and beasts, or any other object that may strike the fancy, or may be suggested by the accidental shape of the plant, a refinement of gardening which in barbarism very nearly approaches our fashion of clipping shrubs into plum-puddings, or perpetually snipping trees that might become beautiful, into close imitation of German toys.—*Globe.*

NEW WAR OF GROWING CYCLAMENS FROM SEED.

IT may be said that in my case the use of cocoanut fibre and charcoal is a mania, but I must write to inform your readers of the complete success of an experiment with that mixture which I have been trying in the raising of cyclamens from seed. On October 19th I sowed a packet of seed just below the surface in a saucer filled with fibre and charcoal, and from that time never allowed it to become dry. It stood on a shelf in a badly-lighted dwelling-room. On November 23 I burrowed down to see how the as yet invisible seeds were getting on, and I found that though they had not sprouted, they had made fine strong roots, which had firmly taken hold of the compost. On November 30 they had all come up, and are now in their second leaf, and I shall plant them out in the ordinary way as soon as possible.—*Ulmorum*, in the *Garden.*

LILIUM GIGANTIUM.

THE following from the *Garden* may afford a useful hint to some of those who cannot succeed with this magnificent lily:—"This is undoubtedly one of the finest of all the lilies, both as regards flowers and foliage. It is empahatically a lily for the south or milder parts of our climate. In Devon and Cornwall, in some old country gardens it is a sight not readily to be forgotten; there it not unfrequently grows from 6ft. to 10ft. in height, and bears from six to 12 flowers. In Devon, quite near to Exetor, I have seen great clumps of this lily, bulbs and offsets 3ft. or more in diameter, and when the first great glossy leaves unfurl themselves in the spring, the plants are very ornamental even if they never blossomed, as indeed with me they sometimes do not. In pots it does fairly well, and has a great liking for strong manure-water once or twice during the week, and, of course, plenty of moisture at all times. Even when supposed to be at rest in winter the soil should ever be maintained in a moist condition. Both in pots and in the outside borders this plant is now making active growth, albeit as yet below ground, and I am persuaded that at no other season do lilies suffer so much from drought at the roots as at this season, when a good sound foundation for the top growth of leaves and blossoms is being made."

TEA.

SO it is proposed to give us a quasi-governmental tea warehouse. We have heard quite enough of governmental interference to inspire us with a lively dread of encountering any more of it. When the tea industry wants a warehouse, it will provide it. If the object be to help the industry, we can point out a variety of modes, by which this can be effected. Let the Government interest itself in providing better means of communication between the tea districts and Calcutta. The intercommunications be are not what they ought to be, let them be seen to. Let the obnoxious forest rules be modified. These, and fifty other things might be done with advantage to all concerned, but we do not want any fresh interference.

WE have repeatedly urged of late, the propriety of making only the finer classes of tea. That low class teas can be made to profit is beyond a doubt, but it is suicidal to flood the market with a large percentage of cheap low-class teas at the present moment when the industry is suffering from a plethora of stock. The *Produce Markets Review* in a recent issue, says :—"There has been less activity in the Indian tea market, and most descriptions are, not so firm. The low broken proportion is considerably in excess of the demand, and as much of it is below the average quality, even of this class of tea, prices have further declined. If the supplies of low broken sorts continue as large as during the past few weeks, values may reach an exceptionally low point, as the lower China sorts are being freely offered at declining values. The medium kinds of which the grocers appear to hold good stocks at present, have also declined, although not to the same extent. The competition for the finest teas shows no abatement, and the few fine brands brought forward have fetched extreme prices." THIS exactly bears out what we have been urging.

SINCE the advent of tea rolling and withering machinery, a radical change has taken place in the mode of manufacturing teas. We do not now speak of the present rage for underfermenting to produce pungent rasping liquor, but of the system which is now in vogue by which panning is considered unnecessary. There can be no doubt that the abolition of panning received an impetus, from the demand for this rasping tea, because panning tones down this very bitter quality in the leaf, and while rasping tea is required, it is of course not advisable to have this flavour toned down. The demand above referred to was brought about by the custom of using Indian tea for the purpose of strengthening weak China qualities, and such being the case, rasp may have been an advantage. Now, however, that Indian tea is assuming its proper place in the market, and is being largely consumed alone, and unmixed with the China article, the raspy flavor is objected to, and hence we find Messrs. George White & Co. in a recent review of the trade, retrospective and prospective saying :—

Under the old fashion, that is to say, the system of hand rolling, &c., there used to be some very fine tea made, and we are inclined to think that one of the processes, *viz.*, that of panning, which has been discontinued, might be revived to advantage.

We quite agree with this remark, an effort to make only the finer grades of tea would tend materially to raise Indian tea in the estimation of the consumer, and would at the same time prove of considerable benefit in reducing stocks.

AT the present moment, and for a few months back, tea stocks in London have shewn a tendency to become less, this tendency has been frustrated to a certain extent by the enormous quantities of tea which have been pouring into the market, and these being principally of low quality, have tended to keep down prices. The cause of lowering stocks is, of course an increased demand, this too may be largely brought about by the low prices prevailing, but there are not wanting sure signs that it arises principally from an increased consumption, and a steadily growing taste for the Indian article as compared with that of China. This is a healthy sign, and the tea planters of India will surely make an effort to meet this revival half way, by making a tea which will give satisfaction if drunk alone.

A LONDON Trade journal has the following on the tea sales for week ending 18th March :—

"Of the 12,000 packages brought forward at the public sales a very large portion consisted of low broken descriptions, which in consequence of their undesirable quality, fetched exceptionally low prices. Souchongs and Pekoe Souchongs sold at comparatively steady rates, but for the medium sorts previous quotations were scarcely maintained. The finer qualities were actively competed for, and readily taken at full prices.

THE PROPERTIES AND USES OF TEA.

IN a book written by Professors Bentley and Trimen, entitled, "Medicinal Plants," we read :—"The principal use of tea is to form an agreeable slightly stimulant, soothing, and refreshing beverage. It was formerly believed that tea, from the *theine* it contained had the effect of diminishing the waste of the body, and as any substance that does this necessarily saves food, it was regarded as indirectly nutritive; but Dr. Edward Smith has shewn that on the contrary tea increases the bodily waste by acting as a respiratory excitant and in other ways. From containing gluten, tea has also been regarded as directly nutritive. As a nervine stimulant, tea may be taken with great advantage in headache and neuralgia, and in other affections caused by the exhaustion of the system from depression of nerve power. Its effects in such cases are said to be analogous to quinia, and hence tea has also been given in intermittent fevers—in asthma, whooping cough, and other spasmodic disorders. Tea is drunk by upwards of 500 million people," in other words by half the human race.—*H. & C. Mail.*

SHIPMENTS OF TEA FROM CALCUTTA.

FOR the information of our home readers, and as a complete record of the movements in Indian tea, we give the following particulars of tea shipped from Calcutta during 1880, with the names of the firms shipping, taken from the annual "export summary" of Calcutta :—

	1880.
Messrs. Williamson, Magor and Co.	6,665,341
" Begg, Dunlop and Co.	3,751,293
" Macneill and Co.	3,442,046
" Schoene, Kilburn and Co.	2,818,196
" Balmer, Lawrie and Co.	2,060,742
" Barlow and Co.	2,036,901
" Stanley and Co.	1,446,827
" Lyall, Rennie and Co.	1,288,112
H. P. Thomas, Esq.	1,205,785
Messrs. Octavius Steel and Co.	1,045,685
" Andrew Hoyes and Co.	975,043
Messrs. Macknight, Anderson and Co.	958,786
" Carlisles, Nephews and Co. ...	949,682
" Duncan, Brothers and Co.	934,229
" Mackinnon, Mackenzie and Co.	901,661
" Ralli Brothers	844,750
" Barry and Co.	829,975
" Shaw, Finlayson and Co.	772,456
" Maxwell and Co.	709,980
" Geo. Henderson and Co.	627,337
" Hoare, Miller and Co.	619,999
" Young and Co.	545,207
" Gillanders, Arbuthnot and Co.	530,432
" J. Mackillican and Co.	508,111
" John Elliott and Co.	428,206
" Jardine, Skinner and Co.	377,663
" Agelasto and Co.	377,315
" Gladstone, Wyllie and Co.	331,538
" Crooke, Rome and Co.	320,396
R. S. Staunton, Esq.	279,931
Messrs. Lloyd and Co.	284,608
" Grindlay and Co.	239,091
" A. R. McIntosh and Co.	151,380
W. Blackhall, Esq.	111,470
Messrs. Petrocochino Brothers	106,327
" Kettewell, Bullen and Co.	87,958
" Nicholls and Co.	79,840
" Hinde, Allen and Co.	76,189
" Gisborne and Co.	72,105
A. Ewing, Esq.	52,855
Messrs. Ralli and Mavrojani	49,605
" F. W. Heilgers and Co.	48,900
" Finlay, Muir and Co.	40,267
" Lewis and Co.	36,790
" David Sassoon and Co.	33,835
" Ede and Hobson	31,440
" W. S. Cresswell and Co.	25,096
" Tamvaco and Co.	21,424
Total	40,024,596
Other firms	4,115,061
Total for U. K.	44,149,657
To Continent	[illegible]
" America	17,111
" Eastern Ports, &c.	[illegible]
" Australia	[illegible]
Grand Total	[illegible] lbs.

BOHEMIAN TEA.

WE translate the following from the *Indische Mercuur* for February :—
For some years a shrub has been cultivated as *Thea Chinensis* in different parts of Bohemia, the leaves of which prepared as green and black tea, has been used to a considerable extent even in other countries. Not only is it brought into the market as "Chinese" tea, but it is used to adulterate the finest sorts of tea. A botanist named A. Vogel has identified the plant as *Lithospermum officinale*, and has subjected it to a careful botanic-chemical analysis, regarding which we give the following particulars :—Theine or any other alkaloid is not found in the plant, but only cellulose, gluten, gum, glucosides, fat, ethereal oil, rosin, tannin, chlorophyl, albumen, acid salts, water, &c. Dextrine also appears to be present in it. The composition differs greatly and notably from that of Chinese tea.

COFFEE.

LIBERIAN SEED.—A correspondent writes : "I notice the fruit vendors at Polgahwella Station are offering Liberian cherries at one cent. each. Where do they get it? One would scarcely suppose the proprietors of Liberia Estate (in the neighbourhood would put such a premium upon coffee stealing by thus opening the path to thieves.

LEAF-DISEASE IN NATIVE COFFEE.—It would appear that the injury caused to Native Coffee gardens in the Central Province by repeated attacks of leaf-disease, has been far greater than that suffered by estate coffee, probably, from the fact that the native gardens are less cared for, and are generally in a less vigorous state of health than plantation trees. But be this as it may, the accounts we have received from the Central Province, and especially from the neighbourhood of Badulla which we all suppose to be the peculiar home of coffee, are most distressing. On a recent occasion, when the Government Agent, on a tour through his province, brought to the notice of the headmen of Uva, the heavy arrears of revenue, the reply was that the villagers were quite unable to meet their payments in consequence of the serious losses they had by their native coffee gardens having almost entirely gone out of bearing. In proof of this, the Agent, we believe, was shewn a number of Native Coffee gardens which certainly bore out all the statements made to him. We mention this particularly, because in the Uva country, coffee is always supposed to thrive far better and yield better crops than in any other part of the Island, yet, here we see native gardens suffering most severely from the attacks of this pest.

MADRAS COFFEE AT MELBOURNE EXHIBITION.—Madras has a second time beaten Ceylon, by standing first in the order of merit as to the quality of her coffee. The former defeat was at the Sydney Exhibition, and the Colombo Press on that occasion attributed Ceylon's want of success to the fact that their planters had not got sufficient warning, and that the demand for specimens was made at an inconvenient period of the year. On the present occasion not only had they due warning, but a special Commissioner was sent to the Exhibition to uphold the merits or their exhibits, while Madras was unrepresented as regards a local Commissioner. We shall be curious therefore to learn the cause to which this second triumph of Madras is attributed by the Ceylon Press.—*Mail.*

THE correspondent who writes about the great prevalence of grub on his and his neighbours' estates, should take heart by what has been accomplished in other directions. No pains must be spared to clear out this serious pest, and that it can be done we have no doubt. Having enjoyed immunity for several years, these insects have multiplied exceedingly, and no wonder. But the indiscriminate slaughter hat has been going on in Maskeliya and Lindula for months past, must have the best effect in lessening the number of our enemies. The efforts of planters must not slacken until they have completely overcome this insidious foe.

LARGE SALE OF CEYLON COFFEE PROPERTY.—We believe the Elkadua group of estates have been purchased by a company of gentlemen for somewhat about Rs. 210,000. There are about 1,200 acres of coffee and 50 of tea. Among the coffee there is much cinchona, over 500,000 plants having been counted, from six months to four years' old. The coming crop of coffee is said to be between 10,000 and 12,000 bushels parchment. Should such be the case, there is no doubt the purchase is a good one for the Company; and we congratulate them on having, as their representative here, one of the shrewdest, most far-seeing and popular men in the planting community. We wish him and his partners every success.

THE BRAZIL COFFEE CROP.—Messrs. Robert von Glehn & Sons in their monthly coffee report, make the probable deficiency in the coming, as compared with the last, Brazil crop equal to 1,200,000 cwts, and how altogether a total deficiency of coffee crops in 1881-82 of 2,270,000 cwts. as compared with 1880-81.

LEAF-DISEASE IN COFFEE.

A CORRESPONDENT, writing on leaf-disease in Coffee, says :— "Something might be found out of the manner the Arabs treat the coffee plant. Mocha is the king of coffees—either by climates or treatment—perhaps it is that arid climates grow the best. There remains no doubt of the plant being perfection. Doctors and botanists may advise a good deal to counteract influences, yet Arabia is the starting point, because it gives the best. Dent's Concession in Borneo in its most arid parts should give next to Mocha. English coffee growers must beware that the Spaniards in Manilla do not take to, and surpass them in coffee growing. Any one finding out the mode to dispense with fungus, I think must do so from Arabia. If any one cannot be found here who has been in Mocha, by bringing one plant with fungus upon it, and taking it to Mocha in a week, perhaps he might find out the Arabs' secret from that add to his fortune in a treatise on the plant, and thus surpass those who cannot dispense with fungus. Of all the people who have gone to plant coffee, has one of them asked at Aden anything about?"—*L. & C. Express.*

THE JAVA COFFEE CROP.

IN the British Consul's Report for 1879, dating from Batavia, we read :— The coffee leaf-disease (*Hemileia vastatrix*) broke out in March on some plantations in the neighbourhood of Buitenzorg, but its effect does not appear to be so pernicious to the growth of the shrub as it has proved in Ceylon.

No doubt the comparatively fair crop of that year deceived the Consul, but we suspect very different will be his opinion of leaf-disease now that 1880's crop shews a falling-off by more than one-half the previous return. We have received the following authentic statement from a reliable quarter :—

Java Coffee Crop :—1879 and 1880.

District.	1879. Private coffee.	1880. Private coffee.
	cwt.	cwt.
Bantam	2,550	971
Buitenzorg	15,786	7,286
Preanger	6,486	2,185
Krawang	15,543	2,793
Cheribon	1,032	1,214
Pecalongan	5,461	1,948
Samarang	42,014	38,857
Kadoe	3,096	1,518
Bagelen	2,368	425
Solo	114 750	88,086
Djocja	644	182
Pasoeroean	37,946	20,643
Probolingo	206	486
Botakie	729	729
Kedirco	6,079	5,464
Madioen	101.382	9,714
Total private coffee cwt.	265,625	182,446
Government	1,529,951	678,537
Total for Java	1,795,576	860,983

It seems that a good deal of coffee was lost in 1880 for want of transport, labour, &c., but of course, it is rank heresy to preach such a doctrine to the Dutch authorities in Java, for they believe their management of their colony to be perfection.—*Ceylon Observer.*

THE COFFEE TRADE.

IN its commercial retrospect for 1880, the *Anglo-Brazilian Times* refers with some natural pride to the position of Brazil as the largest producer of coffee in the world, and quotes the following estimate of the total production in 1855 and in 1878 :—

		1855.	1878.
		Kilo-Tons.	
Brazil ...	...	163,400	225,500
Dutch poss ...	...	71,322	91,404
West Indies	...	29,300	41,800
Ceylon ...	...	28,780	53,422
South Africa	...	22,315	35,890
Arabia ...	...	6,176	2,799
Central America	...	4,000	4,000
Philippines ...	...	3 500	32 500
Oceania ...	...	1,358	3,896
Africa ...	...	—	150
		330,154	490,843

Brazil has of late been blest with abundant coffee-crops in the year 1878-79, the exports alone reached 3,705,830 sacks of 60 kilos, and those of 1879-80 were 2,909,05 sacks, while subsequent returns are of a promising character. Ceylon, on the other hand, has suffered in many recent years from adverse crops, in a great measure owing to the disease of the plant, and 1878 was a year specially adverse in this respect. Brazilian coffee, however, does not to a great extent reach this market, which is mainly the European rendezvous for colonial growths, and the figures below which are taken from the Board of Trade Returns, show our trade in this article during the past four years :—

Imports.		1877. cwts.	1878. cwts.	1879. cwts.	1880. cwts.
From Ceylon	..	780,341	5.9,151	627,433	540,676
From other British possession ..	..	274,032	269,917	307,381	355,246
From Brazil ...	..	187,912	200,998	260,297	272,442
From Central America	..	228.686	159,544	260,141	208,388
From other Countries	..	138,096	136,797	162,182	179,187
Total imports	..	1,609,717	1,273,410	1,617,389	1,555,939
Consumption—					
Home consumption	..	293,127	298,154	309,788	290,802
Exports ..	..	1,104,397	1,017,062	1,288,624	1,174,514
Total Consumption	..	1,397,524	1,315,216	1,598,412	1,465,316
Stock in bond, Dec. 31	..	371,918	308,104	305,708	389,933
Prices per cwt.—					
Ceylon Midd. Plantn.	..	107s.	95s.	104s.	86s.

With increased stocks and diminished consumption, it is scarcely to be wondered at that prices have fallen heavily, and do not as yet show any signs of revival. Indeed, prices are exceptionally low just now.

CACAO.

It has been ordered by the Admiralty that for the future cacao will be offered to sailors in lieu of grog. Formerly sailors under eighteen were not allowed grog. Under the new rules there is to be an extension of age to twenty, and foremast men within that category will receive instead of a ration of rum, an allowance of 'soluble chocolate' during the middle of morning watch in addition to tea and sugar. The issue of spirits to officers will also be discontinued, but those gentlemen will receive instead a monetary compensation amounting to the 'savings price' of the spirits. This arrangement, it is to be presumed, will not preclude the officers of the ward-room mess from enjoying or offering their friends a *petit verre* with their coffee after dinner, but it will, we suppose, render the midshipmen utterly grogless. No doubt pessimists will see in this an additional reason for supposing that the service is going to the dogs, but the sweet 'little cherub which sits up aloft' will not turn his back on poor jack because he has become the victim of enforced temperance. On the contrary, it will, it may be hoped, keep him in view with a still more kindly eye.

CINCHONA.

The Trade in Cinchona.—The action of the Madras Government in continuing to compete with private planters in the growth and export of cinchona bark was becoming a matter of serious moment to cinchona planters in Ceylon as well as in India, and Mr. Dickson Manager of the Scottish Trust and Loan Co. of Ceylon, deserves the thanks of the planting community generally for his protest, addressed to us, though the necessity for further action has fortunately ceased on account of a resolution come to by the Madras Government that in future the bark from their estates shall not be sold but used for the manufacture of alkaloids for use in India. It seems that they do not intend to follow the example of the Bengal Government and have the alkaloids extracted on the spot, but will have this done in England. We suspect, however, that this will not be for long, the expense of freight proving a formidable item of the expense.—*Ceylon Observer.*

Some new specimens of cinchona have been introduced into Madras by Mr. Cross on behalf of the Government, having been obtained by him in South America at a distance of about three hundred miles from the coast. Amongst the plants are three *calisayas* of the Santa Fe variety, which yield on analysis 10 per cent. of pure sulphate of quinine.

In his excellent work just published, describing the introduction of cinchona cultivation into this country, Mr. Clements Markham gives reasons for spelling the word "chinchona" and not "cinchona," or "cinhona," as it was spelt by Linnæus, and the altered spelling has raised a botanical dispute. The title "chinchona" is given to the bark tree as a memorial of the cure of fever by its means in 1638 of the Countess Chinchon, wife of the Governor of Peru.

Cinchona Bark.—The Government have shipped by the P. and O. steamer *Ancona*, 488 bales of cinchona bark from the Government cinchona plantations on the Neilgherries. The bark, which is valued at one lakh and twenty thousand rupees, is forwarded to the Secretary of State for India.—*Madras Paper.*

We have repeatedly pointed out that the time has come when the Government should cease to cultivate cinchona, This industry has long passed the experimental stage, and it should now be left in the hands of private enterprise.

CINCHONA.

As a great deal of cinchona is now being raised by private enterprise, the attention of Government has recently been directed as to what would be the best means of dealing with their own plantations, so that they may not compete with private enterprise. It has been decided to send the bark to England, not to be sold in the market, but for the manufacture of alkaloids for use in India. The work has been undertaken by a London chemist, who has had the good fortune of coming across, in the process of extraction of alkaloids, two other alkaloids which are cheaper, and just as efficient febrifuges as the quinine now used.

CEYLON CINCHONA.

We congratulate the Messrs. Mackenzie Proprietors of Craigellachie, one of the highest estates in Haputale, on the splendid prices, secured for their crown bark, running from 4*s.* 6*d.* for young branch to 8*s.* 1*d.* for good and fine stem per lb. as reported from Mincing-lane. This is by far the highest rate paid for Ceylon bark at the sale reported by this mail, but renewed crown from "Hoveton Gardens" (on the Nilgiris we suppose) realized 8*s.* 10*d.* to 8*s.* 11*d.* per lb. It would be interesting to know the age of the Craig trees from which the 8*s.* 1*d.* bark was taken.

CINCHONA SHAVING.

A Lindula correspondent sends us the following note on the new process of 'shaving' cinchonas instead of barking them as by the old process. 'I have been watching the process of shaving off the outer bark containing the sulphate of quinine by means of the small easily handled spoke-shave, the invention of Mr. Wm. Smith of Mattacoolie estate, and was much pleased with what I saw. The ease, rapidity, and certainty with which the removal of the outer bark is accomplished, render these implements most useful in the hands of coolies who could not be trusted with the old barking process with the knife. A four-year old tree was completely shaved in the space of certainly not more than two minutes, and the celerity with which the thin strips of bark can be dried, as compared with the drying of thick bark is most marked. Mr. Smith is having a very simple but powerful form of press made for baling up the thin shavings, and this will enable him to turn out a large quantity of the dried shavings daily. What I saw in his store, appeared to be perfectly dried, by merely having been spread out on the floor under the iron roofing. This work will afford employment for women and children.—*Ceylon Times.*

SERICULTURE.

One of the vernacular journals has been informed by a native silk merchant that owing to the prevalence of intense cold in Europe, the silkworm rearing industry is expected to suffer considerably. In consequence of this silk is being actively purchased both in the districts and the capital, and stocks are becoming so scarce that the foreign firms in Yokohama, who are as a rule quiet at this season are very active.

TOBACCO.

"Tobacco is an Indian weed,
Green at morn, cut down at eve,
The smoke that does from it ascend
Shows man's life must have an end;
Think of this when you smoke tobacco."

During the last fifteen or twenty years, while roaming around, we have not failed to notice that, although in every society—whether that to be found round the civilized board of a festive friend, or at messes, in clubs, at Mansion House dinners, or at the dinners of civic and other public bodies—there are always to be found plenty of men who do smoke, still there is a respectful minority who do indulge, if it be an indulgence, in the use of tobacco in any way, either by smoking, snuffing or chewing it. We have observed, at select parties, that perhaps one-half are smokers, the other half are non-smokers. Of course, we only here allude to *males*, and not to that delightful portion of the human race that played such sad havoc with Lord Byron's hero, Don Juan,

"For woman's face was never form'd in vain
For Juan, so that even when he pray'd
He turn'd from grisly saints, and martyrs hairy
To the sweet portraits of the Virgin Mary."

We have, of course, in our peregrinations, wanderings, and "tramps abroad," sometimes found even lovely woman indulging in tobacco, in a mild way however, in the form of cigarettes, and also at the same time aping her lords and masters, in the way of gently "pegging;" but then there are, popularly speaking exceptions to every rule, although some philosophers strenuously deny this; such maintain that a rule can have *no exception.* Not long ago, when dining at a party in a private residence where there were eighteen intelligent males assembled around a friend's hospitable board, we had exactly nine smokers, and nine non-smokers whereupon a little argument arose about the smoking of tobacco, whether it was healthy, or an unhealthy practice; whether it, soothed as well as stimulated a man, or, indeed, whether it had any particular kind of effect at all, one way or the other. We all know, that is those who have learned to smoke, how awful are the first sensations resulting from the primary use of the narcotic, plant. *Punch* indeed, most beautifully and poetically pourtrayed the effects of a first indulgence, where two young and lovely maidens were shewn in a handsomely furnished room, one lying down on the sofa, dishevelled, pale, and unsorconed altogether, and the other, coming up to her, says, "Lotty, dear, what is the matter with you?" The dishevelled one replies, "Oh, dear, I have just had a whiff of Charley's pipe, and I feel *so ill.*" We can call to mind, after more than half a century, the awful effects produced by our first whiff out of the gardener's "cutty pipe;" we were rendered *harmless* for several hours, and having betaken our small sell into the strictest privacy, we had been voted by mama, and our sisters and aunts, to have been for the time very good and quiet.

Tobacco is certainly a most wonderful plant, and its use is universal over the entire world, civilized, semi-civilised, semi-savage, or savage; in fact, from "Nova Zembla to Peru." Akin to the intoxicating liquors we consume are the narcotic substances we indulge in; and if the history of the former in their relations to the social state be full of a melancholy interest, that of tobacco is still more striking and extraordinary. We may safely indeed say that to the economical statist, not less than to the physiologist and psychologist, the connection of man with tobacco, in different countries, forms one of the most wonderful chapters in his entire history. In supplying his natural wants and cravings, man passes through three successive stages First, the necessities of his material nature have to be provided for, and "beef and beer," or what may generally be termed food and drink, represent the means by which these necessities are supplied. Secondly, he seeks to assuage—as the British soldier so often does—the cares of his mind, and to banish uneasy reflections. This is effected by fermented liquors; and savage and civilized tribes, near and remote—the houseless barbarian wanderer, the settled peasant, and the skilled citizen—have all found out, by some common and instinctive process, the art of preparing fermented drinks, and of procuring for themselves the enjoyments and miseries of intoxication. And so, whatever material is employed, and heaven knows their name is legion, for the purpose,—whether the toddy of the palm tree, the sap of the aloe, the juice of the mango or of sugar-cane, the syrup of honey, the must of grape, the expressed liquor of the apple and pear, the wort of malted grain, the barley brew of Robbie Burns or the milk of the Tartar mare,—in every instance the substance called *alcohol* is produced by the fermentation, and forms the intoxicating ingredient of every liquor. Thirdly, man desires to multiply his enjoy-

ments, intellectual and animal, and for the time to exalt them. This he attains by the aid of narcotics, chief among which are tobacco and opium. And of the many other kinds of narcotics it is interesting to note that almost every country or tribe has its own special narcotic either imported, or aboriginal; so that man's instinct has led, somehow or other, to the universal supply of this want or craving also. The aborigines of Central America smoked and chewed tobacco, dreaming their dull lives away in smoky reveries, ages before Columbus was born, or the colonists under Raleigh brought within the precincts of the Court of the Mighty Queen Bess. Indeed, of all narcotics, tobacco is in use over the largest area, and among "all the people, the nations and the languages" of the world.

Tobacco is believed to be a native of tropical America, and it was cultivated and used by the natives long before Europeans knew anything about it. Columbus in 1492 found the chiefs of Cuba smoking cigars, and Cortes met with it subsequently when he penetrated to Mexico. From America it was brought to Spain, at what time it is not exactly settled. Nicot brought it to France in 1560, Sir Francis Drake and Sir Walter Raleigh brought it into England in 1586. Mr. Lane tells us that it was brought into Turkey and Arabia early in the seventeenth century, and it is known to have found its way to Java about 1601. Since then the cultivation and use of the plant has spread over a very large portion of the habitable globe. In Europe it has been raised with success in every country, and forms an important agricultural product in Hungary, Germany, Flanders, and France. In Asia it is cultivated in Turkey, Persia, India, Thibet, China, Japan, the Bahamas, the Philippine Islands Java, Ceylon; also in Australia and New Zealand. It is too, the most extensively cultivated, the most hardy and the most tolerant of changes in temperature, alititude, and general climate. The finest qualities are raised between the fifteenth degree of North latitude, that of the Philippines, and the thirty-fifth degree, that of Lattakia in Syria Salt and tea are the only two articles consumed by man which can compete with his consumption of tobacco. Though in Shakespear nearly everything, under the sun is alluded to, there is no mention made either of smoking, chewing or snuffing the weed. Although the sweet bard of Avon talks much of the delights of wine, ale, and fermented drinks. King James, of happy memory, said of the use of tobacco, "A custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs, and in the black stinking fume thereof nearest resembling the horrible Stygian smoke of the pit that is bottomless." However, the people of England, when it came among them, were not to be deterred from using it by King Jame'ss "counterblaste to tobacco," nor by the papal bulls which Pope Urban VIII. thundered against its use. In Russia the knout was mercilessly laid on the hides of those who indulged in the use of tobacco, for a first offence; and death was the punishment for a second offence. So again in the East the priests and Sultans of Turkey and the Shahs of Persia declared smoking a sin against their holy religion; yet, notwithstanding all this opposition and persecution, the people smoked, and now the Turks and Persians have become the most inveterate smokers on earth. The Burmese, too, of all ranks, and classes, of both sexes and of all ages, down even to infants of tender years, smoke cigars, made of chipped tobacco, rolled up in a green leaf a foot long sometimes, and the smoker will pass his cheroot round the company, just as we hand round side dishes at dinner. In China, too, when in 1641 it became a practice to smoke, the Emperor Tsung Ching issued a prohibitory edict, with about the same results as the 'counter blaste" of James, or the bulls of Pope Urban. And now-a-days the practice has become so universal throughout the Celestial Empire, that very female over eight years of age wears, as an appendage to her dress, a small silken pocket to hold tobacco and a pipe, just as the native females of many sects in India carry about their little betassled and ornamented bag, with betel and cloves or cardamoms, which they listlessly chew squatting on their hunkers in that way, so common and peculiar to the women of the lower orders of India.

To show how much the cultivation of tobacco has increased, we find that in 1662 the quantity raised in Virginia, at that time the chief producer of tobacco, was only 60,000 pounds, and the quantity exported from the Colony in 1689 only reached 127,000 pounds. During the 192 years which have since elapsed, the produce of Virginia has risen to twice as many *millions* of pounds! Turning to Great Britian, we find that in 1689 the total importation was only 120,000 pounds of Virginian tobacco, part of which was re-exported, and now the consumption in the United Kingdom alone is over 60,000,000 pounds! In 1821 the consumption of tobacco per head of population was 11½ ounces, in 1871 it rose to 1 pound 5½ ounces per head! In 1801 the number of retail dealers in tobacco in the United Kingdom was 83,493, now there are about 250,000. The gross produce of the duty in the raw tobacco retained for home consumption, and the duty on the cigars, snuff, and cavendish, and other kinds of manufactured tobacco, consumed in the country all together amounted to £7,907,794 in the year 1876, or about the total sum of money expended on our navy! Some twenty years ago an enterprising gentleman estimated the average consumption of tobacco by the whole human race of 1,000,000,000, at 70 ounces a head, and the total produce and consumption of this favourite narcotic at 2,000,000 tons or 4,480,000,000 pounds at 800 pounds an acre, this would require upwards of 5,500,000 acres of rich land to be kept constantly under tobacco cultivation. Since this calculation was made the population of the world has increased to 1,439,000,000, and the use of tobacco has extended, and its consumption per head notably increased. Neverthless, it is doubtful whether as large sums are now anywhere spent upon tobacco as were spent in England in the time of King James I., who says "some of the gentry bestow three, and some four hundred pounds a year upon this precious stink."

There are three ways of using tobacco,—smoking, snuffing, and chewing In whichever of these ways it is used, the effects produced appear to be much the same in kind, they differ chiefly in degree; but although so extensively used, it is notable that few persons can distinctly describe the effects produced upon them by tobacco; why they began its use, and for what reason they continue to use it. Any smoker, chewer or snuffer can verify this for himself or herself. In future census takings it would be instructive to have some columns entered for tobacco consumers, such as "smokes," "chews" "snuff," some may practice all three. It would be useless to enter into the vexed question whether tobacco is hurtful or the reverse when used in any of the ways indicated here: opinions differ widely on this question. Dr. Pereira, Dr. Christism, Dr. Prout, and a host of other learned physicians have given their opinions freely on the effects of the use and abuse of tobacco. We may, however sum up in a few words. Smoked to excess, and especially by persons not generally accustomed to use it, nausea, vomiting, purging, universal shakiness, staggering, convulsive movements, paralysis, torpor, and death result. Some cases have been recorded of persons who killed themselves by smoking eighteen pipes at a sitting. We have seen some men who never had a cheroot, pipe, or cigar out of their mouths, except when sleeping or eating, or perhaps when in the society of ladies. With some persons it never agrees, and these should, of course, eschew the seductive weed in any form; but both Doctors Pereira and Christism, say that "no well-ascertained ill-effects have been shown to result from the habitual practice of smoking." Dr. Prout, however, held a different opinion, and he sums up by saying: "It happens with tobacco as with deleterious articles of diet, the strong and healthy suffer comparatively little, while the weak, more predisposed to disease, fall victims to its poisonous operation. Surely if the dictates of reason were allowed to prevail, an article so injurious to the health, and so offensive in all its modes of enjoyment, would speedily be banished." Just so, Dr. Prout; but where do you find people using "the dictates of reason" even in the ordinary and daily use of the necessities of life, "meat and drink?" Few, indeed, ever learn, even from sad experience, "*what to eat, drink, and avoid.*" With regard to the use of tobacco, we can only say in the words of Pope—

"Who shall decide, when doctors disagree,
And soundest *casuists doubt* like you and me?"

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NOTICE.

The INDIAN AGRICULTURIST *will be supplied to all Schools and Missionaries in India at half price.*

CONTENTS :

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

ACKNOWLEDGMENTS.

INDIAN FORESTER for April. Calcutta, Central Press, 1881.

ANNUAL Statement of the Trade and Navigation of British India with Foreign countries for 1879-80. Vol II.—Calcutta, Superintendent of Government Printing, 1881.

REPORT in the Cawnpore Experimental Farm, Kharif season, 1880.

SOME remarks about Irrigation in Upper India, Lahore. Victoria Press.

MEMORANDUM on Dyes of Indian growth and production. Calcutta: Home Revenue and Agriculture Department Press, 1881.

INDIAN Meteorological Memoirs, Vol. I., Part V. Calcutta Superintendent of Government Printing 1881.

ACCOUNTS of Trade by land of British India, with Foreign countries from April to September 1880. Calcutta Superintendent of Government Printing, 1881.

CORRESPONDENCE.

THOSE RIVAL PLOUGHS AGAIN.

(To the Editor of the Express.)

DEAR SIR,—I have just read your issue of the 23rd March last, on my return from the interior. It contains a letter from Mr. Gavin Jones, in which he brings a serious charge against me.

Mr. Jones writes :—With regard to Mr. Martin's plough, permit me to inform you that the model is mine, and, in the specification I filed in January 1879, I described that the stilt may be of any suitable form, and I was greatly surprised to find Mr. Martin claiming the plough as an original production, when, I am informed, he obtained the pattern from the Government Model Farm here, and during my absence in England brought it out as his own invention.

As you have probably not seen Mr. Jones' plough, I send it to you for inspection together with one of my own, and the ordinary country plough as it is used in these parts. If you will look at the three implements carefully, you will observe that my plough has been borrowed from the Indian and English ploughs, and, as I have explained in my memorial to the Governor-General in Council (*vide* printed copy annexed), it is nothing more than a combination of the two principals, having the shape of an Indian with the working capacity of an English plough; the frame pole and stilt being made of wood, the mould board of sheet iron, with a removable share of steel of the English pattern. In fact it bears the closest resemblance to the native plough, in all its parts and shape, the standard or frame being simply made with a sharper angle to admit of it penetrating to a greater depth than is possible with the wider angle in the native standard.

No one who has studied the history of ploughs will, looking at Mr. Jones' production, fail to recall to mind the primitive implement for ploughing used in ancient times, *viz.*, a block of wood with a share and pole stuck to it; a fact of which Mr. Jones appears to have since become conscious and brought out another plough constructed on a different principle. Nor will any one looking at my plough, differ from the opinion expressed by the *Indian Daily News* that, "whilst it is in reality the ordinary country plough, no one can look at it without seeing it has borrowed largely from the English plough," or contest the description given of it in the *Indian Herald* that "it is a compromise between the ordinary country and the English ploughs."

I cannot understand what Mr. Jones means by asserting that the *model* is his. A wooden standard, pole, and stilt is not his, but the old Indian idea, as you will find on looking at any native plough in the country; and if he merely claims to have adjusted the English mould-board and share upon these, a comparison of his production with the native implement will shew any one that he has not been v

successful either in giving a proper shape to the standard, or placing the stilt in a proper position, two important considerations in the construction of a plough. But because Mr. Jones has failed in this respect, is it necessary that no body else should attempt to carry out the idea to perfection? Mr. Jones, however, is not the man who has taken the first step in this direction; there have been others before him, as I have lately seen various adaptations from native ploughs attempted in several parts of the country on this principle.

Mr. Jones may have been abroad at the time I was getting out my patent, but his friends were not slow to publish a report in the papers that I had borrowed from his plough; and that he had done the same from the one made by the Department of Agriculture; nevertheless I am thankful to say that such contrivances did not succeed in preventing the Government from granting me a patent.

Mr. Jones seems to be oblivious of the fact that in the Home Department of the Government of India, styled the patent office, are preserved sketches and specifications of all inventions, and patents are not granted without a careful comparison in order to prevent any infringement of public rights: nor does he seem to have any knowledge of the law which governs and protects patent rights. If he felt sure I have infringed on his patent and deprived him of the fruit of his labour, as he makes out, he should have applied for redress to a court of justice, instead of carrying his grievance before the general public who have not seen the ploughs, and are not in a position to test the truth of his assertions.

The superiority of my plough has been so conclusively demonstrated all over Bengal, and lately in the N.-W. P. at Boolundshuhur, that, riled at his defeat and unable to beat me in fair contest, he now comes forward to claim the credit of my invention.

This, however, is no place for a controversy on such a subject, and apologizing for the length of this letter, I conclude with a hope that you will not fail to give it a corner in your paper and your valuable opinion on the points at issue.—Yours faithfully,

W. MARTIN.

Phuppond Concern, 25th April 1881.

THE RIVAL PLOUGHS.

(To the Editor of the Express.)

SIR,—I have been away from Cawnpore, therefore have only just come across Mr. Martin's letter which appeared in your issue of the 30th ultimo. Before replying, I must premise by stating that I have neither the time nor the inclination to enter into a newspaper controversy, particularly on a technical question which needs diagrams to illustrate.

As Mr. Martin has sent you one of his ploughs, and you are already in possession of one of my "Royat" and "Kathkar," you will doubtless be able to respond to his appeal and satisfy him and the public whether his is, or is not, a copy of my "Ryot."

Mr. Martin's description of his plough, to say the least is very ingeniously contrasted with that of the ryot, but I think you will find on inspection of the two that it will apply equally as well to both, naturally, for they are identical—both have "the shape of the Indian with the working capacity of the English plough. The frame, pole, and stilt being of wood, and the mould board of sheet iron with a moveable share of steel of the English pattern."

Mr. Martin appears to me rather vague in the use of the word "principle." Would he be so kind as to favor the public with an accurate definition of the term particularly in its application to the description of the ploughs under notice, I am not aware of having "brought out another plough constructed on a different principle;" doubtless he alludes to the "Kasthkar"; if he will be good enough to examine it—being I presume a competent mechanic and gifted with inventive powers—he will observe that the "principle" of the "Ryot" and "Kasthkar" are identical, and that they differ only in construction. I suppose it is upon this vague "principle" of reasoning that it suits Mr. Martin, to look upon the two ploughs from his own stand-point, and he would, no doubt, like the public to view them in the same light, but let those who are interested in the matter examine and test the two practically, they will find that I have not so signally "failed" in the adaptation whilst he has succeeded to "perfection." It is very gratifying however to find Mr. Martin so kind as to give me credit for the fact that I became "conscious" of the shortcomings of the "Ryot" and brought out the "Kasthkar." I hope he thinks it was a step in advance!

Begging you kindly to give the above a corner in your next issue.

CAWNPORE, 16 May 1881.

I am yours faithfully,
GAVIN JONES.

TUBE WELL MAKING.

(To the Editor of the Australasian.)

Victoria

SIR,—As I am asked a variety of questions upon the above subject during the time I attend at the Exhibition, I will, with your permission answer the most important of them through your columns—*viz.*, how to bore a well through drift sand; and is it possible to put a tube well through brackish water to obtain fresh water further down! There is no doubt that both these objects are to be attained, and the process with my Tiffin well-boring and rock-drilling machine may be described as follows:—Set the well machine into position with the tube and well auger of the size desired. The tube is then forced down by means of a forcing-jack. Set the auger to work to take the earth out of the tube. As the work progresses, the tube is added to in two-feet length. Should clay or rock be encountered, it is then merely necessary to change the boring tool, and in this case the tool used bores as large a hole as the outside diameter of the tube, so that the tube can be forced down as before. In this way any ordinary depth can be sunk. If drift sand be met with, the tube can be driven through it, and then the sand pump must be used to take the sand out of the tube, and the work is continued in this way until water is reached. Successful wells can be sunk at from 30 to 50 feet per day, and one man and a horse are all that is necessary to do the work.

I may say that I have travelled over a large portion of the United States of America and California, and have seen a great many wells made in this way—fully nine-tenths of them being successful. A great many are less than six inches in diameter, some of which will water 10,000 to 20,000 sheep without showing any sign of exhaustion. I am quite certain that wells may be as successfully put down in the Australian colonies, and thus prove of immense value, especially to squatters who have their runs in dry districts.—Yours, &c.,

WILLIAM STEPHENS.

WELL-IRRIGATION IN GUZERAT.

I.

(To the Editor of the Times of India.)

SIR,—I take the following few lines fom *The Indian Agriculturist* of the 2nd instant:—"In your issue of the 1st April last is published a reprint of a letter on the subject of well-irrigation in Guzerat from the *Times of India*, in which the writer makes some very sensible and pertinent remarks. The subject of well-irrigation is one that might not only engage the attention of Government but also of all those who are desirous of advancing improved agriculture." Experience has taught our Government that unwillingness to recognize the protective influence of well-irrigation is suicidal to their interests and ruinous to the agricultural prosperity of India.

The most important State business that now engages the attention and occupies the valuable time of the ruler of the Bombay Presidency, is *insignificant* when compared with matters touching life and death. In the report on the Famine of 1860-61, by the late Colonel Baird Smith, R.E., I read the following weighty remarks respecting wells:—"They rank with the greatest rivers in the extent of their influence, and it is the larger and the more universal, inasmuch as the supplies from them are accessible to almost every proprietary community, however modest its resources, or however limited its possessions. Hence the immemorial importance of that branch of artificial irrigation which is dependent on wells. A permanent well is equal to the irrigation throughout the year of nine acres, and a temporary well is equal to that of three acres. I have known many instances of from fifteen to twenty acres being brought to maturity under a large and bountifully supplied well.

I am able from personal experience to cite numerous instances in which crops had, when rainfall was scanty and deficient been taken to perfection by the aid of wells. The Hon'ble L. R. Ashburner, C.S.I., made the following official acknowledgment before the Select Committee in England in 1872:—"Irrigation does exist to a certain extent, but no doubt it is the great want of the country to extend it. It is the great object to which we must look for improvement of the country." But for the development of the resources of this rich country we require men of action. The writer referred to in the *Indian Agriculturist* advocates the introduction of wind-mills. In Guzerat we have during the hot months strong steady wind, and I have no doubt that it could be turned to very good account either by Government or by private enterprize. On the banks of our river—the Saburmattee—a very large tract of land might be usefully watered with wind-mills at a comparatively trifling cost. The water-lift taken in 1868-69 by Mr. A. A. Borradaile, late Collector of Ahmedabad, from the farm at the village of Hansole to the Broach Exhibition, where it was approved of and received a prize, raises more expeditiously a larger quantity of water—20,000lbs. per hour—than the lift invented by Major Steele, R.E.; but both these lifts are too expensive for the ordinary ryot. Our indefatigable Governor, Sir James Fergusson, might with very great advantage to the State and the impoverished tenantry of the Queen-Empress, direct without further loss of time the attention of all the Collectors in the Bombay Presidency under his control to this very important subject, and offer a suitable reward

for some very easy and inexpensive plan of raising water with celerity and in sufficiently large quantities for irrigation. Our Collector, Mr. J. B. Richey, is the right man in the right place, and any efforts he might make in this matter would, I am sure be crowned with success.

A FRIEND OF GOVT. AND THE RYOT.

CAMP AHMEDABAD, May 8th.

II.

(To the Editor of the Times of India.)

SIR,—Anent the letter on "well irrigation" in this morning's issue, it would doubtless be very satisfactory if any reliable information could be published, showing the capacities of wells in various districts, their cost, and the areas and crops irrigated therefrom ; also if possible, the percentage of failures in well-sinking and the causes thereof.

Well-sinking is, however, understood to be exceedingly expensive, and is probably too risky a business for men of limited means ; and it would appear to be more economical for the country to first endeavour, by bunding streams in suitable localities, to retain a greater portion of the moisture so liberally supplied by a bountiful providence than has hitherto been done.

There is an admirable work on this subject, by one Colonel Dixon I think, relating to irrigation in the Ajmere districts, which might advantageously be brought to notice at this time. In this work the author shows how he constructed the Roopana Weir in Mhairwarra, 522 feet long, of earth with lime masonry, at a cost of, I believe, Rs. 2,205, and which, thrown across a gorge in a low range of hills, closes a water-course which drains a wide range of country. There are many other such works, small and great, reported on in this work ; and there are doubtless many districts in India where similar works might be inexpensively constructed. It would, therefore, seem worth while for Government to either largely undertake these minor works, or to encourage their construction by private enterprise ; not only as a present amelioration of the state of the "rigorously taxed" Bhagoo, but as a reproductive work which will greatly enhance the value of lands now regarded as waste.

F. S.

My friend in the Guzerat quarter,
Whose hobby it seems is to find
A cheap way of raising the water—
I trust not of raising the wind!
The way which seems most inexpensive,
Whose excellence ev'ry one sees,
Being work'd on a scale most extensive,
Is the way the sap rises in trees!

EN ROUTE.

THE WINDMILL.

(To the Editor of the Indian Agriculturist.)

SIR,—In the *Agriculturist* of the 1st March last, page 64, on the subject of Aloe fibre, I was agreeably surprised in reading that part relating to the value of "wind-mills" as a motive-power in India.

It is no doubt quite true, that in many parts of India, the labourer can be hired at such a wretched low rate, that in many instances, machinery cannot compete with it, as for instance, in some parts of Behar, a man will bring a pair of bullocks, and a boy, together with bucket and rope, beginning work at 7 A.M., and continuing till 11, and beginning again at 3 P.M., and ending at 6. This in the hot season, and that at the rate of six annas a day. When working for himself during the hot season, he does so during the night, and a weary piece of work it is, especially when one comes to think of the wretched condition of men and cattle.

Is it not surprising that no effort has hitherto been made by agricultural societies to offer prizes for the best wind-mills, or that European planters have not on their own account, long since used the winds that blow so regular into their service? They cannot plead the want of knowledge, or means, as the natives in many instances can do. What then can be the reason of this utter neglect of one of Nature's most bountiful gifts, to irrigate your fields, thrush and winnow your grain, grind the corn into flour and grind your sugar-cane? These being only a few of the benefits obtained.

I have only seen one wind-mill in India, and that was set up by Henery Chamier, Esq. in Grundey, Madras. The owner was quite proud of it, but after he left India, the mill ceased working.

However it is to be hoped, that this subject will be taken up in earnests, by those who have the means, and the time to do so, when others will follow the example when they see the advantage to be gained by doing so, and as India has now to compete with powerful, intelligent and enterprising rivals, the sooner she follows their example the less will be her difficulties in the race of competition against her.

OBSERVER.

WORMS IN CALVES.

TO THE EDITOR.

SIR,—Can any of your readers tell me the cure for worms in calves? The calves attacked are generally those dropped in the winter months, and the worms are similar to the "Lumbrici" found in horses. I have cured horses in the tartarised antimony, but am afraid to try it on calves of one month.

If any of your readers can give me a cure, please let them state the dose of the drug recommended for each month of age.

KUMAON.

THE INDIAN GOVERNMENT EXPORTS OF CINCHONA BARK.

(To the Editor of the Colonies and India.)

SIR,—In reply to "Indicus'" letter of the 24th ultimo, I would state—

First.—The Indian Government created their plantations for the benefit of the masses of the people, and to bring a cheap febrifuge within their reach and the whole of the bark ought now to be worked up in India for the benefit of the people, and not shipped for sale here for the purpose of showing flourishing accounts. To talk of a surplus of bark with millions of fevered wretches in India too poor to buy it is bitter irony, as the native press will doubtless show. The shipments are wrong morally and are wrong legally, for by everlasting laws the inhabitants of a country have the first claim upon the produce of the soil, and in the present case the produce is raised from their own taxes.

Secondly.—I have it from the highest authorities that all the capital outlay with interests has been recovered.

Thirdly.—If the Government wish to be prepared for the emergency mentioned, selling their bark in London is in direct opposition. Better let the trees grow and improve until they are wanted or store their febrifuge until required, if they will not distribute it to the poor ryots ; but they need not now fear any emergency, as there cannot be much under fifty thousand acres, containing many millions of cinchona trees, planted by private enterprise in India and Ceylon,

I am, yours &c.,
THOMAS DICKSON.

123, Bishopsgate-street Within, London, April 2.

WHY COFFEE DOES NOT PAY.

(To the Editor of the Madras Mail.)

SIR,—The season here has been most favourable all around for the coming crop. "All the blossom that was out a few days ago has "set," and the little berries are "swelling" fast. They are showing well now, and with the fine showers we have had lately, will be out very soon ; so on the whole "crop prospects" are good, and in some places even "bumpers" may be looked forward to. But still, with everything so favourable before us, and after all the inferior working of estates for the past three or four years (on account of short crops), proprietors still hold back from coffee, and are "plunging headlong," into "gold." Coffee is not looked at, coffee is nothing now, although so long as estates were worked properly, they did pay, and still will do so if worked by experienced superintendents. In days gone by, coffee did give good, very good returns, and the price was nothing to what we get now, and yet coffee does not pay now! For this simple reason, that the old hands, experienced men, are kicked out, and replaced by men who can be got on Rs. 100 or Rs. 250 a month ; young and inexperienced, and who have perhaps never seen a coffee tree, and know no more about how to go to work than a frog. I grant there are many young men who do their best, and try and pick up things from other planters ; but the consequence is, estates suffer, crops are short, and coffee gets a bad name. As time goes on, crops in Wynaad will still grow less, yet it is not the season that has to do with it, but the working. There are many who, although having an interest in the gold fields, hold to coffee, working hard at it. All can't turn up "trumps" in the "gold mania," and as far as I am concerned, I think it a myth with the exception of a few places.

ALLY.

S. Wynaad.

CINNAMON CULTIVATION IN THE HILL AND LOW DISTRICTS.

(To the Editor of the Ceylon Observer.)

DEAR SIR,—During the last few years planters, owing to the shortness of coffee crops, have given their attention to what is called new products. Amongst other things attention has been turned to cinnamon

cultivation. A very great error has been made in cultivating this product. Plants have been put out singly on one estate in the hill country on which I was resident. The visiting agent, on one of his inspecting visits, suggested a field on which the coffee had gone out, to be planted with cinnamon, I was asked to make inquiries in the low-country as to cost of plants. Clumps of plants were then selling at Rs. 30 per thousand; that was considered too high, and my P. D. who was resident on the adjoining estate, during one of his frequent visits to Ambagamuwa, purchased plants at Rs. 10 the thousand and planted them out singly, one in each hole. When next I met him, I pointed out to him the great mistake he had made. The plants would, I said, be fit for cutting in about three years. Each stock would then put out a couple or so of suckers which in their turn will be fit for cutting in a couple of years. The clumps or bushes will thus be gradually pruned, and it would take ten or twelve years before the cinnamon will pay more than the cost of monthly weeding. My P. D. looked surprised and asked me why I hadn't told him so before. For the simple reason, I answered, that he had not consulted me. I have written so much, as I see from time to time advertisements of cinnamon plants for sale, and as a warning to planters not to put out plants singly. It will never pay, especially as the quality of the cinnamon grown on the hills is inferior and is known as Corle cinnamon. The best use to which such cinnamon can be put, is to have it scraped into chips and sold for the extraction of oil. Cinnamón seeds are generally sown in the low country, in beds in which drills are made with the hand, and into which from 10 or 12 to a handful of seed is dropped. The more the seed the larger the clump, the sooner it will pay and the chances of the plants growing, as the outer ones protect the inner ones. It has been said in an old number of your Directory, in an article written evidently by that very able planter who now writes from the "Western Province," that it is next to impossible to make supplies good on our old estates. If the writer of the article in question were to visit the estate under Mr. Drieberg's charge at Ekelle, he would no doubt be agreeably surprised to see acres and acres of supplies flourishing, by Mr. Drieberg sowing his seed in handfuls in drills. Finally it will be impossible for planters up-country to put out plants in clumps, unless from nurseries on the estate, as the cost of carriage of so much soil with the clump will be ruinous.—Truly yours,

B.

VEYANGODA, April 24.

The Indian Agriculturist.

CALCUTTA, JUNE 1, 1881.

CANE-CRUSHING MILLS.

Communicated.

IN January last I was requested by the Deputy Commissioner to test the working of the small sugar mill, and compare its results with those of a native machine or "Behea," a small plot of standing canes measuring 2 kanals (·181 of an acre) was purchased in the Raqba of Premgharh, near Hushiarpur civil station, and the mill sent down to the village and set up alongside a native Behea. A few bundles of stripped canes were provided, and at 1 P.M. punctually we set to work, at 2 P.M. both machines were stopped and progress reported.

Native mill had turned out in 1 hour 1 maund 10 seers.
Calcutta mill ditto ditto 20 do.

This was not re-assuring, and the results were not as good as I anticipated, however after a few minutes' rest I thought I would work at full pressure, I was determined not to be beaten, so I tightened up he "cotters" C. C. with most satisfactory results, and found that in 45 minutes I had got into the earthen pipkin 20 seers of juice, whereas the native mill did not after working its full hour, manage to get more than the 1 maund and 10 seers as before.

I could have done even better than this, but I did not wish to run the risk of an ignominious break down before the whole village. The Calcutta mill was purchased about 8 or 9 years ago, The frame work was shakey, and the bolt marked B in the drawing was *minus* its "nut," the consequence being that the whole affair creaked and swayed in a most ominous manner at times: I felt I was testing it too severely, so had to loosen the "cotters," or as I before said a break down might have resulted, and that would never have done before the sceptical and mildly sarcastic lookers on.

The description of cane used was the species known locally as "Dhaula."

The next day January 7th, I made another trial, results as before.
Native mill, 1 maund 10 seers in one hour.
Calcutta mill, 20 seers in 45 minutes.

The question of cost of operation and relative performance has now to be considered. Taking the unit of performance as the amount turned out in a working day of 8 hours, we have—

From native mill.

$1{\cdot}25 \times 8 = 10{\cdot}00$ maunds at a cost of—

	Rs.	A.	P.
8 Pairs of bullocks @ 8 as. per pair ...	4	0	0
3 men @ 2·5 as. each	0	7	6
	4	7	6

From Calcutta mill—

$\frac{60 \times 8}{45} \times 20 = 10{\cdot}66 \times 5 = 5{\cdot}33$ maunds at a cost of—

	Rs.	A.	P.
1 Pair of bullocks @ 8 as. = ...	0	8	0
3 Men @ 2·5 as.	0	7	6
	0	15	6

Calculating a month's outturn, we have from Behea 300 maunds at a cost of Rs. 135.

From Calcutta mill, 160 maunds @ Rs. 30 per cent. in favor of the latter.

The rollers of our mill are iron, and framing of sâl wood, brass bearings.

A mill with horizontal rollers would give infinitely better result. The mill should be on a carriage mounted on wheels removable at pleasure. The rollers to be about 1' in diameter and from 2' 5" to 3' long, and propelled by belting, a machine of this description, should easily express 40 to 45 maunds of juice per diem, if not more, and its working daily expenses need not exceed Re. 1-5.

The native Behea seldom extracts more than 50 per cent., whereas our European machines extract 70 to 80 per cent. of juice. In the eyes of the natives our machines have one serious defect, they crush the pachki or megass to shreds in such a manner that it cannot be utilized for inferior cordage or "twist" for mats. Theoretically they are wrong and have, I maintain *no right* to turn their megass into rope, they should use it as fuel underneath their coppers or "taiche" and return the ash as manure to the soil. This they will not do unfortunately for themselves.

Such a machine as I have suggested above might easily be turned out for Rs. 700, and should turn out 50 maunds of juice per day, or about 1,500 maunds of juice per mensem, and allowing the acre to yield under *native cultivation* 250 maunds of juice, this mill would deal with 6 acres per mensem, but working as the natives sometimes do, 12 to 14 hours out of the 24, would suffice, for say 10 acres per mensem. Sugar cultivation will never be fostered and devolped until we see dotted over the face of the country a few score factories or "Usines" like the one now at work at Shahjehanpur, N.-W. P. If instead of investing their hard-earned money in scandalously rotten concerns, and the loans floated for the sole benefit of bankrupt states such as Peru, Spain, Turkey, Mexico, and South American Republics, the Englishmen at home turned their attention to their country and endeavoured to develope its staples, they would find if not a rentable El Dorado, at least a field for enterprise which would speedily reward them to an extent beyond their most sanguine anticipation.

AGRICULTURE IN MADRAS.

THE Madras Administration Report for 1879-80 has come to hand, and contains a vast fund of entertaining reading. This report is always well written, and a well written book on almost any subject, is worth reading, but the Madras Government, from the interest they take in agriculture, cannot fail to produce an interesting book. The very get up is superior, and is quite equal to what one would expect from an English book-binder.

The total area of Madras under assessment is 57,905,722 acres —and under the general classification of crops the land under crop was as follows:—

	Acres
Cereals	16,441,323
Pulses	1,613,514
Garden produce	580,798
Drugs	156,886
Spices	200,905
Starches	15,096
Sugar	58,977
Oilseed	983,221
Dyes	244,969
Fibres	1,162,671
Total	21,457,800

This accounts for not much over one-third of the land, the whole details of which are as follows :—

	Acres	Percentage
Cultivated	20,014,090	34
Cultivable but not cultivated ...	17,808,282	31
Pasture and Forest	6,286,444	11
Uncultivable	13,796,906	24
Total	57,905,722	

Here then is an answer at once to those who say that India is too densely populated. Here we have 31 per cent. of cultivable land uncultivated, besides 24 per cent. of what is called "unculturable." That is to say, it is not adapted for annual cropping, but the most of it is well adapted for forest growth, and this is a matter which does not in India receive the attention it deserves. In Scotland vast stretches of land were put under forest 20, 30, or 50 years ago, and the landlords are finding the experiment exceedingly profitable, more so in many cases, than if the land had been suitable for cereals, and had been let out for that purpose. The population of the Madras Presidency is about 32 millions, and the gross area 138,856 miles, shewing a density in population of 230 to the square mile, while Oudh supports 468, and the average all over India is 210.

With regard to the quantity of grain produced, we are left entirely in the dark, except the slight information to the effect that the crop was a ten-anna one. The average is assumed to be a twelve-anna crop, hence in the year under notice, it was five-sixths of the average.

The prices of grain were of course much lower than in the two previous years, when famine prices ruled, but they have not yet sunk to the normal range which ruled before the famine.

The following table shows at a glance the ruling rates for the past five years, the rates are in seers (of 80 tolahs) for rupee :—

	1875-76.	1876-77.	1877-78.	1878-79.	1879-80.
Rice ...	16·0	11·8	8·1	9·1	12·5
Paddy ...	28·6	20·4	13·6	15·7	21·8
Cholum ...	26·6	19·8	11·1	13·1	19·9
Cumbu ...	26·4	18·1	11·3	14·4	20·6
Ragi ...	27·9	19·4	11·1	14·2	20·8
Varagu ...	39·6	28·2	15·8	19·0	26·5
Wheat ...	11·4	9·7	6·5	5·9	6·2
Salt ...	15·8	15·0	11·2	11·9	11·9

This is in conformity with ordinary experience, for when, from any abnormal cause, prices rule exceptionally high, they very seldom fall back to their original level. The prices of labour did not vary much, and this is all the more noticeable in Madras, where a large proportion of wages is paid in kind. Before looking at what the Government have been doing in this way—for this corporate body is an extensive farmer—we shall have a still closer glance at the condition of the rayat. The area under cotton was 95,465 acres or 7·8 per cent. over the previous year, and here we begin to miss the information as to the quantity produced. We should liked to have know the outturn per acre. It is quite impossible to compare one year with another, when only the number of acres under crop are given, and the only clue given to the produce is to be found in a comparison of the prices of grain in the past few years. This at best is a clumsy estimate, because other causes than the quantities produced, go to influence the prices. A scarcity in another part of India is sure to raise rates, and although there has been no scarcity in any portion of the country during the year under notice, an abormal demand may have existed for Ceylon, Mauritius, or China. It would be much more satisfactory if the outturn per acre could be arrived at, and we think this could be done without much extra cost or trouble.

In the Government department, we find more details given, and it is perhaps natural that this should be so, the majority of such operations being under the charge of Europeans. The greatest attention has been given to agricultural education, especially at Saidapet. So far as it is possible to know, much good work has been done, and it is to be hoped that the lessons learned there by the native youths, may not be forgotten when these students return to their villages. We confess, however, that we have not much faith in the earnestness of the students. They seem more anxious to have some complimentary letters pinned to the end of their names, and from this we suspect those youths will be much too grand to take to agricultural pursuits at home.

Several experiments were made with different manures, cattle-box manure having been found useful. The providing of manures for their crops is quite beyond the ability of the rayats. Our agricultural reformers however, will not see this, and hence these annual experiments, which all go to prove, that if the rayat will only put ten rupees' worth of manure on each acre he sows, he would realize a large margin of profit. This may be perfectly true, but they may as well tell the rayat to expend a thousand rupees per acre, so far as their ability to carry out the recommendation is concerned. What we want—and we are almost tired of pointing out this—is an implement which will turn up two or three inches of the virgin subsoil. Manure might then be largely dispensed with. This plough need not cost more than from five to six rupees, and a small expenditure in this direction would soon tend to add fifty per cent. to the outturn of crops.

The Government cinchona plantations have had a very favorable year, the production of bark having amounted to 179,299lbs., and the profit made Rs. 2,61,091. We cannot resist the opportunity of drawing attention here to this fact. The object of the Government in opening out these plantations, was to give the new industry a fairer trial than it could have had under private management, where capital might possibly be scanty. On this subject, the Administration Report for 1874-75 says:—"As yet cinchona cultivation has not proved attractive "to planters, who generally believe that the crop is too much "of a speculation." It has now entirely passed that experimental stage, as is proved by the profit realized by the Government. This has been as follows :—

1876-77	Rs. 48,920
1877-78	„ 2,88,980
1878-79	„ 3,32,535
1879-80	„ 2,64,091

Under these circumstances, we maintain that the time has come for the Government to withdraw from the work, and leave it in the hands of private enterprize, as was done in the matter of tea.

EDITORIAL NOTES.

A JUNIOR or first class school has been formed in the School of Agriculture at Sydapet, the attendance being rather small—only ten boys. It, is believed that many boys will be induced shortly to join this elementary class.

THERE are in the United States 727 paper mills, making 1,800 tons a day of all kinds of paper ; but the writing paper used is not less than 200 tons daily ; half of which is manufactured at Holyoak.

THE Madras Government have forwarded to the Secretary of State a case containing samples of the gums and resins of the forests in this presidency. These specimens have been collected by the museum and forest authorities, and are being sent for analysis to a London chemist.

THE Dominion House of Commons has passed a resolution to encourage the manufacture of beetroot sugar, by exempting all made in the Colony from excise duty for a period of eight years. We doubt much this effecting the object of establishing the manufacture.

CALIFORNIAN vines are so prolific that at no distant date they may be expected to compete with those of the old world. France supplies the deficiency in its own production by importations from Spain and Italy, and even Californian wines are brought to Bordeaux, there transformed and re-exported to the country of production under a French brand.

A SMALL consignment of two tons of Egyptian cotton has been brought by the P. and O. S.S. *Mirzapore*. As it is a very fine, soft, and long staple cotton, it has been procured by one of the spinning companies in Madras, as an experiment, to see if it is possible to spin the finer and more expensive descriptions of yarn, which at present have to be obtained from England.

THE Royal Commission on Agriculture is now sitting four times a week in London. The Commissioners have taken the evidence of landlords and of agents and are at the present time completing the evidence forthcoming from tenant farmers. They propose to take the evidence of labourers, and so present a full view of the question.

THE complaints that are now made against the way the Tramway ill-uses and smashes up baggage and goods in transit, and the total indifference of the Company to complaints and claims for compensation, are far louder and deeper than anything we ever heard in days gone by, when baggage and goods had to be brought the long journey *viâ* Caragola in rough country carts and over the many difficulties of that route.

MR. P. T. SLEMA LEBBE has been good enough to send us a bunch of grapes the produce of his cultivation which was referred to in a paragraph in the *Jaffna Patriot*, copied into our issue of last evening. He informs us that the bower yielded over 120 lbs. Having tasted the grapes, we can testify that in the present hot weather they are very refreshing. The bunch sent us is six inches long, and weighs 7 oz.

A GENTLEMAN who has made great use of salt in growing onions, and who has been very successful, informs us that he has used as much as two barrels to the acre. He thinks that the salt adds to the growth of the onions, weakens the growth of weeds, and is very beneficial in warding off the attacks of noxious insects, but thinks that a sufficiency of salt to kill grubs and wire-worms would also kill vegetable life generally.

THE late enhancement of freights on the G. I. P. Railway is said to have already begun to produc the evil effect predicted for it, namely, a diminue tion in the flow of traffic of grain, and other up-country produce, to Bombay. Even under ordinary circumstances, the cost of conveying a ton of whea from the Central Provinces to the sea coast it very little, if at all, below the cost of transis from Chicago to Liverpool.

THE Hon'ble V. Ramyengar, C.S.I., Dewan of Travancore, was a Alleppey lately to witness the Cardamom sales, and returned to Trevandrum on Monday evening. We are sorry to hear that the proceeds of the sale this year are much below those of the previous year, and considering that Cardamom constitutes an important factor in the public revenue of Travancore, it is much to be regretted that there should be any decrease in the revenue under this item.

CONSIDERABLE annoyance has been caused to Messrs. Thomson and Mylne, on account of a printer's slip in our May issue. In the article on "Sugar-cane," in the paragraph commencing "It is not only" the "*Beina*" machine, appears as the "*Behcea*" machine. We are sorry that this has occurred, and would take the opportunity of pointing out the necessity of plain clear writing, the reverse of which is often the cause of such mistakes.

A CORRESPONDENT *Observer* touches a very important subject, that of wind mills. For irrigation purposes they are invaluable. He asks why they are not used. One objection to them is, that as there might be no wind when the farmer wished to raise water, it becomes absolutely necessary that each wind-mill must be supplemented by a tank of storage purposes, and as large quantities of water permeate through the soil, this tank must be *pucca*. This we fear is the great objection.

WE in India stand no chance with America in the matter of cheap communication. We have previously referred to this subject in so far as it operated against the Indian wheat trade, showing that on the East Indian Line grain is carried at a shade over one-half penny per ton per mile for long distances—the correct figure is ·547*d*.—while in America the rate is under a farthing. From the following extract from an American paper it will be seen that minerals are carried at marvellously low rates.

THE climate of Chili is very favourable to bees. Wax of a good yellow colour, without odour, and other kinds fit for candles are produced. The exports in 1870 were 134,511 kilos., value 121,058 pesos=605, 290 frs., and in 1874,98,087 kilos., value 83, 779 pesos. Of honey the shipments from Valparaiso were in 1870, 571,848 litres, value 114,368 dols.=571,840 frs., and in 1874, 1,384,844 kilos., value 207,871 pesos=1,039,355 frs.

There were in 1875 89,067 hives known, the principal number of which were in the provinces of Santiago and Colchagua.

FROST kills watercresses. When they are fast rooted and flourishing in a brook or any other water; it will be found that after a coat of stout ice has been formed, the crop is entirely gone. To preserve cresses out of doors, shelter of some kind is necessary. It is not unusual for the market-growers to let in a flood of fresh water when a sharp frost is expected. This covers the plants and the ice formed so far above them that they escape its effects. Another plan is to lay planks or tree loppings over the bed. Where it happens to be convenient, a frame is the best protection.

WE (*C. & M. Gazette*) are glad to hear that the experiments which have been conducted in the Chumba State in the cultivation of hops, and the introduction of silk-worms, promise to be successful. Of the hops planted in various parts of the State, it was found that the English sorts did exceedingly well in Panji alone; but the Bavarian and French hops grew satisfactorily in most parts of the State. The silk industry quite fulfilled the expectations of the Superintendent of the State, who expects that it will now be taken up by the zemindars, as they have seen that it is likely to be profitable.

SOME time ago Mr. J. H. Angas supplied the manager of the Government Experimental Farm at Cashel, in Victoria, with a bag of his celebrated Hill River Purple Straw wheat, which took the £50 Challenge Cup last year in Adelaide. In reference thereto this gentleman wrote him on March 29 as follows:—"You will be pleased to learn that the wheat grown from seed procured from you last year has obtained the highest honour at the Exhibition, weighing 68½lb, per bushel, and also btained Messrs. R. Goldsbrough & Co.'s Cup, value 40 guineas, for the best twenty sacks of wheat grown in the North-East division of Victoria, weight 67lbs. Since weighted, and found the former is correct —real weight 68lbs. 4¾ oz. per bushel."

THE monsoon rains of the year 1880 varied very much in quantity in the several districts of the North-Western Provinces. In the upper districts lying under the Himalayas the rainfall was plentiful in June and July, but insufficient during August and the first half of September, and the season closed with extraordinarily heavy rain and destructive floods in the middle of September. In the lower part of the Doab there was short rainfall from the beginning of August, which in the districts of Agra, Etawah, Cawnpore and Bundelkhund, ended in an almost complete drought and failure of the unirrigated *kharif* harvest. Indeed, some other districts such as Muttra, Aligarh, and Etah, were only saved from the same fate by receiving a portion of the heavy rain which fell higher up the country in September.

COAL has been put into New Orleans from Pittsburg, 2,000 miles at 60 cents. per ton, and the average rate does not exceed 85 cents. making less than one-third to five-twelths of a cent. per ton per mile. The lower rate would be 1·8 cents. per bushel for carrying wheat the same distance. Railroads carrying wheat from St. Louis to New York 1,200 miles, now charge 23 cents. per bushel, or at the rate of 38¼ cents. per bushel, if carried 2,000 miles.

That is to say the average rate is ·21*d*. per ton per mile, while in some instances it has been carried at '16, now on the East Indian Line, the principal coal line of India, the charge from say 748 miles at the rate of 603*d*. per ton per mile or 187 per cent. higher than the average rate in America.

ATTENTION is now being directed towards fibrous plants in this island. The aloe (*Agave*) fibre is already exported to a certain extent and of good quality. The *rhea* fibre (*Boehmeria nivea*) has been cultivated with success, but the difficulty of extracting its beautiful fibre has discouraged its promoters. It is re-

ported lately that a chemist in the neighbouring French colony of Réunion, M. Reynaud, has discovered a process for obtaining at a trifling cost, the fibre not only of the rhea but of the aloe and all other textile plants. If such is the case, a new era will be opened to an important class of industries. The statement is, however, questionable, seeing that the *rhea* is a bark fibre, and the aloe an interior fibre.

RAINWATER brings down yearly about 12 pounds of ammonia per acre of ground. To supply an equal amount of sulphate of ammonia, at six cents. per pound, would cost the farmer $2·80 per acre, and is, therefore, the manurial value of the rain. This refers to America where the rainfall is about 38 inches per annum. Here in India it is twice that quantity, so that each year's rainfall, supplies ammonia to the land at the rate of twenty-four pounds per acre. The question for us to consider is, how much of this valuable manurial agent reaches the soil, and how much is simply carried off to the sea by floods. When the time comes that we have subsoil drainage, we may expect the soil to be able to retain the large portion of this valuable material.

THE Province of Amazonas, Brazil, exported last year nearly 200 tons of sarsaparilla root. The vine, which is believed to be *Smilax papyracea*, grows in the swamps in a kind of rich, black muck or mud, and the collectors often spend weeks in these marshy pools. The roots are traced and raised with a sharp stick, but the vine or creeper is not disturbed, the roots being cut off near the stalk, which is covered up with a little earth, so that fresh roots many grow and in time a fresh harvest be gathered. Two or three pounds are produced by a single vine. The quantity used in this country alone is said to exceed 120,000 pounds. Attempts have been made from time to time in different countries to cultivate the plant, and they will doubtless ultimately be successful; but several years are required to produce plants with good roots.

MR. ROBERTSON, of the Government Farms, Madras, submitted lately to the Board of Revenue a report on the experimental cultivation of Madagascar paddy which he considers the home of the Carolina species. The product of the experimental cultivation of this variety of rice appears to the Board of Revenue to be of superior quality, and if Mr. Robertson's present opinion, that it thrives with a quantity of water less than the indigenous varieties should be confirmed by further experience, the result should be of great value to localities where the railfall is scanty and water not always abundant. The samples received by the Board will be forwarded to the Chamber of Commerce, whose opinion the Government would be glad of both as to the article itself and upon the suggestion to send the grain and rice to London for valuation. 48lbs. of seed sown on the 20th September 1880 yielded on 2nd February 1881, 1,483lbs. grain, and 2,436lbs. straw.

THE cultivation of cardamoms is, according to Mr. Markham, carried on to a great extent on the western slopes of the Coorg Mountains. In the month of February, the Coorgs start from their villages, and arriving on the mountain slopes, select one of the largest trees, giving a preference to those on a western or northern slope. Around this selected tree they raise a platform and commence to fell it. In felling it, they take care that it shall fall towards the base of the slope, and thus, in its fall, carry all before it. Having cleared a space of some 300ft. long by 40ft., broad and freed it from all brushwood, they commence planting. In three months the plants begin to appear; after about 20 months the plants have reached a height of five feet, and in six months later, that is 26 months after the first sowing, the first clusters of flowers begin to appear. During this period the ground is kept constantly cleared of all weeds. Six months (October) after flowering, the first crop is ready for picking, but a full crop is not obtained till the following year. These plantations are kept up for six or seven years, when the soil having become exhausted, fresh ground is again cleared. The harvesting is attended with some amount of suffering, as the grass which springs up around the cardamom plants cuts like a knife, and large leeches are very abundant. The capsules, when picked, are packed in bags and carried to the villages, a distance, frequently, of ten to twelve miles. Some families have been known to collect cardamoms to the value of Rs. 600 to 1,000 per annum.

"WE hear that it is in contemplation by the Dewan to import a windmill from Europe to work the wells in the Rajmehal on the High Ground. We trust that the report is true as such an example would have a good effect on the ryots. The superior advantages of windmills for working pumps have been demonstrated long ago, and we believe they have been introduced into other parts of the country." This paragraph we have extraced from the *Bangalore Spectator*. The introduction of windmill is a subject of more importance than at first sight appears. It being now generally admitted on all hands that well irrigation is better suited to India than is canal irrigation, provided the cost of raising the water could be brought within reasonable limits. The windmill seems to us to promise this saving. The only drawbacks to its introduction is its cost, and the necessity for it to have the accompaniment of a *pucca* tank. These furnished, the subsequent supply of water can be had at a nominal cost. The cost of the apparatus itself is not so very much, but the outlay necessary for a tank will be considerable. The necessity for having a tank will be seen at a glance when we remember that it would frequently happen that there might be no wind at the very time the farmer wanted to raise water, and besides the supplying of water to several fields simultaneously would demand a larger delivery than was perhaps available. Hence the extreme importance of storing a larger supply, and to neutralise the effects of percolation, all storage tanks would have to be *pucca*. We are making inquiry into the cost and efficiency of windmills, and will shortly be in a position to speak definitely on the subject.

THE improving of our cattle is a subject on which much has been said and written, the only remedy suggested has been the introduction of a better class of breeding stock. Granting the advantages certain to accrue from this, we cannot shut our eyes to the fact that even if our cattle were improved by that means, deterioration would immediately commence on account of the miserable class of food we give them.

It never seems to have occurred to the Indian farmer, that if he keeps cattle, he must feed them. The custom in force in India is to allow these unfortunate animals to eat whatever may not happen to be of any value, and they are generally supposed to pick up their living as they can, outside of working hours, at a time when under better arrangements, they would be resting. Crops are never grown here, with a view to provide cattle food. At home this is an important item of a farmer's duty to see to the providing of a plentiful supply of nourishing food—both green and dry—for his cattle. In another column will be found an article detailing certain experiments made in growing turnips with various manures. An acre treated with 5½ cwt. of dissolved bones and ½ a cwt of sulphate of potash, produced 15 tons 6 cwts of turnips, reduced to Indian weights for purposes of comparison, we find this to be 417 maunds 11 seers. The produce of this one acre would suffice to give 15 animals three seers each daily all the year round.

The cost of this manure was about £3 per acre, consequently a farmer could give 6lbs. of turnips daily to a cow, at a cost per annum of four shillings. This of course is over and above the ordinary cost of raising such crops. Still it seems worth our notice.

IN a thoughtful article on the anticipated changes in regard to our opium monopoly, the *Indian Herald* remarks :—"The scheme, as far as is yet known, is intended to abolish the system existing in Behar and Benares, and of which Patna and Ghazipore are the centres, and to assimilate it to that of Malwa, where the opium is produced by the subjects of native princes. By our present system we directly supervise the growth of the poppy and the manufacture of opium, binding the ryots to sow the needful amount of land, and receiving the entire produce at certain fixed prices. The opium is eventually sold by public auction to the Calcutta merchants, by whom it is shipped to China. We understand that it is now proposed to withdraw from this immediate connection with the trade, and to establish a thorough system of customs' control, without relinquishing the right of regulating the quality of opium produced. One immediate effect of the proposed

scheme, the details of which may be looked for before long, will be the dissolution of the present opium establishment, but doubtless some provision will be made for the officials who are thus likely to be deprived of their means of livelihood. The scheme, as a whole, if designed for the purpose of merely disguising our connection with the opium trade, must be condemned, whether it entails loss of revenue or not. But on the other hand, it may be the intention of the Government to bring about changes of a beneficial character in the administration—changes which accidentally harmonise with the wishes of the scrupulous coterie at home. The Government is certainly entitled to the benefit of the doubt, and until we know something more of the matter, it is premature, to say the least of it, to mumble accusations of dissembling and hypocrisy."

MR. P. DE LAVAL LENNOX, of the Bhawarna tea estate, in the Kangra valley, has contributed to the *Journal of the Agri-Horticultural Society of India*, a very valuable paper on cattle-disease in the district of Kangra, its treatment and its remedy. Mr. Lennox's specific is simple enough—the leaves of the *Potentilla*, or wild strawberry, pounded into a pulp and given as a bolus. Previous to the use of this remedy a beast seized with the cattle-disease, as it appears in the Kangra district, almost invariably died. The symptoms of the disease were, listlessness and refusal of food, flabbiness of the ears, flowing of mucous saliva, loosening of the teeth, aguish shiverings, excessive relaxation of the bowels, increasing till accompanied by blood, and generally ending in death. Mr. Lennox lets the disease run its course until four or five evacuations have occurred, and then gives a bolus, about the size of a hen's egg, of pounded strawberry leaves, repeating the dose every three hours until the beast recovers. Under this system only one animal has been lost out of a large number so treated, and as the *Potentilla* is obtainable anywhere along the Himalayas at a height of from 3,000 to 4,000 feet, and also along the banks of irrigation canals and other moist, but not wet or damp places, and as it costs nothing beyond the trouble of gathering, the value of the remedy is immense, and we should imagine that it would prove efficacious in cases of dysentery in the human subject. Mr. Lennox is ready to sends dried (pressed) specimens to any one wishing to identify the plant and give it a trial. The *Potentilla Tormentilla* was, it is believed, used by the ancient Greeks for the cure of colic, diarrhœa, and dysentery. The natives of the Kangra valley, who are constantly going to Mr. Lennox to be shown the plant and instructed in its use, tell him that where this remedy is used at the proper time, it not only cures the cattle at one homestead, but prevents the pread of the disease.

IT is difficult, we fear, to induce tea investors to believe that the recent improvements in the London markets is other than transient, but such as will sit down and fairly study the prospects of the trade or business in its entirety, will we think arrive at no other conclusion than that tea has reached its normal value, and to look for the prices that ruled during the prosperous years from 1874 to 1876 is a hopeless delusion. That small parcels of full flavoured high class teas suitable for mixing (such as Pekoe and Broken Pekoe) will command an average of eighteenpence, may reasonably be reckoned on, but that it will not pay to make these brands alone is equally certain; and we again counsel all concerned in the industry to grapple honestly with the real difficulty that renders tea planting, at the present day, a hazardous enterprise, and one that, unless prompt measures are taken, will speedily prove it a hopeless one. Were agents and managers to work loyally together, there can be little doubt that their combined views would meet with attention, but at present neither the Government nor the moneyd public can precisely understand in what way assistance is required, the reports on the Labor Commission not having resulted in bringing about that unanimity that sanguine people expected. At the risk of wearying our readers, we repeat what has so frequently been urged in our columns, that the only hope of tea planters ever being able to compete with their Chinese rivals is to put down their teas in London at a similar value, and unless they make up their minds to do so, none but those who can keep their heads above water during this, the critical, season will pull through. That planters with capital to back them will survive we can fully understand, and possibly when their less fortunate competitors are compelled to abandon the enterprise, the smaller quantity turned out may, for a time, tend to keep up the price of Indian tea; but under these circumstances all hopes of introducing it direct to the general public, unadulterated, upon which success ultimately depends, must end, as the comparatively small parcels brought forward will be bought up at auction by dealers solely for mixing purposes. Tea has as fair a field before it as any commercial undertaking that has ever been brought forward in this country, and all the drawbacks to success—the bonus, want of inter-communication, jealousy among planters, famine rates for provisions, difficulty in procuring labor,—rest on one common requirement, which is railway communication; and unless that is provided out, fully two-thirds of the gardens must be abandoned. There is no use in blinking the question; all who are competent to form an opinion on the subject are convinced of it. It may be argued, by many, that the Railway from Daudkandy could not be made under two or three years, and what is the impecunious planter to do meanwhile? The reply to this is that capitalists will come forward to tide those over the period whose properties are really worth keeping up. Lest this assertion should give rise to anticipations on the part of those who may possibly imagine they see a chance of saddling the mortgagors with their plantations in a manner similar to that in which certain individuals served the Land Mortgage Bank some sixteen years since, it may be as well to mention that the draft articles of association provide against such a contingency, and moreover the Syndicate will not be prepared to advance on any but first class properties and those whose title-deeds will bear the strictest scrutiny. First class properties do not necessarily mean the acme of desirability in tea holding, such as an undulating plain planted with Munipoorie indigenous, although such will of course more readily command support; but we believe we may confidently assert that properties whose only drawback is pure impecuniosity will not lack a helping hand. Meantime, although traffic statistics will have to be collected in a systematic manner, tea planters on the line of route of the proposed railway may, even at this early stage of the proceedings, render material assistance, approximately estimating the amount of traffic both in goods and passengers that passes their doors upwards and downwards.

OFFICIAL PAPERS.

MEMORANDUM ON THE ADMINISTRATION OF THE NAGA HILLS DISTRICT.

WE make a few extracts from this memorandum :—

Conservancy of forest round Kohima.

18. Nothing has yet been done in the matter of forest conservancy and the subject requires careful consideration. The Conservator will be requested to visit Kohima after the rains, and to prepare a report, showing how much country round that station ought to be preserved (1) for timber for building purposes, (2) for firewood and grass. Meanwhile, the Political Officer should put a stop to all clearances, firing of the jungle, and *jhúming* within a moderate radius of (say) five miles round the station.

Extent to which *jhúming* is practised.

19. With regard to *jhúming*, or destruction of forest for purposes of temporary cultivation, the practice appears to be very various. In the part of the Angami country visited by me in my tour, the cultivation is, as far as I saw, mostly permanent, the terraced fields being built up laboriously with retaining walls and irrigated by channels led from streams. Among the Rengmas there is a little permanent cultivation, and in the clearances there is for the most part an attempt at terracing, and the land is cultivated, for two or three years successively. I was told that the practice among the Western Angamis and the Kutcha Nagas is the same. But among the Lhotas the system of cultivation is that of the *jhúm* pure and simple: the grass and reeds, the small trees and small branches of large trees, are cut and laid about the ground and burnt; the ashes are carefully raked and distributed over the ground, which is then hoed up, and the seed sown broadcast or dibbled in. Only rice is grown, and no irrigation is practised; but the *jhúms* are carefully fenced and sedulously watched till the crop is ripe. The same land is never cultivated a second year, but is left to lie

for seven or eight years till its turn comes again ; and by a rough rotation of this sort almost all the land suitable for *jhuming* is taken up in turn. There is not much valuable forest left now, and what is left stands for the most part on steep and rocky ground. The question to be decided is whether any effort should be made to place restrictions on this wasteful mode of cultivation, and, if so, what restrictions.

Restriction of *jhuming*.

20. The evils laid to the door of *jhuming* are chiefly two ; first, that it destroys the forest ; secondly, that the soil, being exposed to the action of the rain, is washed away, and only the bare and rocky hillside is left. The first charge is undoubtedly true ; but in a hill country so far from the plains, with little valuable timber and no demand for it likely to arise, beyond a very limited demand for houses at Wokha and for bridges on the road, there is not much cause for adopting any measures of protection beyond the obvious one that the tract should be inspected by a competent Forest Officer, and that any parts growing valuable forest trees should be set aside as Government reserved forests. With regard to the second point Mr. Hinde states that as far as his experience goes, the low jungle grows up so fast that the denudation of the soil does not extend beyond the first season, and that in its long period of fallow the repeated decay of vegetable matter restores the soil to its original condition, so that a hillside *jhumed* for the second or third time produces as good a crop as when *jhumed* for the first time. This may be the case, but obviously there has not yet been time to decide this point by actual observation. Even if it were proved to be true, the increase of population which will follow on the protection and security afforded by our Government will in time necessitate a more careful and productive system of husbandry, and it would therefore be very desirable if these tribes could be gradually led to see the advantages of terraced and irrigated fields and of permanent cultivation. The labour entailed by *jhuming*, *i.e.*, the cutting of trees, reeds, and grass, and the fencing in of a new spot every year, is really greater than the labour of terracing would be in most cases. It cannot be supposed that any change can be effected except in the most gradual and tentative way ; but the steps which I suggest are the following : First, the Assistant Commissioner at Wokha should investigate what the actual facts as to the rotation of lands are. Do the people really adhere to any fixed system, and can they point out beforehand what hillside will be *jhumed* next year and the year after, and each year in succession ? Are any private rights supposed to exist in these lands, or can any member of the village community *jhum* any portion he likes of the hillsides set apart for the year's *jhuming* ? Secondly, they should be instructed that, though they may *jhum* lands which have been *jhumed* before, they must not cut down forest hitherto untouched or *jhum* in new places without special sanction, to be given after the Assistant Commissioner has visited and inspected the spot. Thirdly, it would be useful if the Assistant at Wokha were to take up some suitable low-placed lands, and set the example of terracing and irrigating them, in order that he may learn by experiment what difficulties there are to be met and overcome. Further, in the course of time, when our influence has been more solidly established than it is now, it might be practicable to lay down a condition that no cultivator is to begin a *jhum* until he has at least terraced and levelled one field for permanent cultivation ; but it would not be wise to do this till the people have acquired more confidence in our intentions, and more understanding of our methods, than they now possess.

Growth of potatoes.

21. In connection with this subject, I may mention that it is very desirable to encourage the growth of potatoes and other vegetables which are likely to sell well or to be locally consumed in the hill villages, and the Political Officer is requested to further this by all the means in his power, to procure seed at the proper season and distribute it to suitable persons with the necessary instructions, and to keep a record of the results.

SELECTIONS.

CULTIVATION OF RUBBERS IN INDIA.

THE first attempts which were started in July 1873 in the Darjeeling Terai, and in the Goalpara district of Assam, were failures, but in July 1874 Mr. Gustav Mann took charge of the experiment with very satisfactory results. Three plantations have been formed. One, on the right bank of the river Kulsi, in the Kamrup district of Assam, consisted of 95 acres in 1879, on which were 2,895 plants. Another is at Charduar, at the foot of the Himalayas, 18 miles north of Tezpur, in the Darrang district of Assam, where there were 685 acres under cultivation in 1879, the growth of the trees being excellent and most vigorous. The third plantation is at Bamun, also near Tezpur. Here there were 8 acres planted with 459 trees in 1878, but the climate is too dry. No artificial shade is now given, and the young trees are healthy and vigorous. Experiments are in course of trial, to plant the *Ficus elastica* in strongly made baskets placed in the forks of trees, and on grass lands, as well as in the regularly prepared beds. The trees may be tapped at the age of 25 years. After 50 years they will yield 40lbs. of caoutchouc every third year, worth £4. In Cachar the India-rubber tree was discovered in 1862, and 750 cwts. were collected, the yield being increased to 1,500 cwts. in 1863. The yield from the first tapping is 35 to 40 lbs. The tree is then untouched for three or four years, and the second tapping yields much less. Mr. Edgar reports that Cachar forests would yield 2,000 cwts annually. In 1879 the quantity of caoutchouc exported from India was 10,033 cwts valued at about £61,685.* Besides extending the cultivation of the taxes, the officers in charge of the plantations will carefully investigate all such questions as the most favourable time of the year for tapping, and the best methods for cultivating and preparing the caoutchouc. The experimental cultivation of the *Ficus elastica* has thus been satisfactorily commenced in India, under the able superintendence of Mr. Gustav Mann.

1874—16,837	cwts valued at	...	...	£117,775
1875—19,893	do	...	...	108,618
1876—15,258	do	...	...	97,861
1877—13,308	do	...	...	90,169
1878—18,794	do	...	...	89,381
1879—10,033	do	...	...	61,685

* Caoutchouc exported from British India during the last six years.

THE CINNAMON TRADE.

A WRITER to the *Ceylon Times* of the 5th instant, has warned the cinnamon growers against the practice of making chips and inferior cinnamon out of tops, and has recommended only the making of oil out of such stuff. The reason is plain enough, for when stuff is exported, a very large number of buyers manage to supply their wants by purchasing the same at a cost of cents. 20 or 25, instead of purchasing the dearer article at a higher rate. The result is a depression in the market of prices for good cinnamon. One who is accustomed to this trade has informed us that if the practice of making and selling chips is discontinued, the rate of one rupee per lb, can be freely obtained here for good cinnamon. For the sake of a profit of 8 or 10 cents per lb. cinnamon growers make and sell the chips, the loss resulting therefrom being that the people of London, as well as those of other continental towns, get accustomed to these chips and supply their wants that way and thereby keep on these low prices for good cinnamon. We see now plainly that the cinnamon grower exchanges a very small profit for larger and legitimate ones. Our advice therefore is, burn and reduce to manure all these chips, wood, black coffee, and all the refuse called bones, and to which we shall add bad areca-nuts, and our trade will then prosper.—*Lakrivikirana*, April 9.

THE BEHEEA SUGAR-CANE MILL.

AT the Lucknow agricultural meeting, virtually, the only sugar mills exhibited were the well-known ones patented and made by Messrs. Thompson and Mylne of Beheea in Shahabad. A specimen of Messrs. Cantwell & Co.'s (of Calcutta) patent conical-roller mill was indeed on the ground, but no one appeared to look after it, and it was not tried. But a complete set of the Beheea mills was on the ground, and the agents of the patentees were there to show how they were worked and give any information that might be required ; and printed particulars both in English and the vernacular were distributed. This mill must now be too well known to require description. It is a portable machine for use in the fields, and in its simplest form is a pair of cast iron grooved rollers, with pinions working into each other, one of them being turned by a lever, to which one or more bullocks are yoked. These rollers are set vertically in a rough wooden trestle frame, the legs of which are embedded in the ground, and there are simple adjustments which ensure parallelism of the rollers, and that they shall be the proper distance apart. At Lucknow it was seen that the patentees had been making every effort they could to improve the mill and to meet the wishes and even whims of the cultivators. The novelties were, as described by our special correspondent—(1), a smaller mill, to meet the wants of the poorer cultivators, with rollers only 4½ inches in length, to crush three canes at a time, costing only Rs. 45, against Rs. 85, the price of the 6" roller-mill hitherto used ; and (2), the introduction of three-roller mills, for all sizes rollers, for the better crushing of the thick canes cultivated in some parts of India. In the three-roller mills the juice is expressed more gradually, and the strain and consequent risk of breakage on the spindles is reduced. This year, moreover, the spindles have been made stronger, and the pinions deeper, and other improvements have been introduced. The price of a two 8" roller mill, thus improved, remains at Rs. 95, and that of the three 8" roller mill at Rs. 115 ; that of the three 4½" roller mill being Rs. 55.

As it has been found that the Punjabi sugar cultivator has a fancy for making ropes, sheaf-binders, and coarse mats out of the cane stalks, after the juice has been imperfectly expressed by his wooden horizontal smooth-roller mill, and he cannot do so with the perfectly desiccated and crushed refuse of the grooved-roller Beheea mill, the patentees are having multiple seven-roller mills made, which will pass the stalks out whole. It has been proved by calculation that it is cheaper to squeeze out every drop of juice, though, in so doing to break up the cane, and to buy other fibre for rope-making ; but the Punjabi will have his own way, so he is to be humoured. Then, again, having found that, down-country, the native prefers the native *kolhu* because he can sit on it and go to sleep ; Mr. Mann, the agent for the N.-W. Provinces, has contrived a sort, incapsizable bicycle for the driver to ride on. It consists of a light wooden frame, in which a pair of ekka

wheels is set, with the axles radical to the mill and close together, but one slightly in advance, so that its nave just clears the nave of the other, and on this is fixed a box for the driver.

The rate at which the use of these sugar mills is spreading is wonderful. In 1872 only 59 mills had been sold; but by 1876 the number was 1,825, all sold at Beheea, and chiefly for use in Shahabad. In 1877, the sale was begun in other parts of India, and by the end of 1879, 5,827 had been sold at Beheea, and 2,300 elsewhere, or a total of 8,127, and the estimate of the demand for new mills in 1880 was 4,000. At a fair at Saharanpore in February last, the demand for the mills could not be supplied. Two brothers, Syads Niaz Ali and Gholam Ali, of Jagadhri, bought 80 mills, paying for them on the spot, and wanted 100; and they ordered 500 for next year, to be paid for in advance. These enterprising men let the mills out on hire. Mr. Mann, towards the end of the fair, was quite mobbed by purchasers, holding out their money over each other's heads, and complaining that they had been waiting for days for their mills, and had not got them. Clearly, the prejudices of the natives of India in favor of their ancient ways are not irremovable. Towards this end, in the N.-W. Provinces and Oudh, the Department of Agriculture and Commerce has played its part, for in 1878 it obtained the sanction of Government to make advances to cultivators for the purchase of the mills, to be repaid with interest at six per cent., and it has frequently taken the trouble to exhibit them at district shows, and otherwise to make their merits known. In a recent circular the Director said: "If we may apply the results of this experiment to the total production of sugar in these provinces, it follows that by the substitution of the Beheea mill for the *kolhus* now used, the total annual produce would be increased by the value of nearly a crore and a quarter of rupees."

From the statememt circulated in the showyard at Lucknow, the following comparison of the working of the Beheea mill and the other two contrivances in use in Behar and the adjoining districts of the N.-W. Provinces, is taken.

1.—The Beheea mill, worked by three men and four bullocks, squeezed, in the season, 10½ acres of cane, and produced 400 maunds of *gur*, worth Rs. 3-14-6 per maund, or a total value of Rs. 1,561-8-0, at a cost of Rs. 29 per 100 maunds.

2.—The stone mill (*tikura*) worked by six men and eight bullocks, squeezes 7½ acres of cane, and produces 300 maunds, of *gur*, worth Rs. 2-12-6 per maund, or a total vlaue of Rs. 834-6-0, at a cost of Rs. 87 per 100 maunds; and

3.—The wooden mill (*kolhu* or *raksab*), worked by four men and four bullocks, squeezes 3¾ acres of cane, and produces 150 maunds of *gur*, worth Rs. 3-6-6 per maund, or a total value of Rs. 511, at a cost of Rs. 100 per 100 maunds. The comparision is put in another way, thus:—To squeeze eighteen beeghas of cane (11¼ acres), in a season of four months, there are required—

1 Beheea mill,	4 Bullocks, and	3 men.
2½ stone ,,	20 ,,	15 ,,
3 wooden ,,	12 ,,	12 ,,

In connection with these mills there was also shown and worked, at Lucknow, a specimen of the evaporating pan used at Shahabad, which Messrs. Thompson and Mylne find is a much better vessel for making *gur* in then the deeper ones used in the N.-W. Provinces. It is five feet in diameter, but only three inches in depth, and produces 80lbs. of *gur* in an hour, of a quality very much better than that turned out by the deep pans, the risk of burning being greatly obviated.—*Civil and Military Gazette.*

SUMAC.

SUMAC, which in one or the other of its varieties grows throughout the United States, has generally been regarded as a noxious shrub, which most farmers made war upon and destroyed, and nine-tenths of them probably would be glad to get rid of. Yet its production is really a profitable business when grown by culture. During the past ten or twelve years, our wild sumac has become more and more utilized, until in some sections it has attracted a degree of attention not known to the general reader. We have known for years that a considerable amount of the leaves had been gathered in Virginia, principally in the neighbourhood of Richmond, but were somewhat surprised, a few days since, to learn from Mr. C. D. Chambers, a citizen of Pamplin City, Albemarle county, that wild sumac had become an important article of traffic in his section of the State. None is cultivated there, however. Instead, the leaves are gathered from the wild shrubs, abundantly found there on the hill sides and poorer waste lands, mostly by negro women and children, and carried to the neighbouring towns, where it is bought by the merchants, as they buy nuts, furs, wool, etc., in their season. At these points, the dried leaves are sacked and forwarded to Lynchburg, Richmond and Petersburg, where the sumac is ground in mills adapted to the purpose and used for tanning purposes, or shipped, mostly to eastern cities. Between the three cities named considerable rivalry exists, each of which has its "runners" sent out to buy up the stock, and sometimes become quite as much a bore as the famous "Chicago drummers." We have no means of determining accurately the amount of sumac gathering in Virginia, but it annually amounts to thousands of tons.

Until about 1866, most of the sumac consumed in the United States was imported, nearly the entire of the importation coming from Sicily. In 1866, the amount imported reached 186,872,572 pounds, valued at $155,191; in 1867, 18,790,990 pounds, valued at $559,421; in 1869 11,242,451 pounds valued at $468,362. These are the custom house valuations, which are the valuations at the ports from which shipped, yet give over 30 cents per pound, or over $60 per ton for the sumac. The American sumac, as yet, falls considerably below the Sicilian product in market value, in part in consequence of the fact that it is not cultivated with us, and hence is not uniform in quality, and partly because it has not been as well prepared by the manufacturers. This latter defect, however, has been in a large part removed by the invention of machinery employed now in its manufacture. Chemical analysis shows that the American sumac has 30 per cent of tannin, its valuable property, while the Sicilian has but about 28½ per cent. Notwithstanding the superiority of the American, it has never sold in our markets at so high a price as the Sicilian, bringing only a maximum of $90 per ton in 1869, while the latter sold at $180. In 1869 (the latest returns before us), 11,200 ton of imported sumac and 5,000 tons of domestic were consumed in the United States. Of the latter, Virginia produced 3,500 tons. But the home production is much larger now.

In the Agricultural Department report of 1872, we find that in that year 12,000 pounds of sumac were shipped from St. Louis to New York, and thence to St. John's, New Brunswick, to be used for tanning purposes, but whether produced in Mussorie or not is not stated. But that sumac can be grown in the latitude of this state, as well as in the latitude of Richmond, Virginia, we see no reason to doubt. The complaint, so far as we know, is, that it grows here too luxuriantly and is too difficult of eradication in the estimation of many of our farmers. In any event, it is quite certain that the leaves of our wild sumac may be gathered and made an article of commerce quite as readily and quite as profitable as in Virginia. The leaves (and these only are used with us) may be gathered at any time after they begin to ripen, about July 10, up to the appearance of frost. The leaves, including the stem (not stalk or branches), are placed in open sheds to dry, care being taken that they shall be kept from getting wet or becoming heated, either, of which impair or destroys their market value. When thoroughly dried, they may be broken up promiscuously, sacked, and marketed.

In Sicily, sumac is planted in rows about three feet apart, cuttings being used, and cultivated much as our corn is where level culture is practised. In this way two crops are produced, the first year after planting the first crop being cut off close to the ground, the suckers springing up from the stubs, furnished a second crop.—*Journal of Agriculture.*

DEEP PLOUGHING IN INDIA.

IT has been said with much truth that if great Britain has any two duties towards India it is to teach her why not to lie and how to plough. We have not perhaps so much to preach the Ten Commandments here as to cure what Emerson calls the "pioneer state of things in the country," and to assist with the true British maxim of "Travers" in what Sir John Kaye terms "the oft-hoped, ever-realisable, but never perhaps to be realised hope" of developing the resources of the country. We have just now some twenty and odd gold and silver-lead mining companies throughout the length and breadth of the land; while the ryot, who, with his forefathers of happy memory, has been scraping the surface of mother-earth with his babul-bough, for the last 30 centuries, has not been taught either the meaning of the Catonian maxim *bene arare*, or the wholesome rule the late Mr. Mechi gave to the world, *viz.*, "a plough should be both a digger and an undertaker." That the subsoil of India contains within its yet unexplored recesses vast stores of plant-food and that the surface-soil has by a system of perfunctory agriculture been so far impoverished and debilitated as to grow only the lower order of crops, and these of a quality inferior to those grown in other parts of the world, is a truth which is no less fully established than it is alarming. The ryot has not yet realised this fact, but it is idle to think that merely preaching it even from the house-top to him will induce him to avail himself of his subsoil and thrust his plough deeper. He is steeped in ignorance and poverty. Ignorance can be elutriated from his mind by precept and practise; by the experimental farms which Government have established in different parts of India. These farms, however, are too few and far between, and they do little towards instructing an agricultural population of some 180,000,000 inhabitants. We are glad, therefore, to note that the influential, though, as we remarked the other day, ill-advised deputation that waited on Lord Hastings on on the 5th of April, warmly advocated the desirability of diffusing a more wide-spread and elementary education among the great mass of the people of India in strict accordance with the spirit of the Educational Code of 1854. Poverty, however, is not easily or so cheaply cured. It is the greater of the two cancers that eat at the heart of Indian agriculture; for, though knowledge be power, the knowledge of the use of a plough to the man who cannot afford to buy or even rent one, is so much throwing away of pearls on swine. Towards the permanently-settled zemindars of Bengal, Government have not half the imperative duty they have to the ryots of the Deccan, where the land is for the greater part in their own hands. Bearing in mind this consideration, as also remembering that by far the best part of the Indian revenue proceeds from the land, Lord Mayo, eleven years ago, called the urgent attention of the Secretary of State for India, to the duty of helping the

Deccan ryot. To this day nothing has been done. Mr. Wedderburn last year published a paper proposing a system of Permanent Settlement. The scheme was assailed with a full cry by writers, who should have known how to raise better objections than mere technical ones, and then the scheme was allowed to slide. We trust it is still under the consideration of the Secretary of State, and that it will be applied in due time to the Deccan, when the failure of the Agricultural Banks crotchet, as we anticipate, comes about.

Once cured of his ignorance and chronic bankruptcy and poverty, it will be an easy matter for the Deccan ryot to plough—and to plough well. The great saying of the epigrammatic Cato: "*Quid est agrum bene colere? Bene arare. Quid secundum? Terum arare. Tertio? stercorare*" has been erroneously, or, at best negligently construed by writers on agriculture—and in these days of high scientific farming we ought to know more than even the Romans. The fact is that the subsoil though, as a general rule, richer than the surface-soil, should not always be brought into immediate play. Even admitting that the ryot is strong enough to use a powerful implement, it very often happens that the subsoil is poorer in, say, iron and alumina, the inversion of which would not only impoverish the upper soil but lessen its capacity to resist drought and insects. Sometimes again the lower soil is so raw, sour, and soapy that to conjure it to the surface would be the sinfullest act a farmer could commit. A scientific distinction has therefore been made between deep-*ploughing* and deep *cultivation*. We are not aware what ploughs are used by the Agricultural School in Poona—probably one of Howard's; but Mr. Chick of Calcutta lately took out a patent of whose wonders we have heard much. The plough, while strong and durable and capable of deep-ploughing, is said to be so portable that the weakest plough-boy can carry it to and from the field. It can be driven by one man and may be drawn by a pair of small bullocks, such as are commonly used by the ryots, the rearing of stock in India being notoriously a disgrace to the country. It is so constructed that while it ploughs deeper than the native plough, and with good bullocks will go to a depth of seven inches, it actually requires less exertion on the part of the ploughman himself than the native plough. He has to exert no downward pressure, but simply to guide the plough with one hand, while he drives the bullocks with the other. Such casual repairs as may be necessary may be executed by any village workman, and the plough, is so simple that the ryot can work it at once without previous instruction. The price is only Rs. 11-8, and though a little dearer than the native plough, is surely within the reach of very many ryots who, we are assured, would secure from its use a large profit from increased production. From experiments it would appear that, *cœteris paribus* that Mr. Chick's plough is capable of realising for the ryot 30 per cent of production over and above his present maximum.

Besides Mr. Chick's experiments, others quite as successful have been lately made at Hissar, near Delhi, under the superintendence of General Angelo, which goes far to prove that the English plough can be thoroughly adopted to Indian requirements.—*Deccan Herald.*

OUR WHEAT TRADE.

THE subject of the enhancement of freight on the G. I. P. Railway is of interest to a great many people outside the Bombay Presidency. In spite of repeated protests by the mercantile community, the Directors of the G. I. P. Railway have issued an order which took effect on the 2nd instant, for such an increase in the ordinary rates as must, in the estimation of the trading community, have the result of lowering traffic. It seems that the Directors have been induced to take this step, in consequence of their diminished receipts after the end of the late famine. But it is equally evident that the traffic was gradually expanding during the interval. In fact, the volume of trade had so largely increased a long while back as to leave no room for doubt that the railway would soon be enabled to earn a good revenue and make up for past losses, without any such dangerous resource as the increase of freight charge. A few weeks ago, according to a Bombay contemporary, wheat trade from inner India to Bombay rose to five times its highest figure at any previous period, that is for the same month, and to ten times the average of the preceding five years. The same progress was manifest in the important item of linseed. But it is added that the wheat shipments for March were much below those for April, so that the conclusion is that Bombay may most probably witness an unprecedentedly successful season in the wheat trade. Yet as we have shown, this is the very time that the Railway Directors take it into their heads to impose fresh charges which must act in restriction of commerce. We have pointed out on former occasions, that notwithstanding the competition of the United States, India was quite capable of maintaining a large and profitable trade in certain kinds of wheat, as for example the fine kinds which are used in the manufacture of macaroni, and which are not grown in America. The figures quoted by our Bombay contemporary fully bear out all that we then said on the subject. It is worth noticing that the railway charges over the six hundred miles from Jubbulpore to Bombay even exceed the charges over the four thousand miles from the corn markets of Chicago to the port of Liverpool. While we are on the subject we may remark that wheat of excellent quality is selling at Sumbulpore, in the east of the Central Provinces, for more than sixty seers for the rupee, or less than a third of its price at Lahore. This means that immense quantities of wheat are grown in the Central Provinces, for which the cultivators have no use. As a fact, wheat is often used as fuel in that granary of India.—*C. & M. Gazette.*

EXPERIMENTS IN BREEDING AND REARING ADEN CATTLE.

MR. W. R. ROBERTSON, Superintendent of Government Farms, has submitted the following interesting report, which the Board of Revenue consider very satisfactory, and have sanctioned the expenditure of Rs. 1,200 as proposed for further importation :—

I have the honor to submit the following report on the experiment began at the Saidapet Farm in 1874 in breeding and rearing cattle of the Aden breed. The experiment has now reached a stage at which we may profitable summarise the results and form some general conclusions thereon.

2. In the Annual Report of the Farm for the year ending 31st of March 1874, I referred to the then proposed experiments as follows :—

"56. With the view of effecting some improvement in the cattle of the district around Madras, it is intended to import a few animals of the Aden breed. One bull, two cows, and two calves have been purchased for shipment from Aden to Madras by the first favourable opportunity. The Adens have a high reputation as daily animals; the name Aden by which they are distinguished has probably originated from Aden being the port from which cattle of this breed are generally shipped, they are not found in the neighbourhood of Aden, but are brought from districts situated at considerable distances from the coast. They are small animals, and the bulls of the breed are therefore better suited for use in the early stages of experiments in improving the breeds of small cattle generally found in Southern India, than are bulls of the Nellore and Mysore breeds, which in some instances have been used for this purpose. To show how great a mistake it is to use bulls of these large breeds in attempting to improve the cattle of Southern India, it is only necessary to mention that a cow of an average size generally weighs from 200 to 300lbs. live weight, while a good bull of the Nellore or Mysore breed will weigh from 900 to 1,000lbs."

3 In the next Annual Report the experiment is thus referred to :—

"63. In June we imported the Aden cattle referred to in my last report. One of the cows died during the voyage; the remaining animals, consisting of one bull, one cow, and two calves reached Madras in safety, but were all much out of condition when landed. The cost of the stock in Aden was Rs. 208-14-0, and for their conveyance, &c., to Madras, the charge was Rs. 630-12-0, making the total outlay on account of this importation Rs. 839-10-0. These animals are not nearly so good as I had expected that they would be, and if they are fair specimens of the breed, which I have every reason to believe, they are the Aden breed which has been much over-praised. I make this observation with reference to their form and their general quality only. I have not yet had an opportunity of forming a conclusive opinion regarding the milk-producing capabilities of the cow, though from the fact that she has reared her own calf along with the calf of the cow that died, she cannot be very inferior in this respect. Both the calves are bulls; one, the calf of the cow that died, is much inferior in form and quantity to the other. If the cow should prove to be a good milker, her defects in shape may be overlooked, for it must be remembered that there are several highly valued breeds of dairy stock in Europe, the cows of which are exceedingly irregular in form. If by the use of bulls of the Aden breed amongst the dairy stock of the ryot we can succeed in producing a cross, the cows of which will possess larger milk-yielding capabilities, the experiment will have been fairly successful and the improvement in form may be attempted by the use of bulls of some other breed."

4. The cow in October 1875, gave birth to a bull calf which she reared. No statistics are available showing the quantity of milk obtained during this milking period.

5. In May 1877 she again gave birth to a bull calf, and from that period her yield of milk has been carefully recorded. From the fourth day after calving, until the following March, she yielded 820 Madras measures, or 307 gallons of milk; the average monthly yield throughout, the period was 75 Madras measures.

6. In June 1878 the cow gave birth to a heifer calf. She continued to give milk up to following May. The total yield of milk in this milking period was 694 Madras measures, or 260 gallons, and the average monthly yield was 69 measures.

7. In September of the following year she again gave birth to a heifer calf. The yield of milk in this milking period was 831 Madras measures, or 312 gallons, and the average monthly yield was 83 measures.

8. On the 19th of July 1880, the cow gave birth to her sixth calf. Unfortunately about the end of December she was attacked by foot-and-mouth disease, which for a time put a stop to the experiment, but in the five months she was milked, she yielded 564 Madras measures, an average yield of 3·8 Madras measures or 11½ pints per day.

9. The quantities of milk mentioned were obtained in addition to that consumed by a calf reared in each of the milking periods.

10. The milk was excellent in quality, 16 to 17 pints, yielding one pound of butter.

11. From May 1877, from which period accurate statistics are available up to nearly the end of December last, the total yield of milk was 2,910 measures, or 1,091 gallons, and during this period the cow reared four calves.

12. There has been but little change in the food of the cow, usually she was fed as below :—

Daily 4 lbs. of ground-nut oil cake.
" 2 " of wheat bran.
" 30 " of green fodder.
" ½ oz. salt.

the average prices of which may be taken as—

Bran, at 50lbs. per rupee.
Ground-nut oil cake at 75lbs. per rupee.
Green fodder, at 300lbs. per rupee.
Salt, at 31lbs. par rupee.

or Rs. 6-12-0 per mensem, to which must be added Re. 1-8 per mensem for attendance and sundries, thus making the total monthly expenditure Rs. 8-4-0. For the entire period, forty-three months, the cost will have amounted to Rs. 354-12-0. Deducting from this sum Rs. 100, the value of the four calves reared, there remains Rs. 254-12-0, which represents the cost of the 2,910 measures of milk obtained, the price per measure of which would thus be As. 1-5 or about half the price which is readily paid in Madras for much inferior milk. I have made no charge for bedding straw because the manure of the cow would be a fair equivalent for it. In charging for attendance, I assume that one man on a wage of Rs. 6 per mensem could easily manage six cows.

13. We have now at the farm of the Aden breed five bulls, one cow, and three heifers. The bulls are in considerable request for use with the small cow of the neighbourhood. They are regularly employed in farm work, carting, ploughing, &c., and are remarkably docile and steady at work.

14. The result of the experiment has been so encouraging that I venture to ask sanction for the expenditure of a sum not exceeding Rs. 1,200 in importing a fresh supply of the cattle from Aden, say two bulls and four cows with calves. The expenditure can be met from sanctioned allotment. "Farm Stock" in the budget for the current year. I assume that the stock could be brought across for Rs. 100 per head as shipping facilities with Aden have been so greatly increased since our last importation. If this request is sanctioned, I shall be glad if arrangements can be made through the Political Resident at Aden for the purchase and shipment of the stock. I shall be glad to furnish a detailed description of the kind of animals we require.

15. Of the Aden stock we now possess, I purpose placing a bull at each of the three Agricultural experimental stations it is intended to establish in connection with High Schools.

16. I enclose a statement showing the monthly yield of milk from the Aden cow during the last four milking periods, and another statement showing the monthly yield of milk from three cows of the Punganur breed, a breed which possesses a considerable local reputation as dairy a breed. The last statement shows an average monthly yield of milk during the milking periods from these cows of only 30 measures, in addition to the milk taken by the calf each cow reared, or only about ⅓ths the monthly yield of the Aden cow.

THE TENURE AND CULTIVATION OF LAND IN INDIA.

SIR GEORGE CAMPBELL, M.P., recently read a very interesting paper before the Society of Arts on this subject, which we reproduce at length. Sir George, in that portion of his paper, takes a strange view of the labour question so far as planters are concerned. Apart from this remarkable expression of opinion, which we imagine planters will thoroughly dissent from, there is much that is instructive in the paper.

My subject being "The Tenure and Cultivation of Land in India," I shall first speak of the tenure of the land. The most prominent feature throughout India is this, that everywhere the soil is held by small farmers not above the position of labourers. Speaking generally, it may be said that there are no large farmers. We found that in India under the native system the rent was in the main retained for the purposes of Government. The Government dealt with villages; those villages were little Republics—the units of the States; they managed their own affairs, distributed the revenue demand, and provided for many common expenses and common necessities by a well-arranged system of local rating. Under our system, the revenue demand has been moderated, but much variety of tenure has been introduced intermediate between the Government and the people, giving rise to very various forms of property. It seems to me that in this process we have done harm, from acting upon English ideas, in two directions. In some parts of India we have attempted to establish landlords, in the hope that they will perform the functions of English and Scotch landlords; in reality they have entirely failed to do so, and the people are under this system more rack-rented than under the native Governments. The free-trade system of free contracts between landlord and tenant has answered no better in India than in Ireland; in some cases great political difficulties have resulted, as when through mere ignorance we have imposed Bengalee and other landlords over Sonthals, Gardos, and other aboriginal tribes, the autochthenes of the soil, and, in their view, its true owners. In other parts of the country, an opposite course has led to another class of difficulties; there, rejecting the landlord system, we have made the ryots the cultivators of the soil, absolute owners of the soil, and insisting upon the advantage of individual property, we have put an end to the system under which, in a village community, the combined cultivators had the strength attributed to a bundle of sticks. This course was certainly taken with the best intentions in the world, but it has turned out that in some cases an unaccustomed form of property, given without price and without safe guards and limitations, to people who did not understand it, has been treated by them as children treat a gift beyond their years; they have made too much use of their new-found credit, they have become involved with money-lenders and signed away their rights. They have been sold up by the courts under our rigid system of law, and sometimes, as in the case of the Deccan ryots, their last state has become worse than their first.

The moral, however, of the difficulties which have been experienced, both under the landlord system and under the ryotwar system, seems to me to be that it was a mistake too suddenly to introduce our ideas of property, and that a limited sort of property of the nature of a liberal fixity of tenure is more suited, at any rate in the first two or three generations to our rule in India.

I have now come to the cultivation of the soil, which I am afraid we hardly so well understand as we do the tenure. The great question which has been raised of late years is whether the soil is becoming exhausted at the same time that the population is rapidly increasing, so that grave and dreadful evils may be feared. The population, no doubt, is increasing, but we are still without sufficient data to show the rate of increase; nor has it been made clear whether famines are really more frequent than formerly, or whether we have only had recent unhappy cycle of famines which may have occurred in former ages, of which we have little information. My impression is, that the exhaustion of the soil is rather a thing which there is reasonable ground for apprehending, than a fact which has yet been made apparent beyond doubt as having actually occurred on a great scale. That a process has been going on, leading to much reasonable apprehension, is, I think, patent. We acquired India after terrible troubles, which had caused very much of the land to lie waste; there were many blanks; the last two or three generations have been filling up those blanks. They found much new land, which they brought into tillage; there is comparatively little left now; there is less room for grazing, less for fallows, more people to feed, and more produce exported. No doubt the soil must be exhausted in the end, if improved methods of cultivation are not introduced. Hitherto the great panacea for everything has been irrigation; but now there are very grave doubts whether increased irrigation, without increased manure, is not too much in the nature of a mere stimulant, and does not cause exhaustion and grave evils in the end. I think there can be no doubt of this, that limited portion, of the soil are very highly and skilfully cultivated by certain classes of natives in their own way.

I am glad to hear that a beginning has been made of sending one or two natives to the Agricultural College in Cirencester, and I hope that will be followed up. It is true that many of the free, unofficial Europeans cultivate, very successfully, tea and indigo, but they have enough to do to apply themselves to their own special articles, and have not generally given attention to the ordinary native cultivation.

As to the most profitable staple, I fear that some of our old staples do not progress. The export of sugar and silk has rather gone back; and from what I have seen of the cultivation of cotton in America and the great aptitude of the negroes there for this cultivation, I very much doubt whether India will ever compete very successfully with America in the cotton markets of the world. I rather think that the best hope for Indian cotton is in the development of the home manufacture of the article, by which cultivator, artisan, and consumer will be benefited. On the other hand, we well know that, on the whole, there is a continual increase of exportable produce. Wheat seemed likely to become a very great staple for export; and I still hope it will be so; but the difficulty to which I have already alluded especially applies to wheat. All the alluvial soils, which grow wheat well without artificial irrigation have already been occupied. A great extension of wheat cultivation is scarcely possible without irrigation; and some of the canal lands have certainly become very much exhausted for want of manure. The competition of cheap American wheat stands, too much in the way. But, on the other hand, India has almost a monopoly of the rice supply of the western world, and there is no limit to the demand for rice. In rice, we wholly beat the American: Indian rice is now largely imported into America; we cannot, then, grow too much rice. It seems too, that rice only needs an abundant supply of water, and that it does not exhaust the soil so much as other crops. I hope that some of the rice canals, such as that in Orissa, which have not hitherto been successful, may succeed in the end. They have had to struggle with very great difficulties, owing to the mismanagement of the private companies who at first undertook them, and which demanded exorbitant rates before the people were ripe for them. There are also very great difficulties in the distribution of water connected with the tenure of land. I hope that there is still room for a very considerable extension of the production of jute, oil-seeds, and similiar great articles of export in Assam and some districts of Eastern Bengal, in the Central Provinces, and in some other parts of India. Putting aside here all political and moral question, I think it may be said, as a mere agricultural question, that the opium cultivation continues to flourish, and the value of of opium exported becomes larger year by year. No substitute for indigo has yet been found in coal, or anything else, and I believe that the cultivation may yet go on and prosper if the indigo planters will only avoid the rock that threatens them; that is, that they cling to a feudal system of growing indigo by compulsion, when it would be much better for all parties to give a

fair price for it, and get it by free contract from free cultivators. The tea cultivation, notwithstanding its ups and downs, has been an immense success. I am afraid it is a little down at present, but I do hope that the tea planters will not be led into unfair demands upon Government for the remedy of their labour difficulty. Unhappily, there is still a very great mortality among the coolies employed in many of the tea gardens, which imperatively requires the attention of Government. in the cases of coolies who are not free labourers, but bound down for terms of years, enforced by very stringent laws. No one is more for freedom of contract beween employer and labourer than I am, but what I do object to is any demand for freedom for the planter while there is no freedom for the coolie. One would suppose, from the things that are said, that the Government throw all kinds of obstacles and unnecessary restrictions in the way of the planter, while the coolie are free to do as they like. The fact is just the contrary; if a planter engages a coolie under the ordinary civil law, the Goverment in no way restricts him; but what the Government do say is this, that if you insist, as you have insisted, that you should have penal laws of the most stringent character to enforce civil contracts of labour by criminal processes, and by powers put into the hands of the planters themselves, then the Government must exercise a certain supervision for the protection of the coolies, who are for the time not free labourers at all, and are liable to be sent to the most unhealthy places and kept there. I have no doubt, then, about the proposals for new legislation on the subject. My remedy for the labour difficulty would be to give very greatly increased facilities for the transfer of labour, and the free hiring of labourers without any penal or special laws at all. I should like to see as many new roads and railways as possible, to connect the provinces with over-abundant population with those whose population is scanty. In particular, I should very much like to see a cross railway connecting the Benares and Bahar provinces through the Northern Bengal with Eastern Bengal and Assam. But the question of migration and emigration of the natives is a very broad and difficult one, on which I cannot now enter. There is still, no doubt, room for a good deal of migration in India, but it can only be carried out gradually and carefully; and I am myself much convinced that both to the people of India and to the tropical possessions of her Majesty, very great advantages might result from an extensive Indian colonisation, if we could only make sure that Indian emigrants would be fairly treated under Colonial laws, and by Colonial administrators—an assurance which, in my opinion, we have not yet obtained. I think emigration should be encouraged when, and only when, an Indian going to a colony is there treated in the same way as any other of her Majesty's subjects. However, I will not enter upon the subject now. I am afraid I have already been too long, and I will only commend the subject of Indian land and Indian agriculture to you as being far more important to the people of India, and to all who are interested in India, than all other subjects put together. I hope that there may be fulfilled that which her Majesty's Government have put forward as the o desire, namely, less of wars and more attention to agrarian affairs.

THE INDIAN GLOW FLY.

MR. H. A. SEVERN, F.R.A.S., writes from Devalah, Wynaad:—

"Having failed to find any critical description of these interesting insects—it is possible that the notes I am now able to send you may cause others to enter the field of inquiry. Situated some 2,900 feet above the sea, and in central Southern India, amidst hills, valleys, and streams, I have had peculiar opportunities for observing them. They are not to be seen during the day time, but so soon as darkness steals upon twilight, so surely do these small natural lanterns become visible, and their numbers rapidly increase, much indeed, as the visibility of the stars increases as the evening passes into midnight. The fire-fly, when examined individually is by no means a pretty looking insect, and when compared to other insects and flies, it is certainly both large and ungainly. An ordinary house fly is 5/16 of an inch in total length and weighs ·25 grains; but the subject of my notice, has a length of 9/16 of an inch, and weighs ·66 of a grain. The glow-fly, or beetle, as I should term it, has a black head and antenuce; the thorax and abdomen are of a yellow red colour; two pair of legs are attached to thorax; third pair to abdomen. This latter part of the insect's body is divided into six rings; and, counting from the thorax, it is the fourth ring which emits the light; there is a rectangular opening in this ring which is merely covered by a very thin skin, it is in fact a window, from whence the light emerges! The insect has only one pair of wings, these are small, most delicate and thin, and are sheathed. It is worthy of notice that these insects fly both rapidly and slowly, but make no noise or buzz in the air. To test this further, I have frequently liberated several of these glow beetles in my bed room, and in the dark they have only appeared as fairy stars, as no humming could be detected. As regards the character and quantity of the light, one insect enables me to see the time by a white-faced watch when 4 inches distant; twelve of them placed in a glass jar enable me to read a book with ease; and are equal to a small "Geissler's" tube. The light is of an exceedingly beautiful colour, a sombre yellow tinged with green, and at intervals it is brilliant. A preliminary examination of the light in the spectroscope (a large one made for me by Browning), shews a distinct clear continuous spectrum, no lines or bands of any kind being visible. The insect made to crawl on a card placed over the poles of a powerful compound permanent magnet, showed no signs of uneasiness, or change of light. Similarly placed over an electro-magnet (10 grove cells) and rapidly alternating the current, caused no change; placed within a coil of covered wire there was no change. Blowing my breath very gently on the insect caused no change; this was also tried with a blow pipe. Cold air of 50° caused a distinct diminution of the light; on the other hand, air at 100° caused an increase of light. I now placed several of the insects in a boll jar, and gave them a good supply of clean oxygen gas, the luminosity at once increased fully 25 per cent. on a dead insect (which still emits light). Oxygen gave similar results, and on extracting the luminous part, and blowing oxygen upon it, the light was much increased.

"So soon as darkness has fairly set in, millions of these beetles invade the trees, and as my bungalow is near to a stream and level with the top of the trees, I am able to notice them with much care. The curious pulsation or flashing of their light is remarkable. The insects resting on a tree, all act in perfect concert, i. e., five seconds of no light, then seven rapid flashes; five seconds no light, seven flashes; and so the game continues throughout the dark hours. At first I had reason to believe that the insect when flying only emitted light; this, however, is not the case, for when observing the pole star for variation with my theodolite, it occurred to me during a passing cloud to turn the telescope on to the glowing tree. At once I had the field of view filled with tiny stars both fixed and wandering. It is also worthy of notice that all such glow insects as may be on a dozen or more trees, will continue to keep up the most perfect time, as to the flashing of their light, and the interval of pause; and this, for many consecutive hours. But this singular agreement as to time, relates to close clusters of trees only; consequently, distinct groupes of trees separated one or more hundred yards may not agree, and do not do so as a rule. On safe authority I am informed that the Indian bottle bird protects his nest at night, by sticking several of these glow beetles around the entrance by means of clay. And only a few days back, an intimate friend of my own, was watching three rats on a roof rafter of his bungalow, when a glow-fly lodged very close to them, the rats immediately scampered off. In conclusion, I may say that these insects see by day, as well as by night, and I incline to the idea that the beautiful light they carry serves as a means of intimidation or protection, and certainly as a means, whereby to recognize friends. As I gaze from my verandah down the Nadgani Valley into the dark night, I see the pulsations of light, here, there, and everywhere; and as my optical powers increase, so do these gaseous nebulous patches become resolved into real living stars!"—*Madras Mail.*

FRENCH BUTTER.

FRENCH butter is sent to market in a great variety of packages, according to the requirements of each locality. For the London market kegs holding about 70 lbs. each, crocks holding 50lbs., and boxes containing one doz. 2lbs. rolls are most frequently seen. Extreme cleanliness and refreshing neatness (amounting almost to what the French call *coquetterie*) are characteristic of all the methods, and they are further distinguished by the free and almost lavish use of clean linen linings. The kegs and linen linings cost about 1*s* 9*d*. each; the crocks which are protected by an outside basket, and also lined with linen cost about 2*s*. each, including everything; and the boxes holding a doz. rolls cost about 9*d*. each, including linen and paper. In the hottest weather the boxes are sometimes double, the space between the two boxes being filled with cotton wadding. In fact, the French butter merchants thoroughly realize the importance of delivering their wares in an attractive condition, entailing neither trouble nor waste upon the retailer. On this point I may be allowed to quote the remark of an English friend:—'My cheesemonger said to me the other day, "Look here at this French box. I open it" (which he did); "here is the butter fit to weigh out to you without an atom of loss. Now let us break open this cask of Irish; you see I have to scrape it all round, and lose a lot, besides the trouble."'—*From 'Dairy Farming,' by Professor Sheldon, for April.*

OSTRICH FARMING.

IN July last, when travelling to Grahamstown, Graaf Reinet, and other places, I was much surprised, notwithstanding all I had previously heard regarding the prosecution of ostrich farming, at the extent to which the breeding of, and dealing in ostriches had attained, and the large returns which are in many instances derived by the hatching and rearing, the purchase and re-sale of birds, and the crops of feathers which are plucked from them (according to the fancy of the owners) every six or nine months, as also at the large sales of feathers held on the market at Port Elizabeth every week, on Mondays, and Tuesdays, throughout the year, these sales average from 8,000 to £15,000 weekly, the first amount being considered rather a low return. The total value of feathers sold on this market alone (irrespective of sales inland, or in the Western Province, where ostriches are also bred), during the six months ended June 30th, this year, amounted to £276,188 1s. 10*d*., and for the year 1879, the total sale were £391,120 11*s*. 8*d*., and I think I may safely put down at least two-thirds of this sum as the returns from domesticated birds, the proportion of wi d feathers being very small.

I find that pairs of breeding birds are frequently kept in back yards, or paddocks, of from about a quarter of an acre up to two, four, and ten acres extent, while birds not yet paired off, run together in droves of 40 or 50 in large enclosures—that large numbers of chicks are hatched by the parent birds in these paddocks, and removed when three or four days old, to be reared by hand, the old birds, in most cases, frequently laying again in from eight to ten weeks thereafter, and ostrich nests may sometimes be seen within a dozen yards of the line of railway. It would take up too much of your time, now, to give the various statistics and statements made to me by owners of birds, who have been successful as breeders and feather-growers, but as illustrations, I will quote just two or three out of many instances. All are not, however, equally successful.

A gentleman who resides at Grahamstown, only some three years out from England, informed me that he had invested £1 000, partly in young and partly in breeding birds, which he placed with a neighbouring farmer on half shares of profits, the farmer finding food, land, and all that was necessary otherwise, that after twelve months investment he cleared as his half share £700 by feathers, birds resold, chicks bred and sold, &c., and he knew of several pairs of breeding birds which had realised their owners from £200 to £800 a year. Another party purchased for £120 a pair of breeding birds; 12 months afterwards £140 had been realised from feathers and young birds sold, and he considered he could get £350 for what he then had on hand; these of course were purchases made at lower value than are usually current just now, except in forced sales, pairs of guaranteed breeding birds, four or five years old, are worth from £150 to £200 per pair. One other case; two pairs of breeding birds were placed with a farmer on halves of profit, the one pair for six, and the other for twelve months, the half returns being £220 for chicks or young birds only with the old birds still on hand. Ostriches seem to do both in scrubby brush country and open veldt, and I am informed that their feathers are little if at all injured by moving amongst the bushes. £8 to £12 10s. per annum is considered a fair ordinary return in feathers per annum per bird; odd male birds sometimes return £15 to £18 per annum, these not being breeding birds however.

One gentleman, Mr. Distin, of Tafelberg Hall, Graaf Reinet district, has about 1,000 breeding birds and innumerable enclosures on his firm; he is supposed to realise at least £10,000 a year by ostriches.

The common prickley pear plant (*spun tia vulgaris*), which having spread itself over large tracts of country had previously been considered a pest, and large sums spent by some lando wners in attempts to eradicate it, is now found to be good green food for ostriches. Stuck on a fork or stick, and run through a blazing fire to scorch the thorns, it is chopped up with or without lucerne; mealies and barley are also used to feed with.

I was informed that the first census taken of domesticated ostriches in the Cape colony in 1865 was returned as 88 head, in 1875 the second census returned 22,000, the number now is believed to be quite 100,000, Companies are now being formed to prosecute ostrich farming. The objections raised by me against further extension of this enterprise, namely, that at the present rate of breeding and the production of feathers they would soon become a drug in the market, was combated by the following remarks. "How comes it, then, that up to the present, though the supply has yearly been increasing their value is still maintained, and that feathers being worn all over the world by ladies, children, and females of all classes, and being very destructible articles will always meet with sale." That being further proved by diamonds keeping up their value, though almost indestructible and found in large quantities yearly they also being articles of luxury, and unattainable by many persons owing to their value.

I put forward these arguments at length, now, because I feel persuaded, after seeing the kind of country these birds do well on in the sister colony, and the way they are treated there—that they may be successfully farmed here in many localities, such as the higher and open portions of Uys Doorns, where only lightly dotted over with brush and the Upper Tugela and Weenen districts, which are more of less of a dry climate and sandy character of soil.—*W. G. Baker, President of the Maritzburg (Natal Agricultural Society.*

FOOT AND MOUTH DISEASE.

AS cattle disease in its various forms is prevalent in Oudh, the following letter on the foot and mouth disease addressed to the *Times* by Mr. W. Scott of 4, Austin-friars, London, may have some special interest for our provincial agriculturist and others. Writing under date March 26th, Mr. Scott says.—

"In arranging the papers of my brother the late Mr. T. C. Scott, I have come across to-day a cure for the foot and mouth disease which he called attention to in a short note in the *The Times* in 1869. And I find over 180 letters addressed to him requesting a copy of the recipe which he had printed for gratuitous distribution. Will these 180 gentlemen or some of them tell us through your columns whether they tried the remedy and personally saw it tried, and what the result was! The following was the recipe.—'Dissolve 1lb. of bluestone (sulphate of copper) in a gallon of soft water and wash the animal's mouth with this from a sponge attached to a stick; then put two or three large table spoonful of oatmeal and pounded alum mixed in equal proportions into their mouths as near the root of the tongue as possible, and the discharge of an immense amount of saliva will be the result. Wash their feet, especially between the claws with the same solution and allow them to stand on dry straw. Three applications daily will cure the worst case, especially now when the disease is so much milder than formerly. During the continuance of the complaint all food must be given chopped, as the cattle cannot lay hold of anything with their tongues. Sulphate of copper costs about 8d. per lb., and pounded alum less, and oatmeal can be obtained at any corn chandler's. The disease, as a rule, is not deadly. The worst effect of it is to throw back the condition of the affected animals for two or three months. My brother asserted that the above prescription would arrest its progress in three days. He considered it an infallible cure as tested by himself in 100 cases, in Cheshire when the disease first appeared there. One obvious advantage of the above prescription is, that it can be applied by any ordinary cowman or cattle man, thus obviating the employment of professional veterinaries, who must inevitably carry about this—as my brother deemed it—most infectious disease in going from place to place. Chloride of lime my brother considered a valuable preventive, testimony of its efficacy having been borne to him, at the time, by Mr. Parsons Fowler, the well.known importer of Alderney cattle. This disinfectant is to be sprinkled over the cowhouse floors, under trees where the cattle are in the habit of standing, at gateways, &c."

EXPERIMENTS WITH MANURES IN ABERDEENSHIRE.

MR. BRUCE, Millhill, Aberdeenshire, gives the following results of experiments conducted on his farm last three years. The experiments were conducted on a basis of 4 cwt of Peruvian guano per acre, all the other manures having been made up to that value.

The following were the results on the turnip crop of 1878:—

Manures	Turnips per Acre.	
	T.	C.
1. Bone ash yielded.	16	1
2. Bone meal, fine ground	19	7
3. Do. ordinary	18	8
4. Coprolites	13	7
5. Dissolved bones	18	18
6. Guano	22	10
7. Superphosphate	18	8
8. Guano and Coprolites	21	8

The results of the same manures were observed on the succeeding grain crop in 1879, and reported as follows:—

	Marketable Corn per Acre.			Light Grain.	Straw.	
	Q.	B.	Lbs.	Lbs.	St.	Lbs.
Bone Ash	8	5	24	96	122	10
Bone Meal	5	2	36	192	171	14
Coprolites	8	7	8	96	120	0
Dissolved Bones	8	6	16	16	118	0
Guano	4	6	8	112	176	20
Superphosphate	5	2	86	118	171	14
Guano and Coprolites ...	3	0	0	64	93	0

The annexed are the results of the experiments of 1880 on the grass crop weighed as it was cut green:—

	Grass per acre.		
	T.	C.	Lbs
Bone Ash	2	9	16
Bone Meal	3	6	16
Coprolites	2	1	18
Dissolved Bones	2	1	18
Guano	3	7	84
Superphosphate	2	10	32

In weighing the grass that was made into hay, the different manures gave nearly the same proportion of hay, except the bone meal, which was the heaviest, beating the guano.—*N. B. Agriculturist.*

CULTIVATION OF THE CHESTNUT IN TUSCANY.

THE chestnut tree has existed for centuries in Tuscany, where at one time nearly every hill and mountain side was covered with its foliage.

The number of trees existing in Tuscany and Lucca at the present time is estimated at several millions, and the nut and wood have contributed more to the maintenance of the population of some of the districts than any other production; in some places, in fact, wheat, flour, and corn meal are entirely superseded by the chestnut flour, which is very nourishing and much cheaper as an article of food. The tree grows to the height of 60 or 70 feet, and attains full maturity at the age of 60 years, its vitality and productiveness last for more than 100 years. In many parts of Tuscany it is largely cultivated, and is always raised from the seed or nut; the larger variety of Spanish chestnut is cultivated from grafting on the young trees. Mr. Schuyler Crosby, the United States Consul at Florence, states that there are six different kinds of chestnuts cultivated—the Marone, the Carpinese or Carrara, the Pastinese, the Rossolo, the Romagnuolo, and the Brandigliano. The method of cultivation is as follows:—The chestnut is raised from the fruit, planted in earth which has been softened by being repeatedly worked over. The plantations are generally situated near a stream, and the ground shaded by hedges or trees placed close together. The space set aside for the cultivation of the chestnut is divided into furrows, six or seven feet wide, and in each of them holes are dug about three inches deep, and at a distance of about six inches from each other. In these holes the nuts are placed, with the germs downwards. The use of manure is not largely resorted to, although it has the effect of rendering the plants more vigorous and healthy, as it is dangerous on account of transplanting, as the young tree, finding itself on soil less rich than it has been accustomed to, easily languishes and dies. After two years the plants are transplanted to another part of the plantation, where they remain four years, after which they are placed where they are destined to remain permanently. The season usually chosen for transplanting is after the falling of the leaves, though it is frequently done even as late as February or March. There are two methods of grafting the tree (which is done at the age of five

or six years) ; one is the primitive method of inserting the bud in the end of a branch, with a slit in it, where it is retained by wax or other substances. The other, which is the latest, and has proved the most successful in its results, consists in cutting large rings of bark from the branches of the large or Spanish chestnut, and placing them on twigs of the ordinary kind ; this is a very delicate operation, requiring great care, and is performed in the following manner :—The bark of the Spanish chestnut is cut into circles on the twigs, where marks of buds appear, care being taken to have one or more buds on each circle or cylinder, the bark is then slightly beaten to loosen it from its position, and gently twisted by hand, until a hollow cylinder of bark is obtained, which is then drawn up by the stem that has been previously denuded of its bark in like manner. The cylinder of bark is then carried to the stem of the tree, which is grafted. This stem having been previously denuded of its bark, and cut off down to the place where the ring is to be put on, is then covered with the ring, which unites with the growing bark, and sends out shoots of its own variety. In this manner a tree is covered with these rings, and the natural branches being cut down, all the force of the tree is expended in throwing out the shoots of the large chestnut from the grafted branches. Great care is always taken to cut off all shoots of the common chestnut that may appear near the grafted part, as they interfere with the full development of the part grafted. The operation of grafting by rings is practised in Tuscany from the 10th of April to the 1st of May, that being the time when the sap is running most freely, just before the leaves and buds come out. A method of preserving the grafting buds so that they may be good even after a year, is to place them in tin tubes filled with honey, and hermetically sealed immediately on their removal from the tree ; another method of transporting the grafting buds, is by putting them into hermetically sealed tubes filled with water ; this method can only be used for transporting the buds for distances accomplished under forty days. The chestnut produces flowers, which after the usual process of the male pollen being deposited on the ovaries of the female flower, become chestnuts or the seeds of the tree ; this change of the flower into the nut takes place about the end of July, and it is easy to foretell the crop of the year by the state of the nut germs, for although the flowers may have been abundant, fecundation may not have taken place largely, and it is only by watching the tree carefully after it has flowered, that a judgment can be formed as to whether the production will be good. The ovaries that are not fecundated by the flowers change into useless shells, but those which are fecundated become enclosed in buds containing one, two, or even three chestnuts. The nuts arrive at maturity in two months after flowering, that is to say, in October, and then fall to the ground ; they are also beaten from the trees by peasants armed with long poles, but this is only occasionally done, as it seriously injures future fruit buds, and affects the yield of the tree for another year. The chestnut is pruned and trimmed every three years, which while helping the tree to bear more abundantly, produces wood for fuel and other purposes, and the smaller twigs and branches which are dried and used later for drying the nuts. The leaves are also gathered when green and young, and pressed flat in large bundles, and are then used for putting under pats of butter, and in making a kind of cake called "necol."

The Spanish chestnut has been cultivated with more than usual care and success in the province of Lucca owing to the laws to protect it from destruction, passed by the Lucchesan Republic in the eleventh century. The chestnut is a very healthy tree ; in fact, the only disease to which it is liable is internal decay of the trunk. Cases have been known where the whole life of the tree has been carried on through the external bark while the interior was completely destroyed ; the only way to arrest this disease is by burning out the whole of the interior of the tree by a slow fire. After the nuts are gathered, which is done by picking up those which have fallen and not by beating the tree, they are deposited in huts, in the upper part of which deep trays are constructed on which the nuts are placed to the depth of six inches ; in these huts slow fires of green wood are kept up until they become hard and dry. They are then carried to the mill, where they are ground into flour, in the same manner as corn or wheat. From this flour many preparations are made such as "polenta," and various kinds of cakes, fritters, and even a heavy kind of bread. The different ways of cooking the chestnut flour are known under the popular names of "necci," "pattoni," "castagnacci," "cialdi," "fritelli," &c., and the food so made is sweet and agreeable to the taste. The country people cook the chestnuts in water and make use of this water as a medicine for chest diseases colds, and coughs, and in most cases it has proved beneficial. The food made of the chestnut which is most in favour, is the "polenta," made by simply boiling the chestnut flour in water for ten or fifteen minutes, with a little salt to flavour it, care being taken to keep up a constant movement of the paste, so that no part becomes burnt, which would thus spoil the mess ; it is eaten with cream, butter, ham, &c., and is most healthy and nutritious. Another kind of food made from the chestnut is called "necci," which is flour formed into a cake, and is made by first mixing the flour with cold water, and making cakes piled on each other, and separated by chestnut leaves, pressed for the purpose, and moistened by water, the whole mass is then cooked over a hot fire, and the cakes taken off one by one, when the leaves are almost burnt. These cakes are generally eaten with cheese, Bologna sausage, and meat. Consul Crosby states that, in these regions where the inhabitants live almost entirely on the chestnut, they are of better appearance, and as strong as those who live on what is considered more wholesome and nutritious food.—*Society of Art Journal.*

EXPERIMENTS WITH MANURES.

THE following experiments with artificial manures were tried by Mr. James Johnston, yr. of Gear, Secretary of the Orkney Agricultural Society, with the view to find out the best proportion of potash to apply to the potato and turnip crops, and also as to whether animal or mineral phosphates in a soluble or insoluble state were best. Each experiment consisted of a drill five chains long.

1st. Potatoes.

The soil, which was a light loam, got a top-dressing of farmyard dung applied to it, and ploughed in the autumn The potatoes, which were rocks were planted in April. The artificial manures were sown in drills along with the potatoes, and cost at the rate of about £2 per acre.

Rate per Acre.		Weight of Crop p. Ac. T.	C.	Q.
No. 1. 4 cwt dissolved bones	...	19	5	0
No. 2. { 2 cwt dissolved bones / 2 cwt sulphate of potash / ½ cwt „ magnesia	...	8	16	1
No. 3. { 3 cwt dissolved bones / 1 cwt sulphate of potash / ½ cwt „ magnesia	...	9	13	0
No. 4. { 3½ cwt dissolved bones / ½ cwt sulphate of potash / ½ cwt „ magnesia	...	10	6	3
No. 5. { 4 cwt dissolved bones / ½ cwt sulph. of magnesia	...	10	13	3
No. 6. 4 cwt dissolved bones	...	9	12	2

From No. 5 it would appear that the ½ cwt of magnesia had increased the crop 21 cwt, but the potatoes in this plot were smaller, and had more disease in the skin than the other plots. No. 4 was the most valuable crop, thus showing that ½ cwt. sulphate of potash was the best proportion of potash to apply.

2nd. Turnips.

The soil of part of each drill was mossy, and part was a poor clay, but the results were much the same in both soils. The turnips were yellow, and no farmyard dung was applied. The artifical manure of each plot, excepting No. 1, was applied at the rate of about £3 per acre.

Rate per Acre.		Weight of Roots p. Ac. T.	C.	Q.
No. 1. No phosphates	...	0	8	2
No. 2. 6½ cwt dissolved bones	...	15	10	2
No. 3. { 2 cwt bone meal / 2 cwt dissolved bones / 1 cwt super. of lime	...	12	11	2
No. 4. 5 cwt bone meal	...	12	15	2
No. 5. { 5 cwt ground phosphates / 86·5 per cent.	...	12	8	0
No. 6. 7½ cwt ground coprolites	...	11	14	0
No. 7. 7½ cwt super. of lime	...	14	5	0
No. 8. 5 cwt dissolved bones	...	14	10	2

With the exception of No. 2, all the plots were supplied with 1 cwt of sulphate of potash and ½ cwt sulphate of magnesia, and with the exception of Nos. 2, 4, and 8, all had ½ cwt sulphate of ammonia. The soluble phosphates were thus better than the insoluble, and the animal phosphates than the mineral phosphates.

The following, which was a continuation of the above, was tried to find out the best proportion of potash to apply to the turnip crop. No. 8 is the same as above.

Rate per Acre.		Weight of Roots p. Ac. T.	C.	Q.
No. 8. { 5 cwt dissolved bones / 1 cwt sulphate of potash	...	14	10	2
No. 9. { 4 cwt dissolved bones / 2 cwt sulphate of potash	...	13	15	0
No. 10. { 5½ cwt dissolved bones / ½ cwt sulphate of potash	...	15	6	[illegible]
No 11. 6 cwt dissolved bones	...	12	18	[illegible]
No. 12. 6 cwt dissolved bones	...	13	2	2

All but No. 12 were supplied with ½ cwt. of sulphate of magnesia, which thus appears to have been of no benefit. The best proportion of potash here, as in the potato experiments, appears to be ½ cwt per acre.—*N. B. Agriculturist.*

PHOSPHATE OF ALUMINA AS A MANURE.

IN a letter, replying to Professor Tanner, who had criticised his opinions as to the value of phosphate of alumina as a manure, Mr. John Milne, Mains of Laithers, Turriff, gives a statement of its effects as ascertained by careful experiment in Aberdeenshire, a county in which the soils are naturally very deficient in phosphates, and therefore better adapted to test their relative value than soils in many other districts.

So long ago, Mr. Milne writes, as 1872 I received samples of four different varieties of Redonda phosphate. These I got finely powered, and commenced a series of experiments on turnips, in large flower pots got for the purpose. In other pots I tried crushed bones and also superphosphate. The soil was thoroughly mixed, but, being poor in phosphates, the non-phosphate pots came to nothing. The Redonda pots were a little better, but, even when applied in large quantity, so little better that I concluded it was practically useless. The pots manured with crushed bones and also with superphosphate produced large turnips. Seeing it to be useless in the undissolved state, I made some experiments with a view to dissolve it in acid, and also tried

the effect of fusing it with soda, potash, and lime, at a red heat, but was unable to turn anything practically useful out of it.

After the experiments of the Aberdeenshire Agricultural Association in 1876, directed attention to the use of ground phosphates, one of our Aberdeen manure manufacturers bought a lot of fifty tons of ground Redonda phosphate, which he sold to farmers. From many of these I got information that it proved to tally useless to the turnip crop, neither could I get one farmer to affirm that it did any good. Few farmers are able to discriminate between one variety of phosphates and another, and the negative results obtained by the trials of Redonda phosphate had a most damaging effect upon the sale of all ground phosphates within the county the following year. This induced the Aberdeenshire Agricultural Association to test the effects of phosphate of alumina.

Experiments repeated eight times give an average increase of 3 cwt. per acre of turnips from the use of phosphate of alumina, 103 cwt from the use of curacoa phosphate. 98 cwt from the use of coprolite, and so on.

In 1879 the results on eight plots of turnips at the same stations were of a similar character.

The results of these experiments on turnips are summed up by Professor Jamieson, the Association's chemist, to be .—

That phosphate of alumina has exerted little or no influence on the crop.

That phosphate of iron has exerted little or no influence on the crop.

That phosphate of lime has exerted a decided influence on the crop.

In 1878 I conducted an extensive series of experiments on turnips with Redonda and various other kinds of phosphates, on two farms; but the soils were previously too rich in phosphates to give any definite result, although many interesting effects of combinations were brought out.

In 1879 I made a very careful experiment on turnips with phosphates, on poor light soil nearly destitute of phosphate of lime. The crop came up well, but owing to the cold season and the poor condition of the soil, the crop, although very equally planted, turned out light. The experiment was done in duplicate, and the phosphoric anhydride was applied to all the lots at the rate of 100lbs. per acre. The average results were as follows :—

	Tons.	Cwt.	Qrs.	Lbs.
No phosphate	0	6	1	21
Redonda phosphate washed by acetic acid	0	6	0	22
Redonda phosphate unwashed ...	0	9	3	8
Canadian apatite	0	8	3	16
Carolina phosphate (river) ...	2	7	2	11
Cambridge coprolities	2	9	1	21
Curacoa phosphate	2	19	3	17
Navassa Island phosphate ...	3	2	1	25
Bone ash	3	0	2	5
Lacepede guano	4	10	1	13
Coprolites ¼ soluble ¾ insoluble ...	5	8	3	13
Superphosphate	6	3	1	25
Precipitated phosphate... ...	6	11	3	1

These experiments, conducted with the greatest care to secure accuracy, are to my mind, conclusive evidence that phosphate of alumina is 'practically useless;' and I do not think I committed a very great imprudence when I asserted that in Scotland its effects are 'scarcely perceptible either to the eye or the balance.' It would be contrary to all experience to believe that its effects can be different in any other part of the kingdom. At least I shall have to hear of experiments conducted with equal care to secure accuracy, having a contrary result, before I come to alter my opinion. So far these phosphates of alumina have proved disastrous to all importers, manufacturers, and farmers who have touched them. Witness the failure of Peter Lawson & Sons, the collapse of the Alta Vela Phosphate and the Sewage Phosphate Companies; the law proceedings between importers of Redonda phosphate and manufacturers; the hundreds of tons rejected by manure manufacturers, which have been lying in Liverpool for years without a purchaser, until it is getting smuggled away in small quantities only to disappoint the farmer, and tend to bring the whole ground phosphate trade into disrepute.—*N. B. Agriculturist.*

A PEEP INTO A BEEHIVE.

LIGHT a piece of rotten wood or a roll of cotton rags and blow a few whiffs of smoke among the bees, then rap several times on the outside of the hive with a light stick, and wait a few minutes for the bees to fill themselves with honey. A very little smoke will alarm the bees, and with the drumming cause them to fill their sacs with honey. *When gorged with honey or liquid sweets, bees will not sting unless forced to do so.* Some poor chap may have failed in getting sweetened up, so, on opening the hive, the cluster may be sprinkled with sweetened water. This they consider a great treat, and by the time they have disposed of it, are as harmless as so many flies. The buzzing which they make shows that they are as good natured as a company of fat aldermen just after dispatching a roast turkey at some friend's house. The combs may be taken out and handled just as you please, and the bees brushed and scooped all out with little danger.

Three classes will be found to constitute a prosperous colony of bees during the summer season. A fertile queen, a few hundred drones, and about twenty or thirty thousand workers.

The queen is the only fully developed female in the hive. The supervision of the hive and the laying of eggs is her office. She lays during the summer season from two to three thousand eggs each day. A fertile queen is about three-fourths of an inch long, has short wings, a slim, finely tapered body, and in the common bees, is a deeper black in color than the workers. The Italian queen has no yellow bands crossing the body, but is of a golden yellow color. The cells in which queens are produced are conical in shape and resemble a peanut in appearance. They usually project downward from the edges of the combs. About sixteen days elapse from the time the egg is laid until it comes forth a perfect queen. Five days after hatching, if pleasant, the queen flies out to meet the drone and pair. After pairing, she returns to the hive and rarely leaves it during her life, unless she is accompained by a "first swarm." She lives four or five years, but is not usually very valuable after her third year. If the queen be taken from a colony during the working season, the bees are thrown into great confusion, but they soon construct queen cells, place an egg or a larva in each, supply it with royal jelly (the food for the queen larvæ) and thus cause it to be developed into a queen. Upon this one natural principle depend all of the various methods of increasing colonies by dividing them into parts and allowing each part to form a separate colony.

The drone bee is stouter and larger than either the queen or worker, and similar to the queen in color. They appear in April or May and usually disappear during August. They have no sac within their bodies for carrying honey, no pollen-baskets on their legs, and are provided with a sting, consequently they are unable to assist in the labors of the hive.

The drones are the male bees and appear in the hives about the time young queens are being reared in order to impregnate them. When they have fulfilled this office. they are then destroyed by the workers. But one drone is needed to impregnate each queen, but as bees (and nearly all winged insects) pair while on the wing and colonies in a state of Nature are isolated, many males are produced that impregation may be accomplished before the queen in roaming about, meets with any accident. Drones are produced in twenty-five days from unimpregated eggs placed in larged size cells.

The Worker Bees, well known to every one are, undeveloped females having a sac within the body for carrying honey to the hive and baskets on the hinder pair of legs for carrying pollen—the yellow-dust of flowers —which they feed to the young. Wax from which comb is built, secreted by them under the scales of the bodies. It is secreted from honey the same as animals secrete fat from the food they eat. Eighteen or twenty pounds of honey are required to produce one pound of wax, hence, if honey be taken out and the combs returned to the bees, a great saving is made. Propolis or "bee glue" is a substance gathered by the bees from the trunks of trees, and is used in stopping all crevices in the hive and in varnishing the inside surface. About twenty-one days is the time required to produce workers from the eggs. The worker cells are small and when capped do not extend beyond the surface of the comb as do the capped drone cells. During the first two weeks of their existence they work inside of the hive taking care of the brood, &c. The workers live about two or three months during the honey season, and from six to nine months at other times. As they drop off during summer, their places are supplied by others, so that a whole colony, with the exception of the queen, is changed several times in a season. This is shown by substituting for a black queen fertile Italian queen. The young bees produced will have the yellow bands, and in a short time the whole colony will be entrely changed.

A whole volume might be written about these wonderful little workers. —*American Paper.*

WONDERFUL LIGHTS IN NATURE.

WHILE prospecting on a spur of the mountains near Mesilla, New Mexico recently, one of a party of miners noticed in wrenching his pick from the loose rock a cold current of air. Another blow laid bare a cavity, and a determined assault on the broken shale soon shewed an opening or passage that led unto the rock at a downward angle of about forty-five degrees. The hole was enlarged, and found sufficient to admit a man's body. Several lighted pieces of brush were hurled in, and three of the men, steadied by a lariat held by the others, started down the tunnel under the mountain. The passage was rough and uneven, and about four feet high, and, after thirty feet, suddenly turned to the left. A candle was lit, and by its light they found twenty feet further a large hall—a hall of pillars so completely was it filled with long, delicate columns, reaching from the floor upward out of sight; They were stalactites hanging from the walls in endless variety, while from the floor rose rich stalagmites meeting them and forming figures of all conceivable shapes. Water dripped from above, showing that the work of column-making was ever going on, while a death-like chill did not add to the comfort of the surroundings. The men were about to venture into the labyrinth, when the one holding the candle slipped and dropped it. Nothing could be done but follow the lariat back, but as their eyes became accustomed to the gloom, a curious phenomenon appeared. In various parts of the cave luminous spots of light were seen. Some near them gave out fitful flashes of flame, while others seemed like moons, glowing with a peculiar pale yellow light, others again were of irregular shape, that made the darkness more apparent. Every move revealed new wonders. Oval balls of light, blazed from behind the columns, confronting them at every step, while as far as they could see, gleaming and sparkling, the mysterious lights appeared, making the cavern a realisation of the old tales of enchantment. One of the men struck at one of the growing spots, and knocked it down. Carefully taking up the object, that still glowed but gave out no heat, they felt their way into outer air, only to find that they carried an insignificant toadstool, a fungus

that lost its glow in the daylight. The subterranean plant, for such it was, is generally found in mines, and is known to science as the *Rhizomorpha subterranea*; and is allied to the edible mushroom.

Many of our native flowers, especially the yellow and bright-tinted ones, such as the sunflower, marigold, &c., have often been observed giving out minute flashes of phosphorescent light soon after sunset, while the exhibition given at times by the oriental poppy probably by the oxidation of some hydro-carbon it secretes, is extremely wonderful. Poke weed, at certain times, gleams with a rich greenish tint, and explains some of the mysterious lights that are often seen by the believers in ghosts.

A Brazilian plant, the cipo, makes a wonderful display of pyrotechnics. When bruised or cut it gives out a milky fluid that, at night blazes with light for hours. Certain tribes in the interior use it in some of their rites. A certain number of captives taken in battle are decapitated and their heads tanned by a secret process that leave them like polished leather. The eyes are replaced with peccary teeth, bending outward, while the mouth is also ornamented in a similar manner, giving the head a most ferocious appearance. The long black hair is allowed to hang loose, and the flesh around the neck is carefully drawn together, forming a socket. Into this is inserted the end of a long pole. The head is then decorated with fantastic tassels of various kinds, and a string attached to the chin. At nightfall the whole is set off with the luminous milk of the cipo. The pole is raised and planted, and the head kept moving by the wind and a liberal use of the string. Its ghostly appearance, glowing with a reddish light, would undoubtedly frighten the evil spirits, if there were any, as that is its purpose.

All who frequent the seash ore are familiar with the fiery appearance of the sea at certain times. Innumerable animals are contributing their vital forces to create the display, and in the warmer climates the water seems a mass of living flame. Every inch of its surface is alive with minute jelly-like creatures that, according to some writers, possess a peculiar secretion in glands for this purpose, and in proof of this, several of these animals were placed in clear water in a glass, which instantly became phosph orescent, the light-giving medium thrown out from the animals permeating the water in every direction. Larger jelly fish often shew this phenomenon. When at great depths they appear like great moons rising and falling. One of these creatures was observed off Nantucket of gigantic size. The finder was sculling his boat along in deep water after nightf all, and saw what appeared to be the reflection of the moon, although the moon was not up. Drawing nearer, the seeming reflection assumed the shape of an immense ball of light, while extending from it, as far as the man could see, innumerable filaments and streams of flame issued. With great undulations the ball moved, dragging its fiery tail like a veritable comet, and, reaching the surface, showed itself a gigantic medusa, the Cynea. It was more than six feet across, and, judging from the leng th of the tentacles at more than 150 feet. Mrs. Agassiz describes one even larger that she observed off the rocks at Nahant, a famous place for displays of marine phosphorescence. The waves beat against the rocks on summer nights, splashing into the caverns and leaving them dripping with dazzling scintillating drops of fire. As the rollers come in, their tips seem to ignite spontaneously. Now running along the crest, the light deepens, growing as the wave comes on, and finally seems to burst its watery bands, hurling itself on the shore in a shining mass of molten silver.

One of the most remarkable instances of phosphorescent light appearing on living creatures is found among the herons. Among the keys and the extreme end of Florida, these birds are found in countless numbers. Mullett fishermen and sportsmen have often noticed peculiar dim lights standing motionless over the water among the mangrove thickets. They were discovered, however, to depend on the presence of the birds. When they were approached in the dark, the flapping of wings as a crane flew away would be the last of the lights. The writer has examined many of the birds, especially the 'Ardea Herodias,' or great heron, and found on the breast a spot about as large as the open palm, where the feathers are covered with thick yellow powder, that is easily shaken off, and evidently exudes from the body at this spot as a secretion drying into a power when exposed to the air. The bird stands motionless in the water, and the spot is undoubtedly used for, or accomplishes the end of attracting the smaller fishes within reach of the bird; and, if it is a decoy, it is a most remarkable provision of Nature.

Many fishes are ornamented with rows of fiery spots that gleam and sparkles as they rush through the water. The so-called fireflies of tropical countries afford interesting examples of this wondeful faculty. If the luminous spot that g lows with seeming white heat is examined under a glass, it will be seen that the yellow tissue is made up evidently of fat globules that are intersected by many delicate veins or tr.ches that contain air, and the light may be explained by the union of the carbon of the fat and the oxygen of the air thus introduced, which produces a slow combustion without increase of temperature. That this is possib'e is proved by the successful experiment, within a few weeks of Mr. Kerdig, a Hungarian. He uses mineral substance in a liquid form. He pours a quantity of the fluid on his hat and calmly sets fire to it. A mass of lurid flames rises instantly almost to the ceiling, but M. Kerdig, in no wise disconcerted places his hat on his head, and waits until the flame gradually dies out. He then exhibits the hat triumphantly to the audience. It is uninjured. He next sets fire to the floor, then to his handkerchief saturated with the substance, and finally goes so far as to pour some of it into the palm of his hand and light it but the floor the hand kerchief and the hand are unharmed. The vapor of the mineral substance possesses considerable expansive force, so that in reality it is the vapor which burns and not the liquid. This may explain the curious lights that are frequently seen floating over the sea especially near Block Island, and considered phantom ships by many of the superstitious islander. Such lights are undoubtedly caused by the gases arising from the millions of mossbunkers that are found there in schools, the gas becoming luminous at times when coming in contact with the oxygen of the outer air.

It has been observed that the lights when abdominal as in our firefly are involuntary while in those insects that show thoracic gleams, its appearance seems subject to the will of the animal. An interesting case of the latter is seen in the 'cucujo' or pyrophorus of the West Indies, a beetle two inches long. The light issues from two oval spots on each side of the thorax, or fore part of the body, and when at rest the spot gleams with arid yellow glow, but when in the air it assumes a dark red appearance, and with thousands of them flying through the air the sight is extremely beautiful. The writer recently secured a beetle of the genus elater through the mail from Cuba, and after its long voyage it had lost none of its power. The light was so powerful that it cast a shadow on the wall at a short distance and when placed on a hook and irritated it could be read from the light although, of course disconnectedly. A dozen confined in a glass would give ample light for reading. Ladies use them as decoractions for the hair in southern countries, the bright gleams of red, blue, and yellow being exceedingly effective.—*New York Paper.*

THE POTATO DISEASE: ITS NATURE AND ORIGIN—CAN IT BE CURED?

THIS was the text of a discussion opened by Mr. G. H. Stevens of Gullane, at the meeting of the Haddington Farmers' Club last Friday; and my reason for offering a few observations on the subject is, that I notice he has fallen into the once popular error of supposing the potato disease to be caused by an insect. He goes on to say that it was "ent omological, an insect destroying the plant," and further, that he was "supported by such men as Pr ofessor Tyndal and Professor Huxley. I was not aware that those eniment savants took this view of the potato disease. I know that, more than thirty years ago, Mr. Alfred Smee, then Surgeon to the Bank of England, attained to fame by publishing an article in the *Illustrated London News*, proving, to his own satisfaction, and thousands besides, that the disease was caused by an insect, and giving an engraving of potato shaws with magnified insects on them. Such interest did the matter excite, that 50,000 extra copies of the paper were sold that week. The name he gave the insect was "Aphis devastator." Yet he was quite wrong, as Mr. Stevens is now. No doubt he found a potato leaf with aphis on it, as he might have found them on a rose leaf, or any other leaf.

Such mistakes would be of little importance were it not that if they are accepted, they lead in the wrong direction in search of a remedy; and the potato crop is of such vast importance to the nation that no opportunity should be lost of arriving at correct conclusions—first, as to what the disease is; second, as to the mode of its attack and development; and lastly, the direction in which a remedy must be sought for its amelioration, if not its complete prevention, which latter, I fear, is beyond the power of man.

In the first place, then, let me say that the potato disease is a parasitic fungus, a vegetable and not an insect, as has been proved over and over again—as, for instance, by Mr. Worthington Smith, who has exhausted the subject from this point of view. It has the habits of fungi of other descriptions with which gardeners especially are familiar. Take, for instance, the mushroom. This fungus has what may be termed its resting spore, which, if kept cool and dry, will remain quiescent for years, but when placed in soil of suitable texture and warmth, it "runs," as the gardeners describe it; but even then, the full development of the plant does not take place unless the soil is watered and the temperature of the house is, as to heat, and especially moisture, considerable when mushrooms appear in a night as if by magic. Now mark the mode of attack of the potato disease. The resting spores being in the soil enter the potato through the spungioles of the roots, say in June, and they "run" in the interior of the cellular tissues of the plant, but remain quiescent till warm showers lead to their rapid development in July or August; and we find black spots on the leaves generally first, but also we find destruction of the tissues of the tuber going on at the same time. This is caused by the full development of this mysterious plant, the potato fungus. It can be seen by a microscope fully developed on the back of the leaf as well as in the po'ato. I have myself checked its progress on the back of an individual leaf by the application of sulphur; but it is not practicable to apply such a remedy to any considerable number of plants, and if it were, it would not check the ravages of the disease in the tuber. Its habits are also exactly the same as the vine mildew, and what is called dry rot, which is nothing else than the ravages of a fungus that makes rapid strides in growth when it is favoured by being subject to a stagnant, warm, and moist atmosphere.

I now come to the last head I proposed—*viz.*, to indicate the direction in which amelioration may be looked for. I am of opinion that nothing that man can do will effect a complete cure. The spores may die out as mysteriously as they made their appearance, something the same as the vine mildew has done in this country under a more rational system of vine culture. Thirty-five years ago the vine mildew was rampant in hundreds of vineries in the neighbourhood of London. The practice then was to syringe the vines with cold water every evening during their growth, till the fruit began to colour. When the houses were shut up in the evening, they had an excessively damp atmosphere. When this treatment was reversed, and no water applied to the vines after their buds burst, as is now the practice of the best cultivators, the vine mildew disappeared almost, but not entirely. A return to the old system of management would bring it into full vigour at any time. Here, then, I think there is a lesson anent the potato disease. We cannot prevent the rains falling on the potato fields, as we can in the case of the vines; but we can plant them on well-dried land, and, as plenty of ventilation was found to check the vine mildew, we can plant them on airy, open, well-exposed fields, away from woods or high hedges, and especially much wider apart from drill to drill, as well as from plant to plant, than is at present the custom; for I am certain that, next to bright dry weather in July and August, nothing checks the disease more than plenty of air. I have seen the shaws of diseased potatoes being ploughed into the land which is just spawning the soil, to be ready to produce another crop of the disease whenever potatoes are planted on it. They should invariably be burned. Sulphur, when it can be applied to the smaller class of fungi, as it can to that of the vine leaf, is rapidly fatal to them; but how to apply it to the potato is another question. Some writers advise that the moment the disease makes its appearance, the tops should be cut off. This is utter folly; the disease is already in the tuber as well as in the shaws, and will run its course. The best plan to adopt is to let them alone till the disease has run its course, which is generally by the time the cold weather of October sets in, when they can be separated, the diseased from the sound, at once. They should afterwards be kept cool and dry, under which conditions the disease can make no further progress, for a certain temperature is necessary for its development.

The disease that is at present decimating the French and other vineyards is not a fungus but an insect—the *Phylloxera vastatrix*—a disease that might have been coped with successfully, had the Government of France acted on the suggestions of practical men in this country, made to it fifteen years ago. It is now too late. The potato disease is from its very nature less under man's influence.—*W. T. in Scotsman.*

OUDH TALUKDARS' AGRICULTURAL MEETING, 1881.

THIS is an account of the first of an intended annual series of meetings to be held at Lucknow, under the auspices of the talukdars, with the view of promoting the interests of agriculture introducing improved methods of cultivation, and developing the economic resources of the province. It had been intended that the first meeting should be held in the spring of 1880, but, owing to causes which could not be foreseen, it was found necessary to postpone it till the following year.

2. All the arrangements connected with the meeting were made by a committee of management, consisting of 16 members, 15 of whom were native gentlemen. The committee met publicly on each day of the exhibition for the discussion of various subjects of interest, among which were:—The possibility of the extension of irrigation by the action of the talukdars or of the Government, or of both, and the means by which such extension could be effected: the feasibility of improving the breed of cattle and the means by which this object could be best attained: the improvement of ploughs, the advantages of thin sowing, and the extension of arboriculture.

Papers on these and cognate subjects were read by various gentlemen, European and native; and the proceedings (which were conducted entirely in the vernacular) were watched with intelligence and interest by a large number of persons chiefly those interested in the land.

3. The exhibition comprised the following classes:—

(1) Cattle.

(2) Agricultural implements.

(3) Grain and other agricultural products.

(4) Arts and manufactures.

4. Prizes and medals were awarded to the successful exhibitors, after careful inquiry and comparison by selected judges. The expenses incurred in connection with the meeting amounted to Rs. 11,039; the amount being met by a Government grant of Rs. 3,000 by Rs. 6,000 realised as subscriptions from the Talukdars and others, and by the sale of tickets.

5. The Lieutenant-Governor and Chief Commissioner congratulates the Talukdars of Oudh on the results of this their first agricultural and industrial meeting. A satisfactory beginning has been made in starting a series of such meetings, which it is hoped may be instrumental in effecting a permanent improvement in the agriculture and general industry of the province. The valuable information contained in the papers read on this occasion and the free and intelligent discussion of the subjects which followed can hardly fail, his honor thinks, to be of use in exciting an interest in agricultural and economic subjects, which has hitherto been but imperfectly manifested.

Sir George Couper trusts that these meetings will now be of yearly occurrence; and that the Association will be able in future to fulfil its purpose in regard to them without any direct aid from Government beyond the recognised subsidy for cattle-prizes. What his Honor wants to see the talukdars of Oudh taking a direct and personal interest in the matter; profiting by the information gained; practising the agricultural improvements brought to their notice; and thus helping on the economic progress of the province.

RESOLVED.—That these remarks be communicated to the Secretary to the Oudh Talukdars' Agricultural Meetings, for the information of the Talukdars; and that a copy of this Resolution be published in the *Gazette.*

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The Monthly General Meeting was held on Thursday, the 21st April, 1881.

W. H. COGSWELL, ESQ., *President, in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected Members:

The Manager, Rajmai Tea Estate, Assam; Col. A. W. Twiss, Messrs. O. G. R. McWilliam and E. A. Roussac.

The names of the following gentlemen were submitted as desirous of joining the Society:—

A. H. Collins, Esq., C.S., Assistant Commissioner, Hazareebagh,—proposed by Mr. F. Wilcox, seconded by Mr. H. A. Firth.

T. C. Pande, Rajah of Pakour,—proposed by the Secretary, seconded by Baboo P. C. Mitra.

W. Innes, Esq., Deputy Traffic Superintended, E. B. Railway,—proposed by Mr. W. H. Cogswell, seconded by Mr. W. Stalkartt.

Alfred Bridge, Esq., Calcutta,—proposed by Mr. R. M. Daly, seconded by the Secretary.

Lieut.-General Dhoje Nursingha Rana Bahadoor, Nepal,—proposed by the Secretary, seconded by Baboo P. C. Mitra.

J. A. Anderson, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by M. W. Pigott.

T. S. Anderson, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by Mr. Pigott.

The Secretary, Public Garden, Baugulpore,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

H. E. M. James, Esq., Bombay Civil Service,—proposed by D. R. Lyall, seconded by Mr. A Wilson.

James Paterson, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by Mr. Stalkart.

T. H. Kerswill, Esq., Khoreel Tea Garden, Cachar,—proposed by Mr. W. Aitchinson, seconded by the Secretary.

Rejoined.—W. C. Plowden, Esq., C.S., Simla.

CONTRIBUTIONS.

1. Report on the Government Botanical Gardens, Saharunpore, 31st March, 1880. From the Superintendent.

2. Transactions Asiatic Society of Japan, Vol. IX. Part 1. From the Society.

3. Proceedings Asiatic Society of Bengal, for February, 1881. From the Society.

4. Proceedings Agri.-Horticultural Society of Madras for March, 1881. From the Society.

5. Memoirs, Vol. VI. and Proceedings Vols. 16 to 19 of the Literary and Philosophical Society of Manchester. From the Society.

6. Catalogue of Plants in the Royal Botanic Garden, Mauritius. From the Director.

7. The Tea Cyclopædia. From the Editor.

8. Seeds of Amherstia nobilis from Moulmein. From Major R. W. Fanshawe.

9. Seeds of Cupressus of three kinds, from the Botanic Garden, Saharunpore. From the Superintendent.

10. Seed of *panicum spectabile*. From the Agri-Horticultural Society of Madras.

11. Seed of Bamia cotton, and a specimen of the cotton. From W. F. Westfield, Esq.

Mr. Westfield mentions that this cotton (9 tolas) and seed (26 tolas) is the produce of one plant grown in a large pot on the terrace of his house; the plant is two year's old. The cotton is pronounced equal to ordinary Egyptian. The seed had germinated freely in the Society's Garden.

Mr. R. B. West sent for exhibition a healthy well grown plant, in full flower of *Hæmanthus cinnabarinus* a new variety, introduced in England in 1879.

GARDEN.

The Superintendent's report was submitted. The following are extracts:—

The weather has been very trying and the garden labour has been fully occupied in artificial watering but the showers of the 14th, 15th, and 19th current, released the men for other urgent work. Begonias and other delicate plants have suffered much from the heat.

The manure presented by Mr. H. A. Firth is leaf mould strongly ammoniated. The bed to the south of west tank, mentioned in preceding report as the spot were some imported Rose plants had been planted out was freely manured with it; the first effect was to produce a minute insect which almost destroyed all the leaves, but in a very short time the insects disappeared, and the plants have the healthiest appearance in the garden. Mr. Firth has also presented to the garden 15 Stephanotis floribunda and a quantity of Combretum seed; this latter will be reported on hereafter.

On the morning of the 19th instant, the plot of ground on which tomatoes were grown, was ploughed up by Mr. Stalkartt's plough, the ground was rather stiff, the last fall of rain having been on the night of the 15th instant; the furrow was 5 inches deep by 14 inches wide, the ploughman and bullocks working with ease, and without any special strain. I prefer this to any of the other ploughs that I have yet tried in the garden, as from its peculiar construction and operation, the entire ground passed over is disintegrated, and has also the advantage of being adapted to different size bullocks. The cost seems rather too high for the ordinary agriculturist. Mr. Stalkartt says this can be modified, so as to bring it within their means.

The demand for fruit grafts appears to be increasing and I would recommend preparation being made in time for grafting operations on a large scale.

The present system of drainage is defective, and as opportunity offers will be improved, so as to augment the tank supply. Caladiums have sprouted, and are now making a fine show. Out of the lot of Rose plants received from Mr. Bull on the 26th ultimo, 92 are doing well, 28 are likely to recover, 82 dead. There is very little else for special report, but I take this opportunity to allude to the following donations to the garden :—

Phalænopsis, several varieties presented to the garden some time since by Col. W. M. Lees, have been transplanted from their original boards, where they were rather too thick, and have given quite a gay appearance to the temporary Orchid House, as the flowering has been constant and abundant.

Avocado Pear seeds presented by Col. Lees; germination very fair, and plants doing well.

White Pumplenose seed presented by Mr. C. E. Blechynden; germination good, plants doing well.

Mignionette seed, presented by the Secretary; splendid germination, and large quantity of seeds collected from plants.

Several varieties of acclimatized flower seeds, presented by Col. H. R. Wintle, results good, both as to decorating the garden while in flower and out-turn of seed.

Mignionette seed presented by Mr T. M. Francis; results in flower and seed admirable.

From Mr. W. Galiffe, 2lbs. Arabian Coffee seeds; germination capital, plants are very healthy and ready for issue, these plants seem admirably adapted to the climate of Bengal.

Musa seed from Herbert River and *Cassia magnifolia* germination very fair, and plants are likely to thrive. Presented by Mr. A. L. Bernays. Several varieties of *eucalypti* seed contributed by the same gentleman, none of these have germinated yet. I may observe that some time since, I noticed a plant of *Eucalytus globulus* at the Entally Orphanage some eight feet high as well grown as any I have seen in Australia. I mention this as I believe they have not been found to succeed in Bengal. Five varieties of Maize presented by Mr. C. Girdlestone from Nepal have germinated and will be planted out shortly.

Nurma Cotton seeds presented by Capt. Pogson have germinated very well, and will be further reported on hereafter.

Amherstia nobilis seed presented by Major Fanshawe. None have germinated for reasons already given in previous garden report in May 1880, but I think another attempt should be made to propagate this very handsome plant by seed, and with the next lot received a different treatment than has hitherto been observed, will be tried.

Bamia Cotton seed presented by Mr. W. F. Westfield has germinated well, will be planted out and reported on hereafter.

Layering of Rose plants begun this day.

PARTICULARS REGARDING THE SIRGOOJA OR RAMTIL.

The Secretary placed on the table a copy of the *Calcutta Gazette* of the 13th April, containing an account of the "cultivation of the Sirgooja plant in the Nuddea district." This plant is said "not to be an indigenous product of the Nuddea or any adjacent district, but is reported to have been brought originally from Chota Nagpore, where it is said to be in extensive cultivation." It was introduced into the Nuddea district about 30 years ago.

The subject of this oil-yielding plant has attracted the attention of the Society of various times during the past 30 years. It was first brought to notice by a then Member (Mr. T. M. Robinson) in 1849, when resident at Ranchi. Mr. Robinson sent a specimen of the seed, and stated that its oil is used for food by the poorer classes all over Chota Nagpore, who raise it in large quantities for this purpose. He thought that this seed would yield more oil than an equal quantity of any other he had seen, owing to the extreme slightness of its skin.

This seed at the time alluded to was produced in Burdwan, and also in Beerbhoom, Midnapore, and other districts of Bengal, where it is employed for the same purposes as in Chota Nagpore. Colonel Sykes had previously reported the plant to be cultivated also on the other side of India, though under another name "karleh," (*An account of the cultivated oil and cordage plants of Dekhen*). Experiments were made by Mr. E. Solly with this and other Indian oil-seeds some thirty years ago, which shewed that it yielded about 35 per cent. of oil or 10 per cent. less than Til-seed (*Sesamum orientale*), known in commerce as the gingelie oil.

This seed is identical with the Niger seed of commerce, and is largely imported into England under that name from the Western Coast of Africa. It is also exported from Calcutta, but being included with several other oil-seeds it is difficult to say the quantity that has been recently shipped.

It was subsequently reported to the Society, that the Sirgooja cake was unfit for cattle feeding owing to its horny excrescence, and could only be used for manure. This has, however, been since overcome, for it has been so excoriated that cattle can be fed on it without causing any injury.

The Sirgooja or Ramtil is the *Verbesina sativa* Roxb: *Ramtilla oleifera*, Wight: *Guizotia Abyssinica*, Cass.

The original sample presented by Mr. Robinson in 1849 was placed on the table, as also a sample of the oil presented by Baboo Peary Chand Mittra in 1852.

The export of Sirgooja seed is trifling as compared with other well known oil seeds, such as Lin, Poppy, Rape, Til, and Castor. The export from all parts of India of these seeds during the official year 1880-81 may be valued at about six millions sterling. It would be very desirable if a large proportion of this seed could be converted locally into oil and exported in that shape, seeing how much would be saved in freight. Moreover, the refuse for manure and cattle food would be most valuable, especially for the latter purpose, when so many thousands annually die from want of nourishment.

THE CURATIVE PROPERTIES OF EUPHORBIA PILULIFERA.

The Secretary next read the following note by Mr. P. Doyle, C.E., dated from Queensland, 12th February :—

Euphorbia pilulifera is the botanical name of a plant occupying public attention at present in the Colony as a specific for diseases of the chest. The plant is only known by its scientific appellative. For technical description, see *Flour Australiensis*, Bentham and Mucker, page 51. It is a very common tropical weed, procurable in India and Burmah. Once seen, it is easily distinguishable from other plants. When broken the stem yields a white viscid liquid, very acid in taste, possessing strong emetic and corrosive properties. The Euphorbia family has a great many varieties. Some grow in Europe, but it is only in tropical regions that the poisonous varities are found. The plant referred to has in some cases a bronzed appearance, nearly resembling "pig-weed," but not having the fleshy leaf of that plant. Its seeds are in small knobs close to the stem. The decoction has not only been found efficacious in pulmonary affections, but its curative properties extend to other disorders. Being a poisonous plant, it should be used with caution.

NOTICE RESPECTING GOSSYPIUM ARBOREUM OR TREE COTTON OF THE DECCAN.

The paper next submitted was from Capt. J. F. Pogson, on the above subject.

By this post, I have sent to your address, for valuation, and subsequent submission to the President and Council of the Agri.-Horticultural Society, a sample of seeded cotton wool, of the "*G. Arboreum*," raised at Saharanpore, in the Government Botanical Gardens, under the Superintendent, Mr. J. F. Duthie, F.L.S.

I have ever since 1869-70-71, advocated the introduction and cultivation of this valuable cotton producer, and in 1871, whilst at Kussowlee you were so good as to send me a supply of the seed, obtained from the Deccan.

I am not quite certain but to the best of my recollection I sent a portion to the Officer then in charge of the Saharanpore Botanical Gardens, and with whom I had been in correspondence on the subject of grafting the "Ficus elastica," on the "*Banyan*," tree or "Ficus Indica," (I sent some of the seed to two friends residing in Umballa, but I never heard of the result of their trial), and it is by no means improbable that the cotton now sent, is derived from trees raised from the seed alluded to.

The fact, that the cotton tree of the Deccan will grow in Upper India having been undeniably established, I think the ventilation of the subject, through the Proceedings of the Agricultural and Horticultural Society, will have a most benificial effect, and lead to its general introduction into the Doon, and all places, where sugarcane is known to flourish in the N.-W. Provinces.

In the Punjab, I am certain, that if properly introduced under official sanction, the cultivation of the "Gossypium arboreum," would be found a very profitable undertaking.

I would suggest, the "Chunga Munga," Fuel Plantation, as a good locality for forming a Government Cotton Tree Plantation and Nursery for the distribution of plants to all applicants.

The seeds sown in beds, would soon yield an ample supply of seedlings, and these when sufficiently advanced, could be planted out in all directions, where space could be found between growing trees. The transplanting operations if carried out during the rains, would meet with success, and thereafter the plants would soon be able to take care of themselves, for this cotton being a sunplant, will not need irrigation after being once fairly established, and as it will bear cotton wool pods, within twelve months, and yield them for nine months out of the twelve and do so year by year for twenty years, every thing is in favor of its introduction. As "kunker" which will yield lime, (chunam), when burned, is procurable in most parts of the Punjab, it should be used as a mineral manure for the Gossypium arboreum seedlings. The "kunker," should be reduced to coarse powder, (without being calcined), and two seers of it should be mixed with the soil, excavated for putting down a seedling. Thus one maund of "kunker" powder would be needed for every twenty Gossypium arboreum seedlings, and this manuring should keep the tree well supplied with carbon for at least ten years, when a fresh supply might be applied and dug in. The yield of cotton wool would very soon cover all outlay for preparing the excavations for seedlings and "kunker" manuring, and thereafter 75 per cent. of the produce might be put down to profit, and 25 to cost of collection, packing, cleaning, and transit. As the plantation is preserved, and is well stocked with game, hares may be present in numbers, and if so, thorn bushes will have to be put around each seedling till sufficiently grown. This will keep off deer, and antelope as well.

I do not think the Officers of the Forest Department would object to the introduction of the G. arboreum, and it would go far to make the Fuel Plantations more than self-supporting. I would recommend the utilization of convict labor for digging the holes, and pounding the "kunker," so that the actual outlay would be very trifling.

To private parties, being landed proprietors, I would recommend the regular formation of "Gossypium arboreum," plantations, one hundred and sixty trees being allowed to each acre. When the trees are sixty feet in height, the land between them should be ploughed, and manured preparatory to being sewn, or planted with ground nuts, *i.e.* "*Chena Boodum*," or "*Moong Phullee*." (Arachis hypogea) and I venture to predict, that if "kunker" dust, or any sort of limestone reduced to powder, be freely used as a mineral manure, that heavy crops of cotton, wool, and ground nuts will annually be secured.

In conclusion I would wish to mention that from March 1879 to present date (March 1881,) I have regularly used limestone reduced to powder, as a mineral manure for vegetables, and fruit trees, and have

found it most valuable. In the spring of 1879, I put down a seedling flat, or China Peach, about 3½ feet in height, it is now nearly twelve feet in height, and well supplied with flowers. This year's growth has yet to commence.

I used a soft limestone rich in fossil shells as a manure and with it was mixed calcined bones reduced to powder and moistened with water holding saltpetre in solution. Peaches are rapid growers, but as the other five seedlings, (I had the sixth given to me,) are nowhere in comparison, the growth is beyond doubt due to the lime-powder. The stone was not fired.

The Secretary stated that a few particulars regarding this fine description of cotton were communicated to the Society many years ago (1842) by the then Agent to the Governor-General in Bundelcund. The seed received from Capt. Pogson has germinated most freely in the Society's garden (see Superintendent's report above) and will be carefully attended to.

It was agreed that a copy of Capt. Pogson's paper be sent to Dr. Brandis, Inspector-General of Forests.

REMEDY FOR CATTLE-DISEASE.

Letters were read—

From Messrs. Octavius Steel & Co. apply for seed of the Potentilla, the leaves of which are stated to be a remedy in certain diseases of cattle (see Mr. Lennox's paper in recently published Number of the Journal Vol. vi. Part 3).

From P. DeLaval Lennox, Esq., of which the following is an extract:—

"Yours of 9th instant. I have begun collecting Potentilla leaves for drying. I suspect I shall be at least a week collecting enough for a 5 lb. packet, having only my son to put on the work. Every available Aryan is "on leaf" in the Tea Plantation. though sorry any one's cattle should be afflicted, for *myself*, I am glad there is a Tea Garden with virulent cattle-disease on it, where the efficacy of the Potentilla may be fairly tried, and I hope fervently that it will be found a real cure.

It is heart-breaking work having to do with natives, especially Hindus, in such a matter as cattle-disease. One will not tell another the medicine for fear of destroying its efficacy on his own cattle while ill. Another whose cattle have been (so it is told to me cured, does not care one iota whether his neighbour's cattle live or die. As cattle and persons residing with them at the time of the disease being ascertained to exist there are put into strict quarantine within the particular homestead. Brethren or relatives outside, must either remain far outside, or submit to quarantine along with the rest if he goes near the place to talk with his people. No one will report the disease for fear his own cattle will fall ill though mentioning its name. Each man will tell the *sahib* that the medicine worked wonders, and tell his own people that the recovery of the cattle was not due to the *sahib's* medicine, but to some holy water or "muntra" or "Jhup Sup" of his Gooroo or says "it will live or die according to fate" and so forth, till one feels utterly uncertain. Even Tehsildars go on the principle "it is necessary to send replies according as it may seem desirable to the district or zillah officer."

The Palampur Tehsildar tells me that lately the Potentilla has been effecting many cures up in Kulu, so its Tehsildar reports.

The Palampur Tehsildar says also that the Potentilla has really affected wonderful cures to his personal knowledge. I asked him to tell me the real truth without fear or favor as he could get neither promotion or reduction from one who is only a Tea Planter, and I think he did speak the truth, and I know does try to get the people to use this remedy by all the persuation in his power: but your Tea Garden applicant will, I feel sure, give an unbiased report, whether effective or the reverse. All I want is the real fact so that if it is good I may be able to work stronger in its favour and if non-efficacious avoid making a fool of myself and other about it.

I am to-day despatching about 1¼ oz. of Potentilla seed, not the wild edible strawberry, to you by to-day's post, and if they germinate and grow shall esteem it a great favor if you will let me know the classification and nomenclature of the plant so that in writing about it its identification will be certain.

From Captain Pogson, in reference to the following:—"At page 160 of Vol. vi. Part iii. of the Journal"—writes Captain Pogson—"there appears the following from Mr. F. Tucker, Assistant Commissioner. "I on the same date sent one (a special) to the Mundi Rajah, from whom the Sukeyt Rajah had been asking what is this:—"*Ishtawurbhu-ri-Darai.*" This long word is only Paharee corruption of the English word "Strawberry" and a note to this effect would be useful in the next proceedings. We have two kinds of strawberry growing wild. The Alpine, on Huttoo and Narkunda, and the common wood strawberry, all over the jungle."

MONSTER PUMPKIN OF SOUTH AMERICA.

Read another letter from Captain Pogson in reference to the large pumpkin of which he sent seeds last year and which were distributed but of which, unfortunately, no record was kept. "I should be much obliged" writes Captain Pogson—"if you would insert a short paragraph in the next proceedings on the subject of the "maha kuddoo," and as I am much in need of some of the seed grown last year, it might thus be forthcoming."

MINERALOGY.

THEY are beginning work in right earnest now in connection with the Wynaad gold-fields. Mr. Brough Smyth was a passenger from Australia, with two assistants he brought out with him, by the last mail steamer; and both the *Cathay* and the *Hydaspes* brought out a lot of heavy quartz crushing machinery, which have been sent on overland from Bombay. The question of a payable gold-field will now probably soon be decided.

THE report of the Directors of the Wynaad Gold Mining Company for the quarter ending 31st March is written in a very hopeful strain. One piece of good fortune is that, whereas the Company purchased an estate estimated to contain about 1,000 acres, it turns out, on survey, to contain 1,614 acres. There is reason to believe that the whole of this property is auriferous. Some inquiries that were necessary as to the validity of the title which the vendors could give have delayed the completion of the purchase, and therefore, the commencement of actual mining operations, but the Directors are satisfied as to the strength of the title, and the Company will soon be fully at work. The estates bordering on the Hump estate, and containing reefs which run into it, have been proved to be highly auriferous, and the shareholders of the Company appear to have good reason to take a sanguine view of their prospect.

ACCORDING to figures furnished by the American Mint, the mines of the United States have produced during the last seven years about £56,000,000 of gold and £54,300,000 of silver, an average production during that period of £8,000,000 of gold and £7,750,000 of silver per annum. About 95½ per cent. of the silver found its way to the mints and assay offices to be converted into coin or bars. The Director of the Mint, from a careful consideration of all the data at his command, estimates that the amount of domestic bullion used in the arts and manufactures during the last fiscal year was about £1,100,000 of gold and £800,000 of silver, and that the total consumption in all forms was about £2,000,000 in gold and £1,000,000 in silver.

THE quantity of silver which has been extracted in England from the pyrites imported from Spain, has been 18,000 ounces, and of gold about 700 ounces. A new industry has thus arisen from a product which no one suspected a few years ago to have any merchantable value. We receive the largest quantity of pyrites imported (about 450,000 tons) from Spain and Portugal. This crude ore reaches a value of over £1,000,000, and from the burnt ore, sulphur, copper, and oxide of iron or rouge is obtained.

THE prospectuses of seventeen Gold-mining Companies were issued in London during the quarter ending the 31st ultimo, The proposed capital amounts to £1,362,000 in £1 shares. The names and amount of issue of the Companies are as follow:—

Akankoo ...	£67 000	Indian Trevelyan ...	£60 000
California ...	87 000	La Concepcion ...	75 000
Carta Para ...	50,000	Madras ...	80,000
Cherambadi Dit ...	50,000	Needlerock Este. ...	58,000
Asn. of Canada ...	250,000	North Ooregum ...	40,000
Great S. Mysore ...	39 000	Organoz G. Mines ...	15,000
Guayana ...	250 000	Quartz Hill ...	105 000
Haven ...	50 000	Tambracherry ...	55,000
Hoover Hill ...	40,000		

IN his recent inaugural address as President of the Society of Engineers, Mr. Horsley said that the modern saving in coal in pig-iron making in the foundry, and the enormous saving of fuel in steel-making, is to a great extent the cause of the increasing surplus of coal throughout the country. Mr. Hunt's figures show that the average quantity of coal consumed has declined since 1871 to the extent of 16 cwt per ton of pig-iron made in the United Kingdom. As the annual make of pig is almost 6,000,000 tons, the total economy is about 4,800,000 tons per annum. Another saving occurs in the manufacture of steel rails by the Bessemer process, the quantity of coal required to produce a ton of such rails being generally admitted to be 65 per cent. less than that required for iron rails. The annual production of steel rails is about 650,000 tons, so that we have a reduced consumption of fuel of about 1,166,500 tons as compared with iron rails. There are also other departments of iron-making in which the consumption of solid fuel has been greatly reduced of late years by the use of the waste gases from the furnace, as well as by improved methods of working. This is what we want. Now that consumption has reached such a point in relation to supply, that coal owners are seriously attempting to bring coal to the surface, from a depth, that, fifty years ago, would have been considered madness. Coal as a rule has been such a cheap fuel, that even in this age of Mechanical ingenuity, very little has been done by way of inventing fuel saving appliances. It is, however, high time that something should be done, and judging from past experience, we do not suppose much will be done, till legislation enactment makes the consuming of smoke compulsory.

A VERY remarkable deposit of pretroleum is described by the American Consular Agent at Maracaibo as existing between the Rio Tara and Zulia. Near the former there rises a sand-bank about 35 yards in extent, and some ten yards in height. On its surface is visible a collection of cylindrical holes, apparently artificially made and of different diameters, through which streams of petroleum, mixed with boiling water, gush out with great violence, accompanied with a noise as though two or three steamers were blowing off steam. The column of vapour that ascends from

it would doubtless be seen from a long distance were it not shrouded by the thick forest, to which the petroleum beds that evidently lie underneath give a perpetual greenness and freshness of foliage. A curious phenomenon has been occasionally seen in Venezuela ever since the conquest, consisting of a frequent lightning without any explosion, which is observable from the bar at the entrance of the Lake of Maracaibo, close to the Island of Bajoseco, and which Colonel Coduzzi, in his geography, attributes to the vapour ascending from the Cienega de Agua Caliente. This appearance, called by mariners "El farol de Maracaibo," is more probably due to the inflammable gas that permeates the whole district to such an extent that it is known by the natives as El Inferno. The substitution of petroleum of coal as a steam raiser, is now on its trial, and scientific men are not without hope that the liquid form of petroleum, and its more concentrated power, will soon be turned to account in this direction.

PETROLEUM IN VENEZUELA.

A REMARKABLE deposit of petroleum is described by the American Consular Agent at Maracaibo as existing between the Rio Tara and Zulia. Near the former, there rises a sand-bank about 35 yards in extent and some 10 yards in height. On its surface is visible a collection of cylindrical holes, apparently artificially made, and of different diameters, through which streams of petroleum, mixed with boiling water, gush out with great violence, accompained with a noise as though two or three steamers were blowing off steam. The column of vapour that ascends from it would doubtless be seen from a long distance, were it not shrouded by the thick forest to which the petroleum beds that evidently lie underneath give a perpetual greenness and freshness of foliage. Dr. M'Gregor states that from one of these holes, notwithstanding the difficulties of the position, he filled, in 42 seconds, a vessel containing 15 bottles, or as fast as four gallons per minute, or 240 gallons per hour, or 5,700 gallons during the 24 hours. A curious phenomenon has been occasionally seen in Venezuela ever since the conquest, consisting of a frequent lightning, without any explosion, which is observable from the bar at the entrance of the Lake of Maracaibo, close to the island of Bajoseco, and which Colonel Codazzi, in his geography, attributes to the vapour ascending from the Cienega de Agua Caliente. This appearance, called by mariners, "El sarol de Maracaibo," is more probably due to the inflammable gas that permeates the whole district to such an extent that it is known by the natives as El Inferno. There is no doubt that the supply of petroleum is very abundant not only here but in the neighbouring Republic of Columbia, where, between Escuque and Bettijoque, the labourers gather it up in handkerchiefs, which, when saturated, are squeezed out into barrels.—*Times.*

MARBLE QUARRIES OF ALGERIA.

THIRTY-FOUR kilometres north-east of Oran, on the high road to Arzeu and Mostaganem, is the small village of Mefessour; a branch road to the north-west leads to the still smaller village of Klober. Above this rises the imposing mountain called Djubel Orousse, generally called "Montagne Grise" from its arid, grey appearance. The chain of hills, the highest point of which is about 2,000 feet above the sea, stretches in a north-easterly direction from Cape Aiguille to Cape Carbon, and includes Cape Ferrat. The central part of the range forms an elevated plateau almost perfectly level, with a superficies of 1,500 or 2,000 acres, it has hardly any soil or vegetation, nothing, in fact, to hide, as Consul Playfair states in his last report, "that it is an uninterrupted mass of marble and breccia, the largest and finest, probably, that the world contains." Consul Playfair gives it as his opinion that, not even in the Mosque of Cordova, which, as regards marble columns, is an epitome of all the finest Roman and Greek temples, is marble of greater beauty or variety to be found, and, as far as quantity is concerned, there is as much as in all France and Italy together, not excepting the mountains of Carrara. The discovery is due to a Signor del Monte, who was also fortunate enough to discover the well-known quarries of alabaster, called "Algerian onyx," at Ain Tekbulet, near Tlemcen. He purchased them from the Arabs for a mere trifle, at a time when the country was still unsubdued, and when no one could approach them without danger to his life. He has now obtained a concession of the "Montagne Grise," for a long period of years, and on very favorable terms. The area is about 1,500 or 2,000 acres only, but he has also obtained all the land round about in which there is any chance of marble being found, amounting, in all, to 14,410 acres, so as to avoid the possibility of competition. The whole of this area is an uninterrupted mass of marble and breccia, which only requires to be detached and carried away; roads have been made in every direction, so that there is no practical difficulty in doing either. All over the surface of the elevated plateau may be seen circular depressions marking the sites of Roman quarries, and these, to a great extent, indicate the position of the different varieties. The soil, where any exists, is of a deep red colour containing small particles of iron ore; mines of the same mineral exist in some places, and have been worked, but there is not a sufficient quantity of the mineral to make this remunerative. The ore has already served its purpose—a much more important one—by imparting an infinite variety of rich tints to the marble and breccia rocks. Consul Playfair remarks: "I almost fear to say—all I wish on this subject, last I should be charged with exaggeration, but in sober truth, during the two days I spent in examining the ground, in every direction I passed from one marvel to another, and left in amazement at the magnificence of the treasure which has so long lain. I will not say concealed, but exposed to the most superficial gaze there." The marble is found not in isolated spots, or in limited quantities, but in boundless profusion, and capable of yielding monoliths of any size. Although many varieties are found in practically inexhaustible quantities, by far the most common is the "Giallo Antico." Of this, great varieties of tint are found, and Signor del Monte states that some of it is precisely similar to that of which the columns of the Pantheon at Rome are made. The most delicate and beautiful, as well as the most valuable, is a marble of an exquisite rose tint, which is capable of being used either in large masses or in the finest ornamentation. Consul Playfair states that he has seen a breast-pin made of it, which could hardly be distinguished from pink coral, and blocks from which the largest columns might be cut. With this rose-tinted marble is also found a rich creamy white and another variety, pure white; but it is in the breccias that the greatest variety of form and colour is to be found. they are moreover, perfectly homogenous, the pebbles and the cement which form the mass being of equal hardness, and taking an equally good polish; there is also another advantage, they leave no holes requiring to be filled up with artificial cement when worked. In the Paris Exhibition of 1878, there was a magnificent trophy of marble work in the centre of the Galerie Rapp, exhibited by Monsieur Cantini, of Marseilles, for which he obtained the gold medal. Almost everything connected with this trophy, Consul Playfair says. was obtained from the quarries of Kleber. From inquiries made, it would appear that the cost of extracting the marble and transporting it to the sea for shipment is not great. The extraction of the blocks costs 50 francs per cubic metre; the transport to Oran (about 27 miles) costs 40 francs, and to Arzeu (12 miles) 25 francs Royalties amount in addition to about 30 francs per cubic metre. It is estimated that the marble could be laid on the quay at Oran for 120 francs. per cubic metre, or landed in London for less than 200 francs. The only other varieties of marble found in Algeria are the Algerian onyx before mentioned, the breccia of Chennouah, of a very inferior quality, and the white marble of Filfila, and other places, which can never compete with Carrara.—*Society of Arts Journal.*

GOLD MINING AT DEVALAH.

INDIAN GOLD MINES CO.'S WORKS.

THE works of the Indian Gold-Mines Company at Nadghani, Devalah, South-East Wynaad, are making very satisfactory progress, under the superintendence of Mr. H. A. Severn, and the public are free to see for themselves what is going on. The most prominent piece of work, which meets the eye on arrival, is a partially finished, but substantially built, dam. This structure is composed of bastard granite and Portland cement, and is said to be admirably calculated to withstand almost any pressure of water. At its present stage, the dam measures, roughly, 64 feet in breadth across the top, and 80 feet at bed-rock; 27 feet is the thickness, and 45 feet will be the height when finished. It is 16 feet high, and it is not intended to go any higher this season. The object of the dam is the storage of water, which would otherwise run waste during the monsoon. Thirty or more acres of a natural reservoir is rarely to be met with, and the value of it is considerably enhanced by the fact that the situation commands the entire property, and is at the highest requisite point for drilling tunnels by compressed air, for quartz crushing, for sluicing, and other operations. Leaving the dam and reservoir, a visitor's attention is next directed to the water-race, which is supplied by a 20-inch cast-iron pipe, and a suitable sluice valve through the bottom of the dam. The race skirts a hill for about 400 yards. Following its course is a well-constructed tram-road, which also extends t about 400 yards, and trucks are here and there seen working backwards and forwards, carrying stone from the quarry, and conveying heavy machinery and working gear to their destination. Towards the end of this road can be seen the mechanics' workshop, a well-built and commodious place to work in, measuring 46 feet by 30, containing a 14 foot screw-cutting lathe, a drilling machine up to 3-inch hole, and benches, vices and all requisite modern appliances for carrying out repairs in an efficient manner. The whole of this machinery will be worked by a 15 horse-power turbin, which is situated immediately to the east of, and close to the workshop.

Close to this spot is an incline self-acting tramway, worked by 880 feet of wire rope, connecting the upper tram-road, already referred to, with the main level below. This incline is at an angle of 45 degrees, and is 350 feet in length. It is laid with a single line of rail looped in the centre, for running self-acting trucks. This work is so devised that a loaded truck going down the incline, simultaneously works up an empty one: and while one truck reaches the loading platform at the top of the incline at the identical moment, the other arrives at the turn-table below, for the purpose of unloading. The safety of this method is controlled by an ingenious brak-winch at the top. The incline terminates at the eastern end of the main tunnel level, which is a road-way that will ultimately connect the eastern with the western boundary of the property. At the western end of the upper tram-road descends a 12-inch cast-iron water pipe, 393 feet long, at an angle of 40°. This is termed a water column, and terminates at what is technically known, as a foot-step, on the lower level road. This column is composed of 33 joints, or lengths. The foot step is a T-piece, one branch of which leads to the air boring machinery and the other to a quartz-crushing battery, available for any other purpose that may be necessary, and which is already at hand. Nine pipes lead from the foot of this column to a 25 horse-power turbin, which is

connected to the crank of engine by mortice and spur gearing, thus reducing the speed of the turbin by two motions. The engine compresses air by the wet process into a "receiver," resembling an ordinary Cornish boiler, 18 feet long, and 3 in diameter, to about 158 lbs., pressure per square inch. This air is transmitted from the compressor by suitable pipes and hoses, to the Darlington rock-boring machine, situated in the tunnel, where the strength and capabilities of the reservoir and its water-supply will be brought practically to bear on the prospecting underground. The whole of this machinery stands in a spacious building, 46 by 24 feet, where are also provided an office and changing room. Among other things to be noticed here is a permanent magnetic machine, comprising ten magnets, connected by a double wire cable, by means of which all the blasting in the tunnel will be effected, thus obviating the possibility of accident, and economising time.

The main office, which is close to the engineers' bungalow, is in telephonic communication with the office at the tunnel, and it is intended to extend this line of communication to the "Alpha" works, thus bringing the operations within speaking communication of the engineer's head office. From the main tunnel, a road has been completed, and is about to be railed, to a two-foot gauge, extending to the westward, around the slopes of hills, over gullies, and through rocks to the Alpha slopes, a distance of about 1½ mile, where a crushing mill, manufactured by Appleby Brothers of Greenwich, consisting of twenty stampers driven by a 50 horse-power turbin, will be erected shortly. The crushing mill will be inclosed in a capacious wrought iron building, specially imported. The stampers of the battery are 8½ cwt. each, and will be worked five in a box. The bedbox, or coffer, of each set of five stampers weighs 3 tons. The stampers have a 12-inch drop, and are calculated to produce eighty strokes a minute. Special provision has been made in this mill whereby any five head of stampers can be unpitched at will. The mill, with the exception of the coffers, is entirely constructed of wrought iron and malleable and cast steel. The copper tables are from 16 to 24 feet in length, and the blankets streaks even longer. On the tailings leaving the blanket streak they will be further operated upon by the machine known as the Berdan, of which there are six of 4½ feet diameter. Attached to this large mill is one special stamper, with appurtenances complete, for the purpose of making experimental crushing of stone obtained from any part of the mine. Within this building are suitable offices, retorting room, store-room, and all necessary accommodation. The entire mill has been imported by the Company, to crush the Alpha stone, and it is chiefly with this object that the construction of the road previously alluded to was undertaken in order to facilitate the transport of the necessary machinery to its proper site. In regard to the Alpha property, which is affiliated to the Indian Gold Mines Company, and which already possesses an old-fashioned 15-steamer battery, and a portable engine placed in a most unsuitable spot for water and crushing, Mr. Severn has seized the opportunity to repair both mill and engine, with the object of getting as much work out of the old plant as is possible. The stamps are expected to start within a month. Extensive surveys, levels, prospecting operations, &c., have been carried on here, as well as on the other properties of the Company. Five dwelling houses have already been built, as also a capital office, laboratory, melting house now in course of erection, and numerous sheds, stores, &c. Altogether, there is quite enough to be seen to impress one with the idea that this part of the gold district of Wynaad bids fair to become a small colony of itself. One special feature in the whole of what has been described is, that Mr. Severn appears to have had no difficulty in regard to labor. Considering the magnitude of the work he has undertaken, it is refreshing to hear him admit that all through the work he has been well seconded by the entire staff, including Europeans, mistries, and coolies.—*Madras Mail.*

GOLD MINING IN QUEENSLAND.

IT appears from a report issued by the Department of Mines, Queensland, which has just been presented to Parliament, that the approximate yield of gold in the year 1879 amounted to 288,556 ounces, as compared with 309,612 ounces in 1878. This decrease of 21,056 ounces represents a loss of £72,696, and would seem on a superficial examination to be a very severe falling off in the gold yield of the colony. But a decrease was anticipated, owing to the bed of the Palmer River (the principal deposit of alluvial gold and its auriferous tributaries having been to a great extent repeatedly worked over, and consequently until new auriferous ground is discovered, a falling off must be expected. Although there is this considerable decrease in the quantity of alluvial gold produced, it has not been from the individual earnings of the alluvial miners being less than in the previous year, but from the decrease in the number of that class of miners. There has, in fact, been more gold produced in the Palmer district, relatively to the number of miners working during 1879, than there was during the previous year. This is accounted for by the improved system upon which the Chinese now work, that is, in large gangs sluicing, instead of as formerly in small parties cradling, and by the discovery of several new patches of ground which, although of small extent, and soon worked out, yet yielded large returns.

The quantity of gold exported in 1879 amounted to 281,552 ounces, and it will be seen that there is a difference of 7,004 ounces between the amount exported, and that actually produced. This is due to the fact that a considerable quantity of gold is carried away in small parcels, by persons who do not make entries of it at the Customs. The number of miners at work in the colony in 1879 shows a decrease, as in 1878 there were 2,930 European quartz miners, 654 European alluvial miners, and 1,695 Chinese alluvial miners, in all 14,490; whereas in 1879, there were 2,750 European quartz miners, 441 European alluvial miners, and 5,631 Chinese alluvial miners, in all 8,812. Mr. Lukin, the Under-Secretary of mines, explains that this is but a rough statement, as the wardens of the separate gold-producing districts have not the means of obtaining a very accurate estimate; it is possible to arrive at reasonably correct calculation of the number of settled quartz miners on the older fields, but not of the large floating population of alluvial miners, Chinese, and prospectors, scattered over thousands of square miles of country. The decrease in the number of Chinese, 5,235, is very great; it appears, however, that 889 left one district alone, that of Cookstown, for China, while only 54 have arrived from that country. Numbers have left for southern ports, many have taken to agricultural and other pursuits, a considerable number have dispersed themselves over the many old alluvial fields of the colony, and moving about in parties have no doubt escaped enumeration in the totals returned by the wardens as engaged in mining. Death accounts for a considerable number in the decrease: the death-rate among the Chinese having been abnormally great during the early part of 1879. The falling off in the number of European alluvial miners is accounted or by the exhaustion of the alluvial fields. The decrease in the number of quartz miners has occurred principally on the far northern fields, where many have been disheartened by the difficulties against which they have had to contend, chiefly through the insufficiency of capital necessary to work the ground profitably. The commercial depression, so general throughout the colonies, has debarred the storekeepers, tradespeople, and speculators from backing the working miner as in previous years, when money was plentiful and credit easily obtained. Quartz mining is, however, in a satisfactory condition, as in the principal reefing districts—those of Charters Towers, Gympie, Hodgkinson, Ravenswood, Palmer, and Etheridge, and Gilbert—the yield of gold, in 1879, amounted to 175,868 ounces. This amount, though slightly less than that produced in the two previous years, considerably exceeds that for 1876, when it amounted to 151,587 ounces. The decrease, however, is nothing more than the ordinary fluctuation observable in the returns from all established gold fields during a series of years. Mr. Bligh, the warden of the district of Gympie, partly accounts for it by explaining that, in some divided-paying claims, raising stone has been suspended for a time during the erection of better mining machinery, a change which, though causing an immediate falling off in the production, inevitably leads to a better yield in the future. There is no falling off in the richness of stone at the deeper levels now being worked, and new and promising ground has been opened. Several new reefs, distant about ten miles from the town of Gympie, but within the Gympie Gold Fields, have been tried. A trial crushing from the first one discovered (the Veteran) gave a yield of nearly two ounces to the ton. Equally satisfactory reports come from the other districts. A comparison of the amount of gold won with the number of miners working, shows that the position of the individual miner continues to improve. The actual number of men working was—Europeans, 3,191; Chinese, 5,621 making a total of 8,812. As the total yield of gold for the year was 288,556 ounces, which at an average of £3 10s. per ounce, represented £1,009,946, it places the earnings of each individual miner at £114 12s. For the year 1878, it was £74 15s. 8d. Excluding alluvial mining, which is mainly carried on by Chinese, and taking quartz reefing, which is exclusively in the hands of Europeans, it appears that the yield in 1879 was 189,741 ounces total value, £664,094 average earnings of each miner, £250; against 179,083 ounces in 1878, value £626,688; average earning of each miner, £201 9s. 9d.—*Society of Arts Journal.*

THE SEARCH FOR GOLD.

THOSE who assert that Government should initiate the search for gold, forget that so large a portion of the crown lands in the interior has passed into private hands, that it is very doubtful if the Government own any tracts on which quartz reefs exist, and it is not very evident how Government could undertake to search on any other than crown lands. Those who had hoped to have secured the professional services of Mr. Cameron, who recently arrived in the island, have been disappointed, as that gentleman like Mr. Harvey, was unable to remain in the island. No doubt the presence of these experts in London is much needed by the various companies who desire their special reports on their properties, with as little delay as possible.

So far from the Government being likely to take any steps to encourage the search for gold in Ceylon, we understand they have steadfastly set their face against the enterprise, in the mistaken belief that the discovery of the precious metal in any quantity, would unsettle the natives of this country and interfere with the supply of labour. This feeling has had its origin no doubt in what occurred in Australia on the discovery of the gold fields there. But it appears to be forgotten how great a dissimilarity there is in the two cases. In Australia, gold was found near the surface in alluvial soil capable of being worked by hand without the slightest difficulty, and naturally large number of people were attracted to the gold diggings which required so little means for their working. In Ceylon the case is very different, but there is little doubt that whatever gold exists here will be in quartz reefs requiring a great deal of labour in their working, which would place

it out of the reach of the ordinary labouring man, and as in South India requiring the employment of machinery. Anything like a rush therefore, to any particular locality is quite out of the question, and it may be well to bear in mind that the land on which it is probable gold may be found, has passed into the hands of private parties. The sooner therefore the Government disabuse their minds of this fear on account of any gold discovery, the better. There need not be the slightest apprehension of our labour market becoming disturbed by any such influence.—*Ceylon Times.*

DIAMOND DIGGINGS.

THE diamond-field, which now yields the chief supply, is the South African, an interesting account of which was given by Mr. R. W. Murray, a Cape colonist, at a recent meeting of the London Society of Arts. There, as in Brazil, diamonds were being handled by people who had not the remotest idea of their value. The child of a Boer on the banks of the Vaal River was playing with some pretty pebbles which she had picked up, when one of them by its lustre attracted the attention of a passing trader. Having confided to the girl's father his belief that the pebble was a diamond, the trader agreed to have the profit with him should his surmise prove correct. The Queen's jewellers pro- nounced it a diamond of 22½ carats, worth £500, and at this price it was purchased by Sir Philip Wood-house, at that time Governor of Cape Colony. The receipt of half this sum by the parent Boer called to his recollection the fact that he had seen a similar stone in the possession of a native, and seeking him out, he gave him says Mr. Murray, nearly all he possessed—500 sheep, horses, &c.—in, exchange for his pebble.

It proved to be a diamond of 83 carats, and obtained for it £11,200. This is the stone now in the posses sion of the Countess of Dudley, and known as the "Star of South Africa." Such finds" naturally produced the wildest excitement throughout South Africa, and led to a rush of diamond seekers, first from the surrounding colonies, and soon from all parts of the world. The early parties had no idea of digging for diamonds, they sought for them on the surface along the ridges of the hills, and succeeded tolerably well. An Australian gold digger arriving on the scene inaugurated the "cradling" method employed in California and Australia for the separation of the gold in alluvial deposits. The diamond ferous soil, consisting of drift and pebbles of agate, jasper, and cornelian, with here and there a diamond, was dug out and, after thorough washing the gems were readily picked from the gravel. In 1870, within a year after the first rush, there were 1,000 cradles at work on the banks of the Vaal. These were known as the *wet* or *river* diggings, but after a time they were abandoned for the more productive *dry* diggings. These were too far from the river the to render the washing of the diamondiferous material possible, nor was it needed owing to the light sandy nature of the soil. The digger had only to pass the stuff through a couple of sieves over a sorting table when the sorter was able to pick out whatever diamonds it might contain. The first possessors of those dry " claims" dealt only with the loose upper soil, sinking their pits to a depth of only three or four feet. Their successors, however, finding the surface diggings exhausted, tested the rocky stratum beneath—" a kind of ooely-packed rock, blue in colour, and hard to crumble," which the early diggers had regarded as putting a period to their hopes if diamonds deeper down—when they were rewarded by finding that to contained more and finer diamonds than even the best surface deposits. Diamond mining was accordingly begun, and with it came the need of steam machinery and other expensive plant, necessitating the employment of a large amount of capital and the formation of mining companies. Mines have now been sunk to a depth of nearly 400 feet, in the course of which reefs, not diamond bearing, have had to be cut through, and powerful pumps to be employed to prevent flooding. Those diamond-bearing, areas are circular in shape and form what are known as " pipes." They are filled with intrusive rocks which have been forced up by volcanic agency almost perpendicularly through the surrounding horizontal strata of shale, and through which, as well as through a calcareous tufa usually found on the upperparts of the " pipe," the diamonds are disseminated. Owing to the fact that a larg portion of the diamonds consist of fragments, it is generally thought that the ' pipe'. rock is not the true matrix of the diamonds, but it has merely been the agent in bringing them to the surface from some lower deposit.

The richest of the mines is that of Kimberley, which has an area of about seven acres. Its original possessor sold the estate, of which it was but a small part, for £6,000, and it soon yielded to its purchasers from £20,000 to £25,000 per annum in rents. The Kimberley mine contains about 400 claims, which four years ago were worth three-quarters of a million sterling; in August last, according to Mr. Murray, they could not be purchased for three and a-half millions. There is no means of accurately ascertaining the value of the diamond production of South Africa, but the importance of the new industry may be gathered from the fact that the value of the diamonds sent through the Post Office in 1879 amounted to £3 685,000. Since the finding of the " Star of South Africa" much larger diamonds have turned up, notably one found in 1872, weighing 288½ carats, from which it is believed that a brilliant weighing half as much again as the Koh-i-noor may be cut, and the still larger one found by Mr. Rhodes, recently exhibited to the Queen. Unfortunately, the diamonds of South Africa are not all of purest water, the majority of them being straw-tinted, and therefore of considerably less value than colourless specimens.

A trunk railway is about to be constructed to connect the diamond region with Cape Colony, which will have the further effect of developing the other resources of a rich but hitherto inaccessible region. The discovery would seem also to have benefited the natives by finding employment for them at remunerative wages, and by bringing them under civilising influences. Most of the manual labour at the mines is performed by natives, of whom 640,000 have been registered during the past seven years as servants of claimholders. These earn £2, per week besides their food, and in the great majority of cases the discipline of steady work has, according to Mr. Murray, transformed those (at first) lean, naked and stupid natives, into well dressed, well-fed, and, on the whole, well-behaved workmen, with sufficient intelligence to see to the building of schools and churches for themselves.—*Scotsman.*

FORESTRY.

MR. JAMIESON, Superintendent, Government Botanical Gardens, Ootacamund, has submitted a rough plan for the laying out and planting with ornamental trees and shrubs the waste land on St. Stephen's Church Hill. In selecting the trees named, two objects have been kept in mind—first, only such trees and shrubs have been selected as are likely to thrive in the dry, gravelly, and comparatively poor soil of the hills; secondly, such trees only as differ in character and general appearance from those with which the adjoining hill sides are planted. The selection, being comprised chiefly of *Pinus*, *Cupressus*, and their allies which have a habit of growth peculiar to themselves, will, when grown up, contrast pleasingly with the forest of *Eucalypti* and *Acacia* by which the hills are surrounded. Mr. Jamieson's scheme has been approved by the Government, and is to be carried out without delay at a cost not exceeding Rs. 1,000. He proposed some new paths and roads, but the Government say these are superfluous, and they do not contemplate the employment of any permanent establishment.

THE *Eucalyptus globulus* seems to be doing good service in the Campagna according to recent advices. So virulent was the fever originally, that no less than eighteen of the brothers of the Tre Fontana monastery succumbed to it whilst planting the first *Eucalyptus* trees in that neighbourhood; now, however, upwards of 26,000 of the trees flourish there, and the local malaria has thereby been practically deprived of its malefic influence, and all thoughts of giving up the monastery have effectually passed from the minds of the faternity, who expect, ere long, to be as healthy there as in any other part of the country. Mr. Rimmel should note this fact as a piece of evidence inductively in favour of the hygienic value of his "aromatic ozoniser."

IN Mahren, Germany, where the refuse of the land on the banks of the river is increasing rapidly, the question of planting osiers on the river banks, which has long been talked of, has at last been taken into serious consideration, and the Technical Museum of Industry, before whom the matter was placed, deputed Dr. Broitenlohnen, the head-master of the High School for Agriculture in Vienna, to make an inspection of the river banks, which inspection took place during last autumn. The importance of carrying out the plan of planting osiers was fully recognised, and it is hoped that the steps which are now being taken will, when completed, prove highly beneficial to both the upper and lower classes.

THE cultivation of osier beds and the basket-making industry is beginning to flourish in Rhenish Prussia; Burgermeister Krake, a man who has some authority on the subject, was sent by the Agricultural Society of the Rhine province to inspect the osier beds in France, and declares the French method of cultivating these plants to possess many advantages over the German. The French confine themselves to one particular seed, and rarely venture to cultivate a new sort. The three principal kinds of seed sown are the *Salix amygdalin*, the *Salix viminalis* and the *Salix alba*.

THE WAX PALM IN PERNAMBUCO.

THE Camauba palm (*Copernicia chifera*) seems to be a much more important plant in some parts of Brazil than is generally supposed. In Pernambuco the plant is very abundant, and the uses to which it is put very numerous. The wood, for instance, is used for roofing, both as beams or rafters, and as laths upon which to support the tiles; the fruits are used for feeding cattle, and the leaves are used for making hats and mats. A valuable medicine is obtained from the roots, which has recently been brought to notice in this country. From the shoots or leaves a wax is obtained; for this purpose they are cut before they unfold, dried in the sun, powdered and boiled, the wax rising to the surface of the water. This wax, it is stated, is not produced in anything like the quantity that it might be. It is shown, in a recent report of her Majesty's Consul at Pernambuco, that the export of this wax during 1875-76 amounted to 18,668 kilos., valued at £758; in 1876-77 to 171,980 kilos., valued at £6,957; in 1877-78 it fell to 89,482 kilos., of the value of £3,168; and in 1878-79 to 1,542 kilos., valued at only £61. By far the largest portion of this wax finds its way to this country. It is shown that the decrease during the last year was due to the famine and drought which so severely crippled all industry in the province. It is not a little remarkable that, at a time when roasted date stones are proposed as a substitute for coffee, we should also learn that the stones or seeds of the Camauba palm, when roasted, are used in Pernambuco as coffee.

THE GROANING TREE.

THE history of the groaning tree is this: About forty years ago a cottager who lived near the centre of the village of Badesley, near Lymington, heard frequently a strange noise behind his house like that of a person in extreme agony. Soon after it caught the attention of his wife who was then confined to her bed. She was a timorous woman, and being greatly alarmed, her husband endeavoured to persuade her that the noise she heard was only the bellowing of the stags in the forest. By degrees, however, the neighbours on all sides heard it, and the thing began to be much talked of. It was by this time plainly discovered that the groaning noise proceeded from an elm which grew at the end of the garden. It was a young vigorous tree and to all appearance perfectly sound. In a few weeks the fame of the groaning tree was spread far and wide, and the people from all parts flocked to hear it. Among others it attracted the curiosity of the late Prince and Princess of Wales who resided at the time for the advantage of a sea bath at Pilewell, the seat of Sir James Worsley which stood within a quarter of a mile of the groaning tree.

Though the country people assigned many superstitious causes for this strange phenomenon, the naturalist could assign no physical one that was and in any degree satisfactory. Some thought it was owing to the twisting friction of the roots. Others thought it proceeded from water which had collected in the body of tree or perhaps from pent up air. But no cause that was alleged appeared equal to the effect. In the meantime the tree did not always groan, sometimes disappointing its visitants, yet no cause could be assigned for its temporary cessations either from seasons or weather. If any difference was observed, it was thought to groan least when the weather was wet, and most when it was clear and frosty; but the sound at all times seemed to arise from the root.

Thus the groaning tree continued an object of astonishment during the space of eighteen or twenty months to all the country around; and for the information of distant parts a pamphlet was drawn up containing a particular account of all the circumstances relating to it. At length the owner of it, a gentleman by the name of Forbes making too rash an experiment to discover the cause, bored a hole in its trunk. After this it never groaned. It was then rooted up with a further view to make a discovery, but still nothing appeared which led to any investigation of the cause. It was universally however believed that there was no trick in the affair, but some natural cause really existed though never understood.

MALARIA AND THE VALUE OF THE *EUCALYPTUS*.

THE hygiene of the *Eucalyptus* and pine has been carefully studied by European savants. If there is a healthy spot on earth it is in the heart of the pine forests of Europe. Pine forests are not for us in Southern India, nor is the far farmed *Eucalyptus globulus*, under 5,000 feet elevation, that is to say, just where it begins to be of use in destroying malaria. Most people have read of the wonderful results of *Eucalyptus* planting in Algeria, and in the deadly marshes of Italy and Southern France; but we cannot immediately go and do likewise. *Eucalyptus* globulus is a tree of the temperate zone, and it refuses to acclimatize to a hot climate. It has been grown slower in Ceylon than anywhere else; but for the peninsula of India, 4,500 is the lowest limit at which it is hardy. *Eucalyptus citriodora*—in which the usual aromatic scent of a *Eucalypt* is replaced by a delicious perfume, recalling a combination of scented verbena and lemons,—will grow on a good soil down to an elevation of 3,000 ft., but it is useless for the plains. There are some fine specimens of this tree in Mysore, and it is hoped that it may acclimatise there. Happily the genus *Eucalyptus* is a large one, with species running into the tropics. All the species in a greater or less degree possess the same sanitary and antiseptic properties. Here there is a most interesting study for those who love trees and planting. He who introduces a species of *Eucalyptus*, and proves it hardy in the plain of South India, will deserve to rank not far below those who brought cinchona from the antipodes, or M. Rammel, the enthusiastic Frenchman, who introduced the cultivation of *Eucalyptus* into Europe. Uninterrupted efforts have been made for the last fifteen years to grow *Eucalyptus* in South India. On the plains all these efforts have failed; primarily because the seed obtained was from a species with a temperate habitat growing in the cooler settled portions of Australia. What is required, is that the seed should be from tropical species, and that the experiments should be carried on continuously, in some selected locality. A species cannot be said to be acclimatized till it has borne seed. and healthy plants grown from this indigenous seed. The very multiplicity of the species is a difficulty which all who have had experience of *Eucalypt* planting have felt. There may be twenty or thirty species in nurseries, of these, some of different species, look exactly alike, as young plants. There is often doubt as to the correct naming of the seed. Planted out others alter rapidly in appearance. Certain species, such as *E. rostratia*, *E. microcorys*, *E. saliqua*, are easily recognizable at all stages, others not. It is simplest, when they are older, and bear flowers, to consult Baron von Mueller's admirable monograph on the *Eucalyptus*, and see then what are the survivors in the struggle.

Many species only germinate to die, some of those from a temperate climate shoot up like hot-house plants, and fall a prey to white ants, grubs, or the first hot season. Some have an amazingly rapid growth over topping even *Casuarina*. Most grow fast, and die fast. At the end of two or three years, there is a scattered remnant, the next acre of *Eucalyptus*, is a tangled jungle, but twenty or thirty feet overhead a few graceful tree tops are swaying in the breeze, and others are displaying a massive form. Any one of these may be the tree of the future, to sweeten and adorn the pestiferous swamps of our day, and clustering round human habitations to mark civilisation as does the *Eucalyptus* globulus the homesteads of the Boers in Africa.

People may smile and say that India is conservative, and the British Government practical. Government are conservative, happily, latterly, of their trees, and they have ever had a weakness for tree planting. Trees are one of the few æsthetic pleasures in a country where so much jars on the senses; but the leafy crown, or the gorgeous head of blossom, may conceal decay: as we shake with ague, the doctor nods his head, and thinks that there may be too many trees about the house. Let us plant, but plant with knowledge, and let us banish swamps and all uncleanliness from our midst. Let the man, who would be practical, turn to the published accounts of *Eucalyptus* planting, and the effect of these trees in arresting malaria:—

"The plain of the Dombo in France was once as salubrious as the surrounding country. The exaggerated industry of the marshes transformed it into a pestilential region, when it was quite as fatal for foreign populations to live, as it would have been in the swamps of the Senegal. Sanitary measures are tending to restore it to its former condition. It is evident that we cannot reproach the Dombe with the deleterious influence which human intelligence seems to have undertaken to develope. Deprived of the care which rendered it healthy and luxuriant, the Campagna of Rome has become a branch of the Pontine marshes. On the other hand the environs of Rochefort have become healthy; and Boufarik, one of the most dangerous spots in Algeria, has once become the centre of a flourishing population."

RATE OF GROWTH OF SAL.

ON a recent tour through the forest of Chota Nagpore, the opportunity was taken to measure Sâl trees wherever possible, with a view to ascertaining the average rate of growth. The best countings were obtained in the Singbhoom forest in a portion of the Anandpur Estate, which the Thakur was working for timber to build the new jail at Chaibassa. Careful countings were made on eight stumps with the following results:—

No.	Girth with bark.	Thickness of bark.	Mean diameter, wood only.	A. e.	No. of rings per. inch.
		in.	in.	years.	
1	8' 6"	1·25	29·5	123	8·3
2	6' 6"	1	26·5	116	8·8
3	6' 0"	0·75	21	72	6·8
4	6' 10"	1	23	120	10·5
5	6' 6"	1	21·5	93	7·8
6	...	...	22	100	9·1
7	6' 5"	1	22	93	8·5
8	7' 8"	1	24	115	9·6

giving an average rate of growth of nearly 8 7 rings per inch. The rings on the clean cut section were particularly well marked for Sâl, and the stumps recorded presented no difficulty in counting. Many more stumps were really examined, but the measurements were not recorded where in the least doubtful.

No. 1 gave the following measurements for the different thickness of 10 to 10 rings, counted as the greater radius only Owing to indistinctness on some radii, the mean radius measurements were not procurable. These measurements show a comparatively uniform growth:—

Yrs.		Yrs.	
10	1 10/16	80	1 13/16
20	1 5/16	90	15/16
30	1 4/16	100	1 2/16
40	1 8/16	110	1 4/16
50	1 12/16	120	1 2/16
60	2 4/16	122	3/16
70	1 6/16		
		Total	17½

In the same forest the following measurements of a log 50 feet long; were recorded:—

	Feet.	Inches.		Feet.	Inches.
Girth at ...	0	114	Girth at ...	30	86
	5	101		40	82
	10	88		50	78
	20	86			

This shows a decrease of 23 inches in 45 feet, from 5 feet to 50 feet, or omitting the first ten feet, where the trunk evidently broadened out—10 inches in 40 feet, or ¼ inch decrease per foot of height. Above 55 feet a big knot unfortunately prevented further measurements. To show the size to which timber in the magnificent Saranda Forests can attain, the following measurements of a big tree may be given:—Height, 125 feet; girth, 121 inches, and this was not a very exceptional case. In the adjoining Government Reserve no large fellings were going on, but the following smaller trees were cut and measured:—

At Rongo on the outer Western Range of the Saranda hills :—

	Feet.	Radius.	Rings.	Rings per inch.
On the hill ridge in a dry place, exposed to hot winds (C. 3472) about ...	1,500	2in.	24	12
At the foot of the hill, locality comparatively moist (C. 3473) at about	1,000	2½ „	18	7·2

On the slopes of the Ankua hill overlooking the Koina valley :—

	Feet.	Radius.	Rings.	Rings per inch.
On the summit ...	2,700	2¼ in.	17	7·5

(The age of this is known, for the place was cleared in 1863 for a survey point.)

On the northern aspect slope, good soil, laterite	2,000	3⅜in.	29	7 7
On a western aspect, rock laterite, but very little soil over it	1,800	4 „	62	15 5

These three specimens have been kept and marked C. 3478, C. 3479, and C. 3480 of the Dehra Dun collection. On the hill above Kurkutia in the Kolhan forests, a sapling, or rather shoot, was measured (No. C. 3490), giving 1¼ inch radius to 9 years of growth, or 8 rings per inch of radius.

These measurements seem to show that the rate of growth of Sâl in Saranda may be taken to be 7 to 9 rings per inch of radius for trees growing on good soil in sheltered localities, and 12 to 15 rings for trees growing in more exposed conditions. For good soil, therefore, we may consider 80 to 100 years as the age at which Sâl may be expected to reach 6 feet in circumference, exclusive of bark.

In the Palamow forests, which are all young and chiefly composed of stump shoots from saplings which have been constantly cut over while yet young, before the forests were reserved, a few countings were also made with the following results :—

Forest	Radius.	No. of rings	Rings per inch.
Kumandi Reserve (C. 3434) ...	¾ in.	6	7
Chanpi Forest (C. 3441) ...	3⅛ „	23	7·5
Seemah Reserve, Neturhat (C. 3440) 3,000 feet ...	2 „	20	10
Seemah Reserve,... Henar Valley ... (C. 3444) Shoot 33 feet high ...	2½ „	10	4

These show that, at any rate, at first the growth of shoots is fast if the locality is favourable, and that even at 3,000 feet on the laterite of the Neturhat plateau, the growth is not bad considering the conditions. That large timber can be grown in Palamow is evident from the measurements of old trees on the Jaigir plateau at about 2,500 feet in a sacred grove. These trees showed a height of 100 feet to a girth of 10 to 11 at 1 foot from the ground. In estimating, however, the probable growth of Sâl in Palamow, it would be too much to count on an average of even 7, much less 4 rings per inch, and it will be safer to take the probable age of trees at 6 feet in girth as about 80 years in good, 120 years in moderate, and 150 years in exposed and high localities. In Chota Nagpore the effects of forest, especially in low-lying spots, just below the hills, are very remarkable. In the Seemah Reserve whole areas of young Sâl forest, evidently of promising growth, are often thus destroyed. But in more exposed places, frost is seldom very destructive, and it would seem that, in Palamow at any rate, it is only the low-lying moist places near to high hill ranges, which are much affected.

The counting of annual rings on freshly cut stumps in Chota Nagpore is by no means difficult, but the markings of the annual rings, seem to disappear as the wood cut seasons, or the stump gets older, and it is then difficult to say always what are annual rings, and what are only lines containing fewer or more pores, but not marking annual growth.

J. S. G.

In Indian Forester.

GARDEN.

In the Report of the Horticultural Garden, Lucknow, for 1879-80, we have the financial results of certain experiments in cultivating fruit. Some few did not succeed, but they possibly might elsewhere. Those which showed a profit were the following. The calculation is per acre :—

Peaches ...	49	1	9	163	11	6	114	9	9
Plums ...	17	3	0	56	14	3	39	11	3
Pumeloes ...	16	2	3	89	11	0	73	8	9
Mangoes and Pineapples ...	31	12	0	200	0	0	168	4	0
Cintra Oranges ...	28	1	9	84	5	3	56	3	6
Total ...	142	4	9	594	10	0	452	5	3
Average ...	28	7	4	118	14	10	90	7	6

Here we have then an outlay of Rs. 28-7-4, yielding an annual profit of Rs. 90-7-6, being at the rate of 318 per cent. on outlay.

These profits refer to ordinary native fruits, could we but introduce better varieties, the profits might be even higher.

On looking over the annual reports of Government gardens in various parts of the country, we are amazed at the very little that is attempted in the way of introducing home fruits. A great source of health and pleasure would be opened up to Europeans especially by the cultivation of home fruits. How vast, for instance, is the difference between the ordinary country pear (*naspati*) and the Jargonnelle pear. The former is in flavour more like a good Swedish turnip, than any possible class of fruit. That the home varieties can be profitably grown has over and over again been proved by private experiments at some of our hill stations, notably Simla and Mussoorie. During the year 1878-79 and 1879-80 the Government Botanical Gardens distributed no fewer than 10,042 fruit trees. This distribution has been going on for years. Yet good fruit is scarce in those regions ; hence we arrive at the conclusion that only a very small portion—if any at all—if this large number consisted of really good varieties.

HARDENING OFF TENDER PLANTS PREPARATORY TO PLANTING THEM OUT.

This is a process which should engage the attention of all who have tender plants in an advanced stage. Vegetable marrows and cucumbers for planting on ridges, dahlias, and all other tender flowering plants that are to be planted out next month, should be gradually inured to a lower temperature before being placed in cold frames to undergo the final process of hardening off. When transferred to the cold frame from the growing temperature in which they have hitherto been placed, keep the frame close for a few days thereafter, and if frosty nights prevail, cover the lights with mats to keep up the night temperature to a safe degree. A little shade in the middle of the day in bright weather will be necessary to moderate the temperature for a day or two, after which air may be given for that purpose, taking care not to admit cold frosty wind within the frame. In order to promote growth as rapidly as possible in subjects that are yet too small or backward in growth, let the frames be shut up early in the afternoon with plenty sunlight upon them, and mat up the lights at night to prevent the heat so obtained from escaping by radiation. Gradually admit more air and give a fuller exposure to light as the time advances and the plants become inured to the new conditions in which they are placed. In the earlier stages be careful to water only with water which is at least equal in temperature to that of the frame.

ADIANTUM WILLIAMSI.

This is a new form of 'maiden hairs' of most distinct type. Its chief peculiarity is in its young fronds being clothed with golden farina. The form is most graceful, the fronds pale, lively green, with undulated margins to the pennæ ; they are also of good stout texture, and therefore well adapted for cutting. Its culture proves to be very easy. It is a greenhouse fern, or, more properly, an intermediate house one, requiring a temperature of 50 degs. to 60 degs. when growing. The soil should be a mixture of loam and peat in nearly equal parts, with sharp river sand in such proportion as will render the mass thoroughly porous.

4. The statement below shows in detail the areas of the principal crop, Irrigated during the last four years :—

	1877.	1878.	1879.	1880.
Sugarcane ...	139,005	147,661	165,661	135,229
Rice ...	69,684	79,257	75,903	135,570
Bajra and Juar ...	81,137	12,079	6,035	48,266
Maize ...	61,577	65,818	17,265	89,274
Other food-grains ...	12,272	19,326	13,535	9,207
Fodder ...	36 030	17,155	5 996	7,924
Fibres ...	105,309	74,532	59,580	63,680
Dyes ...	214,286	228,284	135,195	294,683
Miscellaneous ...	15 283	15,914	26,871	30,913
Total ...	781,583	660,026	555,641	700,189

The decrease in sugar-cane has taken place in all the divisions of the Ganges Canal, on the Eastern Jumna and Agra Canals, and is due, as just stated, partly to the state of the market, but still more to the failure of the seed.

The area of rice is nearly twice as great as the average area of the three previous years. This is due, as explained before, to the nature of the

season, but a very marked increase on the Rohilkhund Canals, from an area which had not before exceeded 28,500. (This was the area in *kharif*, 1868, the famine year. Acres to 45,511 acres requires special notice nearly the whole of the area of 1880 was under late rice, and the large increase was due to the almost complete failure of the rains during August and the first half of September in the plains, while frequent small floods from the hills kept up the supply in the rivers without serious damage to the head works of the various canals.

THE CAMELLIA.

NEARLY a hundred and fifty years ago this the noblest of all greenhouse shrubs, was introduced to cultivation in this country from Japan. As first introduced, it was only the single red-flowered form, which is now rarely if ever seen in private gardens, but even in that form it was greatly prized for its noble evergreen foliage and its large lustrous flowers, which surpassed in brilliancy and size anything previously in cultivation. A few years later was introduced some of the older double and semi-double kinds yet to be met with in cultivation. But a tendency inherent in the species to sport and vary soon furnished gardeners with the means of largely increasing the number of varities, till at the present time their name is legion. The great simplicity of its culture, combined with its great hardiness of its constitution, its free flowering charactor and great beauty, render it one of the most popular plants with amateur and professional gardeners alike. Flowering also in the dull months of winter, when little besides in the shape of flowers can be obtained without resorting to the costly process of forcing, enchances its value in all respects.

The culture of the camellia consists of a very few details. The time of starting the plants into growth is naturally at the end of the flowering season, which is under ordinary greenhouse culture about the end of March. They may, however, be brought into flower in September, and kept in continuous succession on till May, if there are sufficient plants and the requisite facilities wherewith to treat them as necessary to attain so prolonged a period of blooming. The attainment of this does not, however, in any way affect, the practical details of their treatment beyond the mere period of starting them to grow. If they are wanted to be in flower early, they must be started into growth correspondingly early; they will not like many plants with which we have to do, force with impunity after the flower-buds are set. The certain result of attempting to push the opening of the flowers at any time while the plants are in a state of complete rest, would be the loss of all or at least the greater part of the flower-buds. The camellia must have complete rest after the flower-buds are set, and any attempt to deprive it of this rest will damage the crop, of flowers both in quantity and quality, and injure the constitution of the plants.

When the flowering period is over the plants will, even when they are kept quite cool and by every means discouraged from making growth, naturally start to grow. By keeping them cool at this stage their flowering period the following season may be thrown back somewhat, and by continuing so to treat them annually, they may be thrown as late as it is possible to keep the plant from making its growth in the conditions natural to our climate. In accelerating the commencement of the flowering period, there is less difficulty than in retarding it beyond certain limits. The plants must, as before stated, be started into growth earlier than their natural period, and, if need be, this must be attained by sacrificing the crop for at least one season. There is rarely any risk of this loss occurring after the first year, for the plant naturally begins to become active at the same time that it was started the previous season, and in this way plants may be, as it were, educated in a few years to bloom from the beginning of September as readily as from the beginning of January. A suitable temperature to start the camellia into growth is by 55 degs. night and 65 degs. day. The night temperature should not, from artificial heat be allowed to exceed the figure stated, although, if the starting period is so late that the outer air may be about that point or near it, no harm will result from raising the thermometer at night a few degrees. The day temperature may be allowed to rise 5 degs. or 10 degs. higher than the figure named by means of sun heat; but a higher artificial heat is undesirable. Abundance of water during the course of growth is of the utmost consequence to the full development of large, handsome foliage, and eventually also of large, splendid flower-buds. During the early stages of growth they must also be freely syringed every morning, and in the afternoon of bright drying days also. The atmosphere of the house in which they are grown should be kept thoroughly saturated with vapor from the evaporating troughs and from sprinkling every inch of dry wall, path, or other evaporating surface in the house. If not duly supplied with moisture at both root and top during the growing time, the plants will not long sustain health, they will become bark-bound, thin, and pale of foliage; and if subjected to such maltreatment for long, they will eventually die. Provided the drainage of the pot is good, it would be hardly possible to overdo the watering of the camellia while it is making its growth. Liquid manure and soot water are highly beneficial during the growing period, and if applied weak and clear, may be given at every watering.

The compost best adapted to sustain robust health in the camellia is rich, fibrous loam, of a sandy texture. If strong and tenacious naturally, it should be rendered friable and open by the addition of sand and charcoal. In potting, great care should be bestowed upon the drainage, and ever afterwards it should be carefully examined annually, and rectified if wrong.

When the growth is finished, and the process of setting the buds is advancing, the plants are usually set out of doors in a shady position, that behind a hedge with a north or north-west aspect being best. Here they will gradually complete the setting of their buds and may remain till September.

During the growing period, up till the time that the wood begins to become brown and hard at the base, and the foliage has attained to its full proportions, the plants must have plenty of shade, along with a free admission of air when the weather is mild enough to favour its being admitted, anything approaching to dry, scorching, drafts or frosty air, being the only conditions to be avoided or guarded against.

The following selection represents some of the best in the various types of double and semi-double flowers:—Camellias with double white flowers—Alba pliuo, fimbriata—the latter the most elegant of all the whites. Blush-flowered—Lady Hume's Blush. White-flowered, flaked or striped with red—Lavinia Maggi, Bonomiana, Jubilee, Pale pink-flowered—Mons. d'Offoy. Deep pink—Augustina superba, Marchioness of Exeter, Chandlers elegans. Pink or rose flaked with white—Leopold's Bonucci, L'Avenir. Deep red and crimson—Imbricata. Often spotted with white on rich scarlet—Mathottiana, a magnificent variety.—*N. B. Agriculturist.*

TEA.

IT is early in the day yet to hazard a positive opinion as to whether or not this season's Darjeeling tea crop will come up to the brokers estimate, but it must be borne in mind that the season has not been an early one, that the weather, so far, has been against quantity, and that throughout the district the general plan this season is to pluck fine leaf only, so far as this can be done consistently with the well-being of the bushes. All these reasons put together seem to go in favor of the outturn being below the estimates formed a couple of months ago. It is very probable that revised estimates will be made by the end of June.

WE take the following from Messrs. Carritt and Co's report of 16th May:—"The first sales of new season's tea were held on the 12th instant, when 2,834 packages were offered, 2,625 of which changed hands. A considerable quantity of half chests and small boxes were included among these, so that the actual quantity sold was equal to about 2,000 chests only. The quality of some of the invoices from Darjeeling and the Dooars was fine but the few parcels from Cachar were of very indifferent quality. There was a good inquiry for all teas with point in cup, but the thin liquoring lower grades, especially Cachars, attracted little attention and were difficult of sale. As compared with last year's opening rates, we quote good and fine teas 2*d*. to, 4*d*. higher, while teas costing under about 1s. 5*d*. excepting a few flavory Darjeelings, were generally 1½*d*, to 2*d*. lower. Teas costing 11*d*. and under, sold at about last year's opening rates.

FINE and finest continue scarce and are readily taken at fully recent quotations. Medium teas are not so quite freely offered, and values are unchanged. Common kinds as usual have formed the bulk of the catalogues, the quantity of broken leaf being so much greater than that of the whole leaf has reduced the values of the former to a very low point; some light-coloured low Fannings have sold as low as 5½*d*.

As an illustration of how tea has been doing in the past year, we may instance the Muttuck Tea Co., Ld.,—whose outturn was 80,994lbs. The total expenditure was Rs. 51,775-15-5, and the income Rs. 35,728-4-3, shewing a loss on the year's working of Rs. 16,047-11-2. The tea therefore cost per lbs. 10·228 annas, while the average price realised was 7·058 annas, the loss on each lb. being 3·17 annas, rather a discreditable state of affairs we should say.

INDIAN tea statistic brought up to the end of March, are as follows:—

	Imports.	*Deliveries.*	*Stocks.*
	lbs.	lbs.	lbs.
1875-76	22,906 000	19,227,400	10,152,900
1876-77	25,632,700	19 503,900	12,105,400
1877-78	32,928,700	24,606,500	17,319,200
1878-79	31,804,400	28,063 300	15,328,300
1879-80	36,875,700	26,620 900	21,381,800
1880-81	42,703,800	34,742,800	23,476,600

This is calculated from 1st of July, which date is in London assumed to be the commencement of the season. During these years the percentage of deliveries and stocks to current year's imports were as follows:—

	Deliveries.	Stock.
1875-76	84	44
1876 77	76	47
1877-78	75	52
1878-79	88	49
1879-80	72	58
1880-81	81	55

From this it will be seen that there is still ample room for improvement in the matter of stocks which are still too high.

THE new market opened in Australia will doubtless help to reduce stocks, by diverting a considerable amount of the total production from the London market, and if the present compara-

tively safe condition of the Khyber Pass continues, we may hope to see from two to three millions of lbs. leaving India for the Trans-Himalayan markets. But perhaps the most hopeful signs in this direction are the steadily increasing home consumption and the very diminished ratio of extensions which has been the rate during the last few years.

As usual we find the London market willing to pay for really good teas. From Messrs. Lloyd and Cheshire's report we take the following :—

We quote the following satisfactory paragraph from the *Australian Trade Review*, dated 9th April last : " Indian Tea—The sale of 19th March was a most important one, the quantity sold being over 3,000 packages, the bidding brisk with full values maintained. This *afthere distribution of previous shipments among the consumers*, seems to indicate that the introduction of these teas is a success so we may now look forward to far larger shipments during next season."

" From some remarks quoted by Sir Bartle Frere in a paper recently read before the Society of Arts, it appears that a few small plantations are under tea cultivation in Victoria County, and other districts of Natal, and with fair success. A resident at the Isipongo states that with one exception he had bought no tea for six years, but used that grown by himself for his household, and found its flavour very good. The shrub is also said to do equally well in many localities in the Natal uplands." In introducing tea-growing into other countries, the question to be considered is not " will it grow" as we know the tea plant will grow almost anywhere, but " will it yield sufficiently to pay." This is the crucial test. We have ventured to doubt the success of the present attempt to introduce it into America, because of the rainfall being deficient. On this important point as regards Natal, we have no information.

A correspondent writing from Genoa to the *Home and Colonial Mail* relative to the prospect of Indian tea in Italy says :—" At present the consumption of tea in Italy is almost exclusively restricted to the higher classes of society owing to the heavy duty it is saddled with, namely, 3fr. 50c. per kilo (2 lbs.) This duty is moreover quite out of proportion as compared with that on coffee, which is only 1fr. per kilo, and there is no doubt, if the duty on tea were reduced to a reasonable figure and the trade placed on a proper footing, that the consumption would soon attain its natural limits. The revenue it brings to Government now is a mere trifle, and we feel sure a reduction of the duty to one-half its present figure would not only increase the revenue considerably, but also do away with smuggling, which is carried on extensively here in almost every article which, like tea, is heavily taxed with duties." The kilogramme being equal to 2¼lbs. it follows that this duty is equivalent to 1, 3½*d*. per lb. which is almost prohibitive. The duty in coffee is only 4½*d*. per lb. and we trust the Italian Government will soon see their way to make a reduction. The duty on tea is exactly 3½ times heavier than that on coffee. The English duty while much lighter than this is still relatively heavier on tea than on coffee. On the latter it is 1½*d*. per lb. while on tea it is exactly four times that amount.

There are frequent complaints from " The Land" as to the quality of the China tea sent over to this country. There is a marked deterioration even as compared with the inferior quality of some of last season's shipments. China tea of a kind has been sold as low as 2¾*d*. per lb., a price which we venture to think is sufficiently indicative of the kind of rubbish which now finds its way into the market. India tea, although prices are not encouraging to growers, is becoming more and more popular among consumers. Grocers are directing attention to it, and now it is the rule to see trade announcements in regard to blends of Indian and China, while not a few retailers sell pure Indian tea and think that the exigencies of the times demand that they should announce the fact in large type.

THE ADULTERATION OF TEA.

A FEW months ago we gave the results of a series of analyses of milk sold in Melbourne, made at the laboratory attached to the Industrial and Technological Museum by Mr. Frederic Dunn, under the supervision of Mr. J. Cosmo Newbery. From the same source we have now obtained some particulars of the analyses of many specimens of tea purchased in Melbourne. Great reliance is naturally and deservedly placed by the public on the reports on various articles of food occasionally emanating from this laboratory. Such reports usually refer to analyses spontaneously undertaken, and the particular sources whence the articles experimented upon are obtained are not divulged. Consequently, they cannot be considered as advertisements either of the merits or defects of any individual product. Moreover, they are not usually paid for by any private person. The laboratory, too, is a branch of the public service, and the gentlemen employed therein are not directly under the control of any Minister of the Crown. Very much work has been done at this laboratory in the direction of exposing food adulterations ; and if this work has not resulted in as great a diminution of the sophistication of the articles we habitually eat and drink as could be wished, it is not the fault of the scientists who make the analyses, but of public authorities who neglect to utilise or pay due heed to the information contained in their reports. With regard to the experiments on teas now under consideration, there is much of a disquieting character in the information supplied by Mr. Dunn, as it shows that a large proportion of the tea that goes into consumption in Melbourne is shamefully debased. But it also shows that the white and yellow rogues who derive a profit from the systematic corruption of this article of food could under a proper law efficiently administer, be punished or, at all events, checkmated. In England, grocers are frequently fined for selling adulterated tea ; but here adulterations of all descriptions are allowed to go unpunished.

However opinions may vary as to the effects of tea on the animal economy, there can be no doubt that injury is done to health by using adulterated tea. At any rate if any persons do entertain doubts on that point, they had better refer to recent proceedings in the Medical Society of Victoria when the subject of tea-drinking was before that body. Nor is it necessary to describe the process by which analyses detect the sophistication of tea. The various methods of adulteration of tea may be defined as the addition of " leaves other than those of tea, except those used for scenting ; exhausted tea leaves and damaged tea ; an undue proportion of stalks or vegetable matter foreign to tea of any kind whatever ; foreign mineral matter, especially sand, quartz, soapstone, China clay, magnetic oxide of iron, &c. Lastly the substances used for artificially colouring or painting the teas, as ferrocyanide of iron or Prussian blue, indigo, turmeric, &c."

Probably most of the sophistication to which tea consumed here is subjected, is done in China. In that direction the Celestials have acquired a degree of skill far and away beyond that to which Europeans have attained. In Melbourne, very many families buy their teas from Chinese hawkers, whose ways are " quite too winning," the lollies which Chinky Chinky Chopsticks gives to the young ones at the door being a very successful bait to induce the housewife to deal with him. Their teas are highly scented with a good " grip" on the palate ; in fact they are such teas as the Canton short-leaf mixtures, which will be referred to further on. The use of such teas is gradually depraving the public taste. Housekeepers request their grocer to supply them with a similar article, and he asks the wholesale merchant to enable him to meet the demand, and thus the evil increases.

The quality of tea is judged, not only by its aroma and by the flavour and colour of the infusion, but by the amount of soluble matter or " extract" as it is called which it yields. But generally speaking, tea is classified according to the proportion of extract, mineral ash, soluable salts and theine obtained. This rule, however is subject to modification, inasmuch as chemical analysis sometimes reveals that the leaves have been mixed with some foreign matter, evidently added to give extract. Genuine tea contains between 4 and 6 per cent. of mineral matter, 3 per cent. of which consists of soluble salts, and yields in its ordinary air-dried condition extract ranging from 32 to over 50 per cent. As a rule, the younger and better the tea, the higher the percentage of extract. The following able gives an analysis of genuine teas :—

Name.		Locality.	Percentage of Mineral Ash.	Percentage of Extract.	Percentage of Soluble Salts.	Percentage of Theine.	Number of Samples Averaged for the Analysis.
Pekoe	...	China	5·90	38·40	3·75	*	1
Pekoe	...	Ceylon	4·71	45·60	3·16	1·81	26
Pekoe	...	Indian	5 19	41·41	3·19	1·77	2
Do. Souchong	...	China	6·00	36·40	4·14	*	1
Do. Souchong	...	Ceylon	4·78	45·11	3·06	1·81	18
Do. Souchong	...	Indian	5·42	39·66	3·19	2 05	7
Souchong	...	China	5·80	40·80	4·21	*	1
Souchong	...	Ceylon	4·72	43·68	3·10	1·79	13
Souchong	...	Indian	5·26	38·85	3 04	1·62	3

* Not determined.

With regard to this table it would not be fair to use it for the purpose of making a comparison between different tea-growing countries, inasmuch as the Ceylon teas were Exhibition teas, while the Indian and Chinese were obtained from bulk samples which had been sold in Melbourne.

The next table gives the results of an analysis of Chinese teas obtained from the importers, and taken from bulk samples:—

Name.		Price per lb. in bond.		Percentage of Mineral Ash.	Percentage of Extract.	Percentage of Soluble Salts.
		s.	*d.*			
Congou	...	1	0	5 26	27·52	2·90
Congou	...	2	3	5·74	32·24	2·83
Congou	...	1	0	5·40	33·00	3·56
Congou	...	0	10	5 72	25 86	2 66
Congou	...	0	10	5·80	24 20	2·09
Congou	...	1	5½	5 50	22·84	2 13
Congou	...	1	5½	5·84	21·04	2 64
Congou	...	1	4	5·49	26·66	2·74
Congou	...	1	5	5·90	25·14	3·23
Congou	...	1	3	7·70	29·04	4·77
Congou	...	1	2	5·49	27 68	2·60
Congou	...	1	3	5 20	21·92	3·02
Congou	...	1	9½	5·38	31·12	3·38
Congou	...	1	6	5·60	29·41	3·09
Congou	...	1	5	5 40	28 24	2 87
Congou	...	1	7	5·66	31·60	2 77
Congou	...	1	7	5 90	29 04	2 89
Congou	...	1	7	5·60	31·44	2·94
Congou	...	1	9	5·46	29 44	2 62
Congou	...	2	3	5 71	3 ·24	2 83
Congou	...	2	1	5·72	31 44	3 26
Congou	...	2	3	5 60	32 24	3·11
Souchong	...	3	6	5·40	31 44	3·21
Congou	...	2	9	5 80	33 81	3·25
Congou	...	3	3	5·60	32·24	3·20
Congou	...	1	9	5·74	31·04	3·34
Scented Orange Pekoe		1	9	6·10	34·64	3·27

There are very few teas in this lot that would pass the standard for a low class genuine tea, and this, too, notwithstanding the high price paid for a number of them. The majority of the samples must be classed as made-up teas, and consisted principally of exhausted tea-leaves re-fired, tea dust, and withered leaves. In many of the samples an excess of stalks and foreign leaves were detected. In some, especially those mentioned in the table as being sold at 10*d*. to 1*s*. per lb. in bond, chemical analysis distinctly showed that besides the adulterants already named, the leaves had been mixed with some foreign matter evidently added to give extract and colour. One or two samples had been very strongly faced, or artificially coloured with plumbago. Starch paste was likewise found. Had it not been for these foreign matters, which are soluble in water, the percentage of extract would have been much lower. As it was; it will be seen that in the great majority of cases the percentage of extract was below the minimum for the lowest-classed genuine teas.

With regard to Canton short-leaf, it may be mentioned, in the first place, that Canton is the centre of tea adulteration. An analysis of a sample of this description of tea showed that, in 100 parts, it contained:—

Percentage of stalks	28·71
Percentage of green tea	15·74
Percentage of black tea	55·55
	100·00

Many stalks were found foreign to the tea plant, and were ascertained to be cut-grass stems. The percentage mentioned as black tea was, in reality, a green tea which had been faced, probably with plumbago. Foreign and withered leaves were also detected, as were likewise a large number of small nodular particles, which proved, on analysis, to be tea-sweepings or lie tea held together by starch paste. An analysis of the whole sample of Canton short-leaf gave the following results:—

Percentage of mineral ash	6·70
Percentage of extract	37·69
Percentage of soluble salts	3·17
Percentage of theine	0·72

This percentage of theine, which is one of the chief constituent parts of tea, is very low. At the same laboratory, about 70 samples of Foochow congou yielded 1·67 per cent. of theine, the lowest percentage being 1·50. In 71 samples of Ceylon (exhibition) teas, the average percentage was 1·89, and the lowest 1·82; and in about 60 samples of Indian tea, the average percentage was 1·77, and the lowest 1·44. It may be added, with regard to Canton short leaf, that it has a very large sale, and is used by grocers to give the pronounced flavour which is so appreciated by the public. Jasminum sambac, evidently used for scenting purposes, was likewise detected in the sample.

As a rule, Indian and Ceylon green teas, which have been analysed at the laboratory, have proved to be perfectly free from adulteration, and the opposite may be said with a few exceptions of Chinese green teas. Some 60 samples of Chinese black teas, obtained from the most respectable grocers in Melbourne and suburbs, and sold at a retail price of 2*s*. to 2*s*. 6*d*. per lb., were a short time since analysed. The following is a summary of the analysis:—

Name.	Price per lb.	Percentage of Mineral Ash.	Percentage of Extract.	Percentage of Soluble Salts.	Remarks.
	s. d.				
Congou ...	2 6	5·40	35·20	3·50	Highest percentage obtained from 30 samples.
Congou ...	2 6	5·47	26·78	2·56	Lowest do.
Congou ...	2 6	5·63	31·92	3·26	Average of 30 different analyses.
Congou ...	2 0	5·52	34·80	3·13	Highest percentage obtained from 28 samples.
Cangou ...	2 0	5·60	19·57	2·49	Lowest do.
Congou ...	2 0	5·55	30·68	3·06	Average of 28 different analyses.

We will conclude with a few general remarks. The sales by public auction of China teas for the six months ending 31st December 1880, is stated to have been 3,391,000lb. Of this 2,005,000lbs were sold at and under 1*s*. per lb. in bond. The remaining 1,386,000lb. were sold at 1*s*. 0½*d*. to 1*s*. 10*d*. per lb. in bond. The duty on tea is 3*d*. per lb. There can be no doubt that grocers make a great profit out of tea. As no articles they sell at a very low price to get custom but they make up for that on tea. Pure tea will go much further than the ordinary teas, and consequently less need be used. It is well to bear that in mind, because much pure tea is used, too much may be put into the pot, and its very goodness may create a prejudice against it. Many persons condemn a large leaf tea as being of little strength. Such an opinion is erroneous. Some of these teas have been proved by Mr Dunn to be very rich in extract, soluble salts, and theine.—*Melbourne Argus*.

COFFEE.

The Government Java coffee crop for 1881 is estimated at 813,300 piculs.

COFFEE IN AUSTRALIA.

We could not perhaps do better than produce a few extracts from an article which appeared in a former issue of the *Standard* on this subject:—"Millicent, the property of Mr. Costello, is situated at about twelve miles distance from town. At the back of a compact homestead the cultivation begins, and here are found 25 acres of coffee, two or three years old, in vigorous growth. It is growing on a spur running north from the mountain. Half the coffee is on the east side, the other on the west side of this spur. The land is the usual basaltic scrub, and we noticed that if possible the coffee looked more flourishing where the stones were most plentiful. William Sabonadiere in his well-known work, "The Coffee Planter of Ceylon," sums up the characteristics of the soil most suitable for coffee culture as follows:—'A dark chocolate colored soil mixed with small stones under ledges of rock and bestrewn with boulders of granite.'" On Mr. Costello's selection these characteristics are found to perfection. The three-year-old trees have a fair crop of young coffee on them, and the two-year-old trees have already a very promising maiden crop. The trees are planted 6 by 8 feet apart, and the older ones are already topped to four feet in height. Although the entire crop is in a most flourishing condition, those situated on the west the range are in a more vigorous condition than those on the east, being more sheltered from the force of the S. E. gales that the district is occasionally liable to. From the summit of the hill among the coffee one of those magnificent views for which the north side is so justly celebrated spreads out before us. To the east, like a panorama, the waters of the South Pacific glistening in the sunshine, and dotted with innumerable islands of verdant green to the west and south, the dense masses of the coast range and scrub land slopes of Blackfellow Mountain tower high above us. We visited Mr. Costello's coffee nursery where we found many hundred of healthy young coffee plants ready for planting out when the proper season arrives. Highly gratified with our visit, we started on our return after congratulating Mr. Costello upon the pluck displayed by him in his endeavour to introduce a new industry into the district. While on this subject we desire to draw the attention of farmers to the advisability of following Mr. Costello's example. The growth of coffee at Mackay is no longer experimental. The machinery required is inexpensive. The families of many of our farmers could do most of the crop gathering and the demand for coffee in the colonies will absorb all that can be produced for many years to come; while the duty of 4d. per lb. on imported coffee will offer that amount of protection to our producers until the Queensland market is supplied with Queensland grown coffee. That Mr. Costello may be considered the pioneer of coffee growing in Mackay does not admit of a doubt, and we trust he may reap the reward which he so justly deserves for his enterprise."—*Mackay Standard*.

CACAO.

CACAO.

I have heard of such wonderful estimates of the profits of cacao cultivation, framed by those who are just beginning in the low-lands of the Western Province, that I think a slight sketch of my own three years' experience may be of service to them. I may introduce myself as a planter of over forty years standing, with a wide and varied experience but when I began cacao I knew no more of the habits of the plant than I had casually picked up from newspapers, and other publications, to which I had given no particular study; I had, therefore, almost a clean sheet to take my notes on. It is just three years since I sowed my first seed in bamboo cylinders filled with the best soil I could command. Most of them grew, and they were planted out on land that had been trenched, rooted and prepared for Liberian coffee, nurseries with the larger trees left as shade. Here they grew till the best plants were four feet high and were getting their branches, when a belt that separated them from the clearing was cut down, and within a few days not a leaf remained on any of them. Some of them still live, and struggle to send out shoots from the stem, but the wind always defeats their efforts. The next batch of plants were put out, alternately with Liberian coffee on land with a very easy incline to the west, the soil being a loose gravel with much organic matter. This lot got on tolerably till the south-west monsoon opened, when they went the way of their elders. Those that remain alive are making a strong effort, but will no doubt be finished off by the wind when it comes round to the S. W. Of course I have given up all attempts to establish a cacao field on that land. On this place, I introduced 500 well-grown plants, in bamboos, in July 1879, and before the end of that year not one in ten was left alive. They encountered three months of dry weather; they were cut by lizards and crickets; insects riddled the leaves, white ants cut the taproots, just below the surface; the wind stripped them; and now at the end of 21 months I have not 25 of the 500 odd remaining. In November 1879 I sowed the whole field at stake and surrounded each plant with a basket work of cylinder from 15 to 18 inches high. On the portion of the clearing that faces the S.-W., the whole of them died out within four months, and three-fourths of those on the eastern side followed. At the end of May, last year. I put down seed at all the failures, but dry weather set in immediately afterwards and they never even germinated. Finally I put down nearly 10,000 seeds in baskets in September and October, one-fourth of which were cut by lizards and crickets, almost as soon as they came up, and above 1,000 were cut the very first night after planting in the field. At the end of November last year the whole clearing was fully planted. Now in April, one-half of the spaces are vacancies. The number of plants for the place is about 8,000. I have first and last used 25,000 seeds, and I have still upwards of 4,000 vacancies. My conclusion is, that, of all the plants I ever have had to deal with, the cacao is the most delicate, and has in this climate the most enemies. I by no means say that the evils to be encountered in getting up a field of cacao in this climate are insurmountable, for I have one field of ten acres, in which I have not at the end of five months absolutely lost ten per cent. of my plants I do not know whether cacao will when more advanced, be able to resist the prevailing wind, on situations exposed to it, but, so far as my experience goes, it inclines me to the negative side of the question. In every situation that I have had to deal with, the young plant needs temporary shelter, but, so far as I have been enabled to observe, it is not benefited by overhead shade, except when very young. Certainly I have seen benefit from placing a jungle branch with the leaves on, over the basket shield in hot weather. This plant does not take kindly to a soil where sand or gravel are the prevailing ingredients; an alluvial flat, or a deep clayey loam, seems to suit it best.

White ants, I had always believed, touched no leaving plant, and it was only after obtaining the clearest evidence I admitted that the young cacao plant was an exception to the rule; It is over true a tale that they have destroyed tens of thousands in the low country, and will destroy hundreds of thousands more before all the projected plantations are complete. I do not know whether the gentleman who recommended steeped aloe leaves was in earnest. The aloe is by no means a common plant in Ceylon, and is a very slow grower, and nothing can be clearer than the utter impracticability of the plan where there is not an aloe plant within ten miles, or a drop of water to be found on the surface of 100 acres. As to the other enemies of this plant, the lizards and crickets breed most freely in a loose dry soil and do not much affect clays, gravels, heavy loams, &c. There is no doubt that allowing the weeds to take and keep possession of the soil, would moderate the ravages of both crickets and lizards on the

cultivated plants by affording them a wider field of choice, but it is an unsettled question, whether the gain in one direction might not be balanced by a loss in another; so far as coffee is concerned, there is no question about the action of weeds. For myself, as the father of monthly hand-weeding on coffee estates, I will not be the man to make the experiment of burying young cacao plants in dirt, in the hope of benefiting them thereby. Seed must now come rapidly down in price, with so many trees coming into bearing at so many points of the country, and there will be little difficulty in maintaining nurseries at a moderate cost, to supply vacancies as they occur.

As to the minor insect enemies, I have observed about half-a-dozen species of caterpillar feed on the leaves, and several species of minute beetles; then a small species of black ant bring the spawn of the white bug and establish it on the tender shoots of a thriving plant, but it generally succeeds in dismissing its unwelcome guest in a few days. Besides all those reptiles and insect foes, there is a large percentage of failure, for which I am still unable to account; a plant of eight or ten inches suddenly ceases to grow, and sometimes remains for months not dead, but sickly, and then suddenly dies off. On examination, there is no sign of insect action, either on root or stem. If this is an effect of dry weather, then why are other less advanced plants not affected in the same way; I have had an ample opportunity this season of studying the effects of drought on the young coffee plants: all that were planted in the same kind of soil, and had grown equally, showed the same day the same signal of distress on the same day, but cacao shows no such uniformity of constitution; a plant that has been cut when very small will fight to establish a fresh stem, through the whole dry season, and probably with success; while its next neighbour, that has met with no check, has been growing freely till it is above a foot high suddenly drops its leaves; sometimes renewing its growth when rains falls, but more frequently going off altogether, even after the advent of rain. I would be glad to learn whether this is common in the experience of other cacao planters, or if it is a special di-pensation, affecting the soil and climate which I have to deal with only. The largest plant I have found the white ants dispose of was three feet high, but I have had cases of sudden death, of plants quite as advanced, for which there was no apparent cause. One plant that some time ago I remarked as a specially thriving one I found this morning with all its leaves withered. Finding it was quite dead, I tried to put it up for further investigation, but it retained too firm a hold of the ground for my strength. In February every plant drooped on the 21st dry day, except the very smallest; in March it was the 25th day on which they began to complain. If therefore what I have stated of the cacao be the effect of drought, it would appear that every cacao plant has its own constitution, and that while one gives up in a week another of the same age and treated precisely the same holds out three or four weeks and rapidly responds to the first shower. Mr. Fraser tells us that in Trinidad it is only the larger seeds in the middle of the pod that are used for reproduction. There may be something in that, but we who have been paying a cent. each for our seeds naturally grudge doubling the cost by rejecting any.—*Ceylon Observer.*

COCA (ERYTHROXYLON COCA).

IN Mr. Markham's "Peruvian Barks," recently published, he has given the results of his own observations, and collated that of other travellers, respecting this substance, and to this account we are chiefly indebted for the following facts:—

"Coca" the beloved narcotic of the Peruvian Indian, was first named, botanically through the labours of Joseph de Jussieu. The history of this noted botanist is a melancholy one. He left France in 1735, in the ever memorable expedition of La Condamine, and after M. La Condamine left South America, M. Jussieu continued his botanical researches, making numerous journeys on foot, notably those to the cinchona regions. The results of fifteen years labours were contained in certain cases of dried plants, &c., and a native servant at Buenos Ayres, thinking these cases contained money, stole them, and this loss had such an effect on poor Jussieu that he returned to France in 1771 deprived of reason.

The coca is the great source of comfort and enjoyment to the Peruvian Indian. It is to him what the kava-kava is to the South Sea Islander, the betel to the Hindu and Malay, and tobacco to the rest of mankind, but with this difference it produces invigorating effects. The Peruvian Indian looks upon coca with veneration In the palmy days of the Uncas or Yncas, coca was sacrificed to the sun, the high priest or Huillac Umu chewed it during the ceremony, and before the arrival of the Spaniards, coca was used in lieu of money. After the Spanish Conquest, much was done to prescribe its use, because as a Council of Bishops held in 1569, said it was a "useless and pernicious leaf, and on account of the belief stated to be entertained by the Indians, that the habit of chewing coca gave them strength, which is an illusion of the devil." Coca, indeed, form its popularity, being used by about eight millions of people, has always had a great commercial importance, and one Viceroy, Don Francisco Toledo, issued no less than seventy ordinances concerning coca in the space of four years (1570-1574).

The coca plant is a shrub of four to six feet high, with straight and alternate branches and leaves like those of the tea plant, and is cultivated at elevations of from 5,000 to 6,000 feet above the level of the sea in the warm valleys of the eastern slopes of the Andes. Here the only alternations of climate is from wet to dry, frost is unknown, and it rains more or less every month of the year. The seeds are sown on the surface of the soil as soon as the rainy season commences, and begin to sprout in a fortnight, being carefully watered, and protected from the sun by a thatched roof. The following year the seedlings are transplanted in a soil carefully broken up and freed from weeds. The ancient custom was to raise the plants in terraces on the hill sides, but now plantations on the level ground are resorted to, although Indians aver that plants raised under the former conditions yield a much superior quality of leaf. At the end of 18 months the first harvest is ready, and the picking of the leaves, performed by women and children, is very carefully proceeded with, so as not to injure the young and still tender shoots. As soon as one crop of leaves is removed, if well watered, and the ground carefully weeded, another crop is ready in about 40 days. A plant continues to yield for about 40 years, and Dr. Poepping gives the profit of a coca plantation as about 45 per cent. Each picker carries a piece of cloth in which the leaves, plucked one by one, are placed. These leaves are then taken to the drying yard, formed of slate flags. Here the leaves are spread out in thin layers, and carefully dried in the sun. Too much exposure to the sun spoils the flavour of the leaf, and if heaped too much together, the leaves frement and become fœtid. As soon as dried, the leaves are packed in bags made of banana leaves, with an outside covering of cloth, or packed tightly in larger parcels of about 50 lbs. each. In the Sandia district of Caravaya, two varieties of coca are recognised, the Ypara and the Hatun Yunca, the latter having a larger leaf than the former.

In Bolivia, coca is treated as a Government monopoly, and the right is generally farmed out. In 1850, coca brought into that country's exchequer a sum of 200,000 dollars. The whole yield of coca in South America is estimated at thirty millions of pounds. Coca soon deteriorates in keeping, and Indians treat it as valueless if kept longer than seven months.

Such is the faith in coca, that it is believed if a dying man can but taste a coca leaf when placed on his tongue, his future bliss is assured. No Indian is without his *cuspa* or coca bag made of llama cloth, and three times a day, sitting down, he takes leaf by leaf and rolls them up in his mouth till he forms a ball. Then applying a small quantity of powder consisting of carbonate of potash, made by burning the stalks of the quinoa plant, mixed with lime and water, he goes on his way rejoicing. The use of coca is widely spread. The shepherd on the cold slopes of the Andes has but this and a little maize as his sole nourishment, and the runner messenger looks to it as his solace and support. As to the properties of coca, it seems very evident that it allows of a greater amount of fatigue, with a lesser amount of nourishment, and prevents difficulty of respiration in ascending steep mountain slopes. It has an agreeable and aromatic taste, accompanied by a slight irritation, which excites the flow of the saliva. When made into a tea, in taste it is like that of green tea, and effectually prevents drowsiness. Applied externally as a poultice, it moderates rheumatic pains, brought on by exposure to cold and wet, and also cures headache.

Mr. Markham chewed coca leaf very frequently, and states that he found it to produce an agreeable soothing feeling, that he could endure longer abstinence from food with less inconvenience, and that when using it, he could ascend precipitous mountain sides with a feeling of lightness and elasticity, and without losing breath. He also considers it the least injurious of all other like substances, even when taken in excess, and at the same time the most soothing and invigorating.—*Society of Arts Journal.*

CACAO.

THE highest French authority on diet, Dr. Fonssagrives, remarked of cocoa as a daily desideratum, in the columns of the "Encyclopedique des Sciences Medicales," that for great nutritive principles, heat-giving properties, and delicacy of flavour, it is alone in its high integrity and beyond all other products; and in classing the cocoas in their various orders, he emphasises the opinion given by declaring the theobromine contained to be a specific against dyspepsia and all nervous affections. The "Histoire Naturelle Societe de Naturalistes" places cocoa amongst the most valuable antidotes of corrosive poisons, and as being most benificial in all cases of rheumatism. Lindley, in the "Vegetable Kingdom," writes of its high value in cutaneous diseases, and eulogises it as a sudorific, and states that in Brazil it is used as a remedy for generic disorders for which its very mucilaginous natures renders it indispensable

Simmonds, in his "Commercial Products," says "it is without exception—regarding its high properties—the cheapest food we can conceive possible." The same authority continues: "The signs by which good cocoa is known are these, it should dissolve entirely in water without leaving a great sediment and should be oily, yet melt in the mouth."

Hoffman recommends it in all hypochondriacal and nervous diseases, and states that Cardinal Richelieu was cured of "ermacausis," or general wasting of the body, by its use. Theobromine, according to Woskrousky, contains:—

Carbon, 45·21	Nitrogen, 35·38
Hydrogen, 4·73	Oxygen, 12·80

As against (nitrogen) in caffeine—the principle coffee—28·73. Comment on this would be superfluous.

Simmonds again instances that those who indulge in excess find their vigour more speedily restored by the use of cocoa than by any other ingest. He further states that when recently boiled in a zinc can, it is highly electrical, and that the South American Indians perform extraordinary journeys, subsisting wholly on incredibly small quantities of cocoa. Space will not premit us to enlarge upon the authorities quoted. Suffice it to say, that their name is legion. In this article we can only briefly summarise them, our intention being to refer more particularly to the manufactured article of the present day, and referring here to the industry known as cocoa essence, the specialite of Messrs. Cadbury, which is a nutritive unrivalled. In the beginning of this article we have drawn attention to the opinion of Dr. Fonssagrives, the eminent Parisian physician and collaborateur of the "Sciences Medicales," and we take the opportunity of affirming that not one ounce in its manufacture is deteriorated by adulteration or the introduction of alien substances. To the public this is a most important matter, and cannot be too widely known. The best cocoa contains nearly a moiety of its weight of natural butter, and this has been found to be far too large a proportion for persons of ordinary digestive powers. Dr. Muter has remarked that the "only objection which can and does exist to its use in a state of purity is the excessive proportion of fat which renders it too rich for most digestions, and gives, unfortunately, colourable excuse for its adulteration. The preparation of cocoa by mixing it with starch and sugar has been palliated by some but an eminent authority urges "those interested in public health to expose and put down the mixture of cocoa with starch and sugar as useless, and founded altogether on a wrong basis, especially now that the fact can be removed, and the article thereby increased in nourishing as well as digestive qualities." By means of elaborate machinery at these works the removal of two-thirds of the butter from the native cocoa is accomplished, the result being an impalpable powder, soluble in boiling water. This cocoa essence is known all over the world, the sale being enormous, and the preparation stands very high as a flesh-former and nutritious beverage.

Having thus generalised upon the manifold advantages cocoa as a beverage possesses, we may now, without being tedious, shortly describe the leading features of Messrs. Cadbury Brother's factory, which situate at Bournville, in a lovely valley in Worcestershire, is perhaps the most complete in its interior economy of any enterprise of equal magnitude. Twenty years ago, when operations were commenced, under thirty employés comprised the staff of the establishment, while now more than three hundred men, boys, and girls are busily engaged in the *mechanical department alone* to meet the requirements of a daily increasing development of a business unique in its various ramifications. The area occupied is some three or four acres, and the works, begun in March 1879, have just been completed. They are replete with every adjunct necessary for the carrying out of all the commercial *requirements*, and ensuring the comfort of those engaged in the manufacture. The whole of the works are on the ground-floor, and a system of narrow-gauge tramways is laid

down throughout their entirety, it being estimated that the firm effects a saving of not less than 700*l*. a year by their introduction of labour-saving contrivances and economical mechanical gear, one of the most effective being an automatic packing-machine, a remarkable example of American ingenuity, which in its action is so rapid that it packs and weighs 20,000 packets of cocoa essence per day. Again, in the box-making department most elaborately constructed machinery is employed; one machine cutting the boards to the required size, while another glues the parts together, and perfects the shell, the output averaging about 12,000 daily.

When the cocoa nibs or beans are first received from the docks, they are placed in a long cylinder, revolving, and pierced at intervals by apertures varying, in gradation from coarse to fine, at the base of which are as many funnels as there are apertures From the funnel the nuts assorted to their sizes, drop automatically into receptions from which all foreign and extraneous substances are rejected. Hence they are removed to the roasting-room,in which are nine rotating cylinders,driven by steam. Here they are placed and allowed to roast. The operation being a most delicate and important one, is only entrusted to workmen of known skill and judgment. After roasting they are allowed to cool, then they are ready to be what is technically termed " broken down." The now crisp roasted nuts are placed in a hopper and afterwards raised by an elevator, and passed through a machine which gently cracks them, disengaging the hard, thin skin, which by this means can be separated from the nutritive portion of the nut—*viz.*, the rich glossy kernel, known to the public as cocoa nibs.

The mill-room into which we now pass, is a very spacious and well-arranged apartment, in which numerous machines are employed in the manufacture of cocoa and chocolate, the most approved modern mechanical appliances having been introduced. At one side of this room a long line of millstones are at work crushing the nibs, which are fed into a hopper, from whence they pass between granite millstones. As these stones are heated the nibs are reduced to a creamy fluid, which flows into a receptacle. The nibs are hard and brittle before they are crushed, but after a few minutes' grinding the oil which they contain is disengaged by the heat, and an oleaginous paste is produced. From this fluid the fat is extracted by means of a certain proce s—a speciality of the firm—and the substances is left perfectly dry. After the cocoa has undergone other treatments peculiar to Messrs. Cadbury Brothers' manufactory, the well-known cocoa essence for which the firm is celebrated is produced.

The second branch of manufacture—cocoa that thickens in the cup—requires only brief description. There is still a demand for this article, which is a beverage preferred by many to any other preparation. A given portion of the liquid cocoa is poured into a large steam-heated pan and weighed with sugar, arrowroot, &c., which differ in kind and quality, according to the value of the chocolate powder required. The mixture in the pan having been thus prepared, strong iron arms are set in motion which reduced the mass to fine impalpab e powder, the process of levigation being completed in a few moments.

We now come to the third branch of manufacture, which is of considerable commercial importance, and very extensive. Sweet chocolate, for eating and drinking, forms the most delicious of all confections of beverages, and cocoa prepared in this way, is another of the specialities of the firm.

The pure cocoa is in the first place incorporate with white sugar in what is called a " Melangeur." This mixing machine consist of a round granite revolving slab, forming a pan, the sides being made of steel. Into this receptacle the cocoa and sugar are poured, and two heavy stationary granite rollers bruise the thick mass, which is reduced to the consistency of dough. A double knife, the action of which is similar to that of a screw propeller, continually revolves just above the rotary stone slab, and distributes the chocolate, scraping the dense admixture as it passes. The mixed substance is then removed from the " Melangeurs" for further treatment in other machines adjacent. The chocolate is placed in a hopper, surmounting an appliance fitted with three granite cylinders, which systematically and gradually reduce the chocolate to a given degree of fineness, the operation being effected with remarkable exactitude. This result is produced by the regulation of the speed of each of the three cylinders. For example, the second roller or cylinder revolves twice as fast as the first, and the third three times as fast as No 1. By this method of gradation perfection is secured, the substance being rendered wonderfully fine and smooth. On passing from the last cylinder the chocolate is removed by a stationary knife in layers thin as the finest sheet of paper,and deposited in a receptacle ready for moulding into shapes and sizes almost innumerable.

We do not in this article propose to enter exhaustively into every matter of detail, as we shall have occasion at another time to recur to other branches. particularly the manufacture of " creams " But the mechanical divisions are of such merits that a few words in conclusion relating to the saw-mills, tinning-rooms, &c., may well be written, these departments being, like all those we have referred to, spacious convenient and containing every appliance tending to economise labour and save valuable time. Any one visiting these workshops would be more than surprised at the " order out of chaos," which is displayed so markedly; and the buzz and busy whirl of the circular saws, the ever-constant hammering of the boxmakers, and the general activity of all engaged would cause one to marvel where the possibility could exist for the use of the thousands of boxes thus turned out.

In any further notice we shall remark on those departments engaged in the manufacture of *confections*, notably among them being those of chocolate creams.

CINCHONA.

THE real Eldorado of India, says the *Englishman*, is cinchona. " We make this assertion after reading the report of the Darjeeling Tea and Cinchona Association for the last year just published, from which we take the following facts:—There was a profit on the past year's working of Rs. 1,87,892-13-4. The estimated crop of bark was greatly exceeded, the total shipment of dry bark having reached 353,608 lbs; and although the results obtained cannot but be admitted as satisfactory, there is considered to have been an element of disappointment in the excessive loss in weight in the drying process during the past season, nearly 4½ lbs. of green bark having been required to produce 1 lb. of dry. A sum of Rs. 1,20,000 has already been paid as an *ad interim* dividend to the extent of 60 per cent., and a final dividend of 40 per cent. on the paid up capital is now declared, making in all 100 per cent. for the year. The estimates for the current season are: Expenditure Rs. 1,06,000, outturn of bark 300,000 lbs. tea 8,000lbs. Where can we find another company in India showing such favourable results?"

IT appears from a statement made in the House of Commons that the further extension of the cinchona trade in India is engaging attention. Captain Price asked the Secretary of State for India whether it was the fact that the Indian Government were exporting large quantities of cinchona bark for sale in London; and whether, in introducing the cinchona plant into India, the Government did so with the object of encouraging private enterprise, or of competing in the market with private trade. The Marquis of Hartington said:—"The object of the Government in introducing cinchona into India was to provide an abundant supply of a cheap febrifuge in that country. Almost all the bark produced in the Bengal plantation is manufactured in India for use there, but difficulty has been found in treating the produce of the Madras plantations in the same way as that of the Bengal plantations. For this reason the greater part of it is sent to England, and it is believed that the sale of this bark has established a reputation for the Indian growths, to the great advantage of private growers; but an experiment is now being made on a large scale with a view to its manufacture in England on Government account, and if that experiment is successful it is probable the sale will be largely increased." We have repeatedly drawn attention to this question. The time has now clearly arrived when the Government should withdraw from the prosecution of this industry.

THE GOVERNMENT OF INDIA AS CINCHONA MERCHANTS.

THE arrival in London of a first shipment of cinchona, by the Indian Government has raised a question of considerable importance. In introducing the cinchona plant into India, the Government had two objects in view. They wished, in the first place to promote an industry for which they believed the soil and climate of India to be well suited, and they further desired to provide for themselves the quinine needed by the troops. The experiment has proved very successful, and the Government are not only able to supply their own wants, but have further been able thus to ship thither a large quantity of the bark for public sale They are, in fact, trading as cinchona merchants, and it is not surprising that against this an outcry is being raised. The planters of Ceylon for instance, complain that their industry, which the Indian Government, by grants of plants, &c., has done much to foster, will be unable to bear up against the competition of the State, which pays no rent for its land, and has the public purse to draw upon. Such competition, moreover, is, they maintain, not only unfair but wholly opposed to the original purpose for which the Government experiment in cinchona cultivation was sanctioned. That purpose was to assist private enterprise, not to put difficulties in its way, and they ask that the Government having obtained their first object should rest there and not come into the market as merchants or traders with the odds all on their side To the complaints the Indian Government may of course have a sufficient answer. Admitting that the State should not trade, they may contend that having a surplus of cinchona, it is only right that they should dispose of it Or they may argue that the funds required for the further development of the industry both in India and Ceylon, may be better raised by such sales than by further drafts from the public purse. Until the other side of the case is thus heard, judgment upon it should be reserved. But it is certainly advisable, now that the first step towards instituting Government competition with a struggling industry is being taken, that the reasons which are thought to justify it, and the length to which it is intended to be carried, should be explicitly stated.

CINCHONA NURSERIES: PRACTICAL HINTS.

IN recent issues of your paper, a number of inquiries appear in reference to the rearing of cinchona plants.

When one considers the millions of seedlings reared and the small, very small, proportion of plants returned, perhaps a few practical hints may not be altogether unacceptable to the many who are now interested in cinchona.

Planters have often expressed their surprise to me at the enormous percentage of deaths which occur in cinchona supplied among coffee, or put out into clearings, and conclude therefrom that cinchona is delicate, and a successful clearing depends upon most favourable planting weather.

That plants die by thousands, I admit, but that cinchona is delicate, I deny. The reason of most of the deaths is, in my opinion, attributable to badly reared plants in nurseries. I have seen nurseries where the plants were estimated by millions. The seed had been sown and allowed to grow as thick as possible, the shade gradually removed, and the tops only hardened, but where were the roots of these so-called plants? In a square foot where the plants could be counted by hundreds, how was it possible for roots to form, or the stem near the ground to harden?

There is no wonder that such plants as these die, but a very great wonder if they live. My cinchona nursery has returned seventy-five per cent. of very fine plants with branches of roots from seedlings pricked out; and I feel assured if the same process is adopted, equal success will attend other efforts.

The first thing in beginning a cinchona nursery is choice of ground. Great care should be taken that the soil is not of a fatty or clayey nature. The freer the soil the better. The nurseries I have seen on

Patna land where the earth was black and fatty have been *complete failures*.

It is not necessary to dig the ground up the same as a coffee nursery. Beds should be rounded at the top a little, to admit of nice drainage; sticks and all rubbish removed to the depth of five or six inches, then good free jungle mould brought, thoroughly cleaned and *fired*, before putting on the bed as a final dressing.

The firing process is recommended by Mr. McIvor, but is not usually adopted, and does not accomplish all he says it will. All insect life, eggs, worms, and caterpillars of all kinds are destroyed; but seeds of some varieties of weeds retain their vital energies, although the earth is heated to scalding point. I need not enlarge upon the necessity of having all vermin removed. The advantages must be patent to any one.

The best way to fire the earth is to get an ordinary sheet of corrugated iron, which is used for roofing, raise it far enough from the ground to admit of a good fire being made under it, then put on a half-dozen baskets full of the jungle earth above described, stir it well up till it is scalding hot, and empty on a heap, and keep for a day, to allow of it gradually cooling, when it may be used. This earth need not be put on deeper than three inches.

The next thing is to erect roofs over the beds. They must be put up in such a manner as to admit all the light of heaven, and at the same time exclude the rays of the sun. If the roofs are of such a form as to exclude light, and allow a semi-darkness to prevail in the centres, the seedlings will scarcely sprout at all, and what may come up will be spindly, delicate, and so very sensitive to the rays of the sun, that when pricked out under ferns they will be scorched off by scores.

The advantages therefore of having all the light possible on the seed beds are obvious. The seeds sprout ten times better, and as they grow, gradually harden, so that when pricked out under ferns, they are able to withstand the sun's rays. I have seen a dozen different kinds of seed beds' roof, and the one I have chosen as the best gives all the advantages to the seedlings above described, with none of the evils.

First of all, the seed beds should be made parallel with the course of the sun, that is one *end* of the bed should face the east, and the other should face the west, and should not be more than four feet wide. The roofs should be erected over the beds facing the north. The top of the roof should not be less than five feet high, and the back about eighteen inches from the ground. The roofs should be erected behind each other. Care should be taken not to build the roofs facing the south, for then the sun would play upon the seed when sprouting and kill it.—*Cor. in Ceylon Observer.*

CINCHONA.

THE STORY OF CINCHONA LEDGERIANA.

(From the Field.)

THE following interesting letter from Mr. C. Ledger, so well known in connection with cinchona cultivation, has been sent to us for publication by his brother, Mr. G. Ledger, to whom it was written:—

While engaged in my alpaca enterprise, 1856, I received in the interior of this republic (on the high table plains of San Antonio de los Cobres, in the province of Jujuy), by return of express that some two months before I had sent to the port of Cobija for letters, funds, &c., a packet of newspapers. In one of the papers I read that her Majesty's Government were sending out to S. America a special mission, under charge of Mr. Clements R. Markham, in search of plants and seeds of the cinchona. A Bolivian Indian, Manuel Tucra Mamani, formerly and afterwards a cinchona bark cutter was then accompanying me with two of his sons. He had been in my service since 1843. He accompained me in almost all my frequent journeys into the interior, and was very useful in examining the large quantities of cinchona bark and alpaca wool I was constantly purchasing. I never could get him to ride; he was always at "my stirup" and would show no fatigue after a journey of fourteen to twenty leagues daily for eight to twelve days consecutively. He and his sons were very much attached to me, and I placed every confidence in them. Sitting round our camp-fire one evening, as was my custom after dinner, conversing on all sorts of topics, I mentioned what I had read as to Mr. Markham's mission. Now, Manuel had been with me in three of my journeys into the cinchona district of the Youngas of Bolivia where I had to go looking after laggard contractors for delivery of bark. It was while conversing on the subject of Mr. M.'s journey, and wondering which route he would take, &c., Manuel greatly surprised me by saying: "The gentleman will not leave the Yungas in good health, if he really obtains the 'rojo' plants and seeds." Manuel was always very taciturn and reserved. I said nothing at the time, there being some thirty more of my Indians sitting round the large fire. The next day he reluctantly told me how every stranger on entering the Yungas was closely watched unobserved by himself; how several seed collectors had had their seed changed; how their germinating power was destroyed by their own guides, servants, &c. He also assured me how all the Indians most implicitly believe, if by plants or seed from the Yungas the cinchonas are successfully propagated in other countries, all their own trees will perish. Such, I assure you, is their superstition. Although there are no laws prohibiting the cinchona seed or plants being taken out of the country, still, I have seen private instructions from the prefect in La Paz to sub-perfects of Sorata and Caupolican, ordering the strictest vigilance to prevent any person taking seed or plants out of the country. More than half-a-dozen times I have had my luggage, bedding, &c. searched when coming out of the valleys of the Yungas.

So much importance did I attach to all I heard from Manuel, that, as an Englishman, I looked upon it as a duty to advise Mr. Markham and put him on his guard. I consequently addressed him, relating all I had heard, under cover to Mr. George H. Nugent, H. B. M.'s Vice-Consul, Arica, sending by express (on foot, of course) a distance of more than 600 miles. Some two months after I received answer, saying, "Your letter arrived too late. Mr. Markham is now in Carabaya not having been allowed to enter Bolivia." Although Mr. Markham was unsucessful upon this occasion, he subsequently succeeded, as related by him in his "Popular Account of the introduction of cinchona cultivation into British India," 1830, and in a book published in 1862.

You are aware how I am looked upon as a doctor by the Indians. Well, one day soon after, when making a decoction from some "coca" leaves Manuel had brought me the boiling water I said: "Manuel, I may some day require some seed and flowers of the famous white flowers, *rojo* cascarilla, as a remedy; and I shall rely on your not deceiving me in the way you have told me." He merely said, Patron, if *you* ever require such seed and flowers, I will not deceive *you*." And I thought no more about it.

Manuel was never aware of my requiring seed and leaves for propagating purposes he was always told they were wanted to make special remedy for a special illness. After much thought, and from my knowledge of him, I questioned if he would have got them for propagating purposes. He was very much attached to me, no doubt, but he was afraid of his own people.

For many years, since 1844, I had felt deeply interested in seeing Europe, and my own dear country in particular, free from being dependent on Peru or Bolivia for a supply of life giving quinine; remembering and relying on Manuel's promise to me in 1856, and I resolved to do all in my power to obtain the very best cinchona seed produced in Bolivia.

His son Santiago went to Australia with me in 1858. In 1861, the day before sending back to South America, Santiago and other Indians who had accompained me there as shepherds of the alpacas, I bought 200 Spanish dollars, and said to him: "You will give these to your father. Tell him I count on his keeping his promise to get for me 40lbs. to 50lbs. of rojo cinchona (white flower) seed. He must get it from trees we had sit under together when trying to reach the Mamore river in 1851. To give my kindest remembrances (and small present) to Fra. Simon, curate in in the Apolo missions. To meet me at Tacna (Peru) by May 1863 If not bringing pure ripe rojo seed, flowers and leaves, never to look for me again. Should I not have arrived from Australia, to give seed, &c., to my daughters, who would give him $500." In June, 1868, he sent a nephew to my children at Tacna, asking for $500, saying he had not then collected seed for the patron, but by next season would do so, if well ripe and not hurt by frost.

I arrived back in Tacna on the 5th of January 1865, after a separation of twelve years from my home and children, completely ruined by the introduction of the alpaca into the Australian colonies turning out a failure.

I at once sent a message to Manuel, informing him of my arrival. At the end of May he arrived with his precious seed. It is only now, some twenty-four years after poor Manuel promised not to deceive me, manifest how faithfully and loyally he kept his promise, I say *poor* Manuel, because as you know, he lost his life while trying to get another supply of the same class of seed for me in 1872-73. You are aware, too, how later on I lost another old Indian friend, poor Poli, when bringing seed and flowers in 1877.

I feel thoroughly convinced in my own mind that such astonishingly rich quinine-yielding trees as those in Java are not known to exist (in any quantity) in Bolivia. These wonderful trees are only to be found in the Caupolican district, and, as rightly stated by Mr. John Eliot Howard, F.R.S., are only to be met in Eastern Yungas. The white flower is specially be longing to the cinchona *rojo* of Apolo.

You will call to mind, no doubt, the very great difficulties you had to get this wonderful "seed" looked at even; how a part was purchased by Mr. Money for account of our East Indian Government for £50 under condition of 10,000 germinating. Though 60,000 plants were successfully raised from it by the late Mr. M'Ivor, I only received the £50.

The seed taken by the Netherlands Government cost it barely £50. I have recently received advice from the courteous Minister for the Colonies, that he proposes to submit to the States-General that £100 be awarded to me.

I see by *The Field* you sent me, containing some account of the propagation of cinchona in Java, that up to this time the seed collected from best specimens has been so well propagated tho that there are now 707,670 Ledgeriana possessed by the Government. At 1*d*. each that would give £2,948-12s. 6d.; at 4lbs of bark per tree, and at, low price of 8s. per lb., £1,182,272. Seeing the immense present and future wealth resulting from my seed, I cannot sometimes help thinking that I am another illustration of the axiom that "inventors are always losers." As far as I am concerned, I lose in money, having spent more than £600, without taking into account the labour and anxiety of so many years. Such then is the "story" attaching to the now famous *Cinchona ledgeriana*, the source, of untold wealth to Java, Ceylon, and, I hope, to India and elsewhere. I am proud to see my "dream" of close on forty years ago is realised, Europe is no longer dependent on Peru or Bolivia for its supply of life-giving quinine.

C. LEDGER.

Tucuman, Arg. Rep. Dec. 15th, 1880.

SERICULTURE.

THE attempts made to introduce the cultivation of the mulberry tree into Western Australia, with a view to the production of silk, promise to be successful, several persons, as well as the Government, having prepared land, and commenced work in earnest. Samples of cocoons from the colony have been pronounced to be of first-class quality; and there is little doubt that, as regards soil and climate, few places are so well adapted for the establishment of this industry.

IT is proposed to establish a silk conditioning house in the City of New York. The silk manufacturing industry of America has reached a point of development where the need of a conditioning house has become imperative.

It is proposed to found such an establishment in New York City. The organisation will have three departments, thus offering a triple advantage to its patrons.

I. *The process of conditioning*, by which the percentage of moisture in the silk is determined. This will give the exact weight of raw material.

II. *The process of sizing or deniering*, by which will be determined the exact bulk (denier) of the thread. This will furnish for thrown silk an analysis of the first twist and the second twist, for raw silk a test for winding and for reeling.

III. *The process of boiling off* (*decreusage*), by which will be ascertained the amount of adulteration or weighting.

This will be the first conditioning house in the United States; in Europe there is one at every large centre of the silk or wool trade and manufacture.

TOBACCO.

THE JAFFNA TOBACCO TRADE.

IS the trade of Jaffna, whether we consider the extent of a land under tobacco cultivation or the amount of capital employed in it. As a matter of fact tobacco is more largely cultivated in the Northern Province than any other product. Extensive tracts of land are devoted to tobacco cultivation in all parts of the province. Too many in Pachellapallai, Wadamaradchy, Poonaryn, and Illeppakadavai it furnishes the only means of livelihood. It is much to be regretted that there is no record of the area under cultivation nor of the quantity gathered in at each season. The customs reports furnish us only with the quantity that is exported to India, the tobacco, which is converted into cigar or which is sent to the towns in the Island being not noticed. There is, however, not the least doubt that the quantity of tobacco which meets the demands of the Island is very large.

In tobacco there is a greater variety than in any other article: but one feature common to the tobacco of the province, and which has been more than once noticed, is that it possesses a flavour and strength seldom met with in tobacco cultivated in other parts of the Island. We cannot at present mention the names of all the species known here. The chief of them are *Illeppakadavai*, *Netheavaddai*, and *Pokkan*, and these are considered very rich and form a large proportion in the tobacco that is used in the manufacture of cigars. Pokkan is also used for chewing purposes—but from its high price its use in this manner is limited only to the well-to-do classes.

Another circumstance connected with the tobacco trade and not generally known, is that the tobacco exported to India is far inferior to that which is utilised for cigars. The tobacco for export is tied into sheaves containing 500 and upwards, rolled into bundles or chippams and sent off. The tobacco exported during 1880 is as follows:—

	cwt.
January	4,064
February	4,820
March	4,569
April	585
October	6,478
November	8,426
December	4,232

The total is 33,174 cwt. We have no figures for the quantity drawn to meet the demands in the Island. It is a well-known fact that a large supply is generally sent to Colombo, Galle, Kegalla, Gampola, and other places.

An impression exists in certain quarters that the tobacco trade has declined, and that it is not so remunerative as it was a few years back. In our inquiries we have not met with a single circumstance to confirm it: and all that we have been able to ascertain shews it to be a wrong and unfounded presumption. There are more men engaged in the trade and the cultivation of the leaf is more extended now than in any period within our recollection.

In this connection it would be unfair not to mention the name of the gentleman who rendered material service towards the extension and development of this trade. We refer to Mr. Charles Morrison now Agent, O. B. C. Kandy. His energy and ability apart, during the time he presided over the affairs of the local Branch of the O. B. C., he gave active encouragement to the trade, extended the business of the institution entrusted to him and relieved the traders from the necessity of borrowing money from the unrelenting Chetty who was the only capitalist then known in the land.

It is the opinion of experienced traders that the outturn for this year will be very small compared with that last year, of the rain in January and February having prevented transplantation. The plants are still young and the crop will not be ready for market for a short time to come. A great disadvantage the tobacco traders suffer from is the stoppage of steam communication. This is a source of loss and inconvenience. The mode now adopted is to send it in sailing vessels to Negapatam and thence to Galle or Colombo by means of steamers.—*Cor. Ceylon Patriot.*

Registered No. 182.

THE

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CONTENTS.

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of [illegible] all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

All correspondence must bear the full name and address of the [illegible]r, not necessarily for publication, but as a guarantee of [illegible] faith. We shall take no notice of anonymous letters.

ACKNOWLEDGMENTS.

Supplemental Report on Indian Wheat.—London: Her Majesty's Stationery Office, 1881.

Report on Popular Education, Punjab, 1879-80.—Lahore: W. Ball, 1880.

Journal of the Royal Agricultural Society of England, Part 1., No. 33. London: John Murray 1881.

CORRESPONDENCE.

BOOKS ON INDIGO.

TO THE EDITOR.

Sir,—I shall feel obliged much if you will kindly inform me of the titles of some good books on the culture of the indigo plant and the manufacture of indigo.

J. G. F.

Bellary, 23rd May 1881.

WEEDS.

TO THE EDITOR.

Sir,—I peruse with interest your note on letter by Gardener, and concur with you in opinion that the nourishment taken by the weeds if given to the plant (tea or coffee as the case may be) the results would be more favourable.

Gardener appears not to see the advisability of keeping a garden free of weeds, rather considers it the best kind of cultivation to allow jungle to grow a considerable height; from this are we to understand a height to cover the plants? It would appear so from his alluding to hoeing the garden when the rains are on.

Probably the following may be of service to some. A party, quite a beginner, allowed the weeds (ferns particularly) to grow on his newly planted coffee estate, with the idea these would shelter the young plants from the sun, the results were he lost over 50 per cent. of his plants, and he attributed the cause solely to excess of moisture caused by weeds. This theory may in like manner be applicable to large plants, the only difference being matter of time.

For my part I have noticed the difference of a well-kept estate and that which is allowed to grow weeds, and am decidedly in favour of the former system, moreover would advise all interested in the agricultural branch to follow the same, although it may be at a greater expense the results, in like manner will invariably be better,

WEEDS.

Neilgherries, 27th May 1881.

ARTESIAN WELLS IN THE DARLING DISTRICT.

(*To the Editor of the Australasian.*)

Sir,—Your paper of 5th March contains a letter with the above heading, signed by Richard Bennett. I have not seen any of the previous writings referred to by Mr. Bennett, but I would like to ask him a few questions suggested by his letter, and to present a few points for his consideration; and here I may mention that I have no pretentions to scientific knowledge, and to prevent misunderstanding. I will also state that, for the purposes of this letter, when I allude to artesian water, I mean water only which actually flows over the surface, not that which merely rises from a lower level to a higher one, say from 150ft. to within 100ft. of the surface. Wells with water of the last description, sunk, or sunk and bored, are being worked successfully all over Australia.

Mr. Bennett is writing about artesian water, and remarks that the river accommodation of the country is inadequate to carry off the water supplied by the rainfall. He infers from this that by far the larger quantity is absorbed by the soil, and sinks to large caverns

and reservoirs in the bed rock, where, he further remarks, it must be subjected to considerable pressure occasioned by the constantly descending water and the atmosphere.

Does Mr. Bennett mean to imply that from this pressure artesian water is to derive its power of rising to the surface? And how does he account for the fact that he never struck artesian water during the time he was engaged sinking wells, and otherwise doing work for the conservation of water?

Atmospheric pressure will probably have at least as much effect in preventing water from rising as in forcing it down. The effect which the pressure of water descending has in forcing water to return again towards the surface must cease as soon as the level of the stratum is reached which bears it away to a lower level. That level was necessarily reached by the water Mr. Bennett got in his shaft wells, if he was successful in obtaining it at all.

Rightly or wrongly, I infer from Mr. Bennett's use of the term shaft well in his letter that he thinks a pipe or tube well would have the effect of giving artesian water in places where it has not risen in shaft wells. This would only be possible on the supposition that the pipe reaches a lower water totally unconnected with that which is in the shaft. And if a case were to occur in which this was done, and the lower water found to be artesian, how about Mr. Bennett's pressure? If his theory is correct, the pressure should surely apply in the first instance to the upper water—or is that only in course of being pressed down to the large cavern or reservoir? In that case, however, the water cannot rise from the reservoir to the surface, because it is not full; if it were full, no more water could get down, therefore the top water should rise as well as that which is underneath.

If it is correct that the well-supplies are obtained from surplus rain water, and that the power which forces it to rise to any given level is derived from the water itself, proceeding first from the surface and forcing itself downwards and upwards again as the various strata fill, then there must be streams or water-bearing strata at that given level which carry the surplus water away somewhere. Surplus, that is, after the strata become fully charged; and this seems to be proved by the fact that at places along the coast, notably and to my own knowledge at Port M'Donnel, fresh water rises through the sea, and can be both seen and tasted, while in the limestone country inland there are streams flowing towards the sea, which can be seen in caves and through holes in the ground under large districts in the south-east of South Australia.

I have said that if it is correct that the well supplies are obtained from the surface directly—that is, if the power which raises the water to a given height is merely that of water rising again towards the level of its source—there must be streams of water-bearing strata carrying the water away, and these must have a very peculiar capacity, because it is a fact that, no matter how long the succession of wet seasons, and no matter how wet they be, the water level in deep wells does not rise, while equally in dry seasons it does not fall, neither does the supply diminish.

If such streams are the outlet for the surplus rain water, there can be no artesian water derived from that source with these channels of outlet, so long as the outlet is sufficient. Not only so. Artesian wells can never be got from any water, no matter how deep, which has any connexion with that which has such an outlet, unless it derives its power of rising from a pressure outside of mere gravitation.

If the outlet were only insufficient, any artesian water from such a source could only be intermittent.

If these or such as these streams be not the outlet, all underground water should be artesian. Because unless there is some other means of disposing of the enormous supply of "constantly descending water," the water bearing strata must surely fill by degrees higher and higher upwards from the "bed rock," and in time the water in the well must rise to the surface.

I know of no one who can tell by any given indication where to sink a well, tube, or shaft, to ensure probable success. All the work is done in the dark, and success varies in different districts, and in different parts of a district, to such an extent that I am inclined to think no one ever will be able to tell. If any one, by theory or otherwise, could guide water-seekers in this matter, he would deserve all the credit Mr. Bennett asks for.

The whole question is a very interesting one, and must be taken up by scientific men, who know more about the subject and the laws by which it is governed than most of us practical workers, before anything will be made of it by writing. We are content to go blundering on, sinking here and boring there, satisfied if water is got at all, without much caring where it comes from or how it comes.

There is, however, a large mass of information, and an accumulation of fact, possessed by well-sinkers, station-owners, and managers, which would be of great use to a scientific man, if by any means he could collect the useful portion.

My own opinion is, that artesian water will not be got generally in Australia, except, perhaps, at great depths, although water which will rise to a given level, will almost invariably be got at reasonable depths, say 500ft. or less, and of varying quality. As a rule, the greater the depth the better the quality. Where artesian water is got, my opinion is that it will always be fresh, or nearly so, and that it will be found to derive its power of rising, not in that it enters the ground and works along between two impervious strata till they crop up to the surface, when it should be got between them, but in that it comes from a very low level, and is forced from there probably by gas or heat generating steam. And if that were allowed to be a possible theory, I should also be of opinion that much of the water in the deep wells which rises so far, and no farther, also derives its power from some such source—from one, at all events, less variable than surface supply. I refer solely to Central Australia, not to the country near the coast ranges.

Apologising for the length to which I have drawn out this letter, my only excuse for which is the interest so large a portion of your readers in this and other dry districts take in the question, I would, in conclusion, ask you or any of your readers to draw attention to any book or pamphlet which may have been written on the subject of water-supply referring to Australia. I know of none.—Yours, &c.,

DAVID BROWN.

Kallara, Darling River, March 22.

ARTESIAN WELL BORING.

(To the Editor of the Australasian.)

SIR,—In your issue of April 2, under the heading "Station Improvements," a letter from "Paroo" appears, in which reference is made to a misunderstanding that has arisen with regard to the use of Messrs. Wright and Edwards's water auger at Mount Wilson well.

As my name appears in that letter, and "Paroo" requests me to state the manner in which the boring was carried out, I shall comply with his request, wishing at the same time that he had named others in the district, who have had far longer experience in the use of this machine, consequently better qualified to point out its advantages or deficiencies. I shall, therefore, confine myself solely to the description of the boring of Mount Wilson well, which is the question "Paroo" wishes to "be set at rest."

When this shaft was first started, it was intended that it should be sunk until water would be struck, but after going down 300ft. through a sort of blue slaty substance, containing an innumerable quantity of shells of marine formation, the work was suspended, and it was thought advisable to try Messrs. Wright and Edwards's water auger, which would be a cheaper method of solving that rather doubtful problem, "Does fresh water lie underneath this blue slate, which seems to be so widely spread over the back Darling country?"

The machine arrived, also a person with it (Mr. J. A. Niemann), who had some experience in the working of the machine. His opinion was, when he examined the shaft, that what he called "bottom" had been struck, and that it was useless to go further in search of water. However, it was determined that the boring should go o[illegible] bottom of the shaft to find out to what depth the blue slate [illegible] also to find out what lay underneath, even if water was not struck.

After two unsuccessful attempts, the tubes in each case either breaking or jamming at something over 100ft., water was at length obtained at a depth of 184ft., or 484ft. in all from the surface.

Now, as to the method of the "boring," which seems to be the point of difference between "Paroo" and Messrs. Wright and Edwards. The tubes, rods, and auger alone, with appendages, were used, the machine itself never having been taken out of the box in which it was packed until the present day. The tubes, with steel cutter attached, are turned round by means of a lever, which has steel teeth that can be screwed up to gripe the iron tube. Another lever of a similar sort is used for turning the rods, at the end of which is attached the auger. When the rods are turned round the auger bores its way down, and becomes filled with the substance through which it passes. The rods are then drawn up the shaft by means of a "whim" or other appliance, and remain suspended in the shaft whilst the auger, at their opposite extremity, is being cleaned; meantime the tubes h[illegible] turning round, which, with the cutter attached, sink down an[illegible]e space of the material that has just been taken out [illegible] By this method it is easily seen that a great amount of l[illegible] saved, as it is unnecessary to screw and unscrew each joint [illegible]e pipe every time the auger is raised to be cleaned. When rock is struck, the tubes are drawn by the same method as the rods and an ordinary steel jumper (a little larger than the tubes) substituted for the auger. The jumper [illegible] in the ordinary way, and the rods are of sufficient weight of them[illegible] to force the jumper through the rock. We are working at a w[illegible] present on this principle, and have reached 476ft., 8ft. of which [illegible]

been through solid rock, in strata varying from a few inches to 2ft. or 3ft. in thickness. I forgot to mention that at Mount Wilson well no salt water was struck, but at a depth of 140ft. a small supply of fresh water was obtained.

I do not think that Messrs. Wright and Edwards's machine would bore to such a depth as the wells I have described. In this back country strong supplies of very salt water near the surface are often struck—so strong that in many cases the shafts have to be abandoned.

Now this machine would be suitable for finding out spots where this salt water does not exist; and where such a spot is found, I would recommend sinking 200ft. or so in the usual method, and then using the rods in the manner above described, so that over 400ft. could be reached without any unscrewing—which, to my mind, is the greatest drawback to the machine.

Hoping, Sir, that you will pardon my rather long explanation, and desiring to see others giving their opinions on these important matters, I am, &c.,

ROBERT A. CHESNEY.

Dunlop, April 9.

SCIENTIFIC CRITICISM.

(To the Editor of the Ceylon Times.)

SIR,—It has occurred to me that the results of what has been termed highly scientific cultivation of coffee in Ceylon has been somewhat on a par with the effect of Liebig's essence of beef on the human system. This essence undoubtedly contains all the active and nutritive principles essential to support the life of man, and yet we know as a fact that man or animals cannot be supported upon it alone; combined with other bulky materials it answers the purpose well enough, not otherwise.

I suppose you remember the reply of the old-fashioned planter to the statement of a neighbour that some clever scientist had invented a coffee manure of great power, the value of which was in its great portability, for that an ounce or two would suffice for a tree. The old planter remarked, "yes, he will carry his manure in one waistcoat pocket and take away the crop in the other."

It appears to me as though a good many amongst us had been living in a fool's paradise as regards cultivation. I for one shall never have any faith in agricultural scientist until they can explain why Haputalle has continued to give good crops for a quarter of a century without manure, when young coffee in other districts refuses to give good crops even with the aid of manure. Why did not Mr. Morris pay a visit to the Ouvah side of the country when he was requested to do so, in reference to leaf-disease, though I am ready to confess that there are other districts in which the attacks of the coffee pest have been successfully resisted without science, and as I believe without expensive manures.

Whilst on this subject allow me to ask if the scientists can offer any explanation of the terrible mortality amongst cinchona seedlings, plants and trees. They die off at all ages and no body has yet discovered why this happens.

INQUIRER.

The Hills, May 8th, 1881.

AGRICULTURAL COLLEGE.

(To the Editor, Madras Times.)

SIR,—It is gratifying to learn that after a dead silence for five years, the Government have sanctioned the entertainment of three agricultural instructors, two for Tamil, and one for Telugu districts, on a monthly salary of Rs. 60, to be increased to Rs. 80 by biennial increment of Rs. 4. The Principal of the College is now prepared to receive applications from the candidates who have a first class certificate of the College, and who are thoroughly acquainted with the language of the district in which the candidate seeks employment. I hear from a reliable source that one of these is to be given to one of the late students. Out of the remaining two, reserved for the present students of the College, one will be secured by the Brahmin scholarship student, and the other by a Moodeliar, as the former stands high in rank among the applicants who took Tamil as their optional language in the University Entrance Examination, and the latter is the only student among those who took Telugu as the optional language. As the nature of the post requires a thorough knowledge of the vernacular of the district, for obvious reasons, there is nothing to be said against the intended selection, which is an impartial and sound one. But what I wish to ask is, of what earthly use is the second class certificates of the College, if only first class certificates are valued? Hitherto we satisfied ourselves that the second class certificated students of the first batch would be provided with employment prior to the first class certificated students of the present classes. Alas! we are really disappointed! The Agricultural Department is no better than the other branches of the Revenue Department, in doing justice to its subordinate. It would fully resemble the Collector's Department in every respect should the three new appointments be conferred on three Brahmins instead of two Brahmins and a Sudra, as is likely to be the case.

EX-STUDENT.

CINCHONA AND COFFEE STATISTICS.

(To the Editor, Ceylon Times.)

SIR,—The advice rendered by the Chairman of the Planters' Association to your contemporary in regard to the preparation of statistical returns of cinchona and coffee, is no doubt perfectly correct in principle, but it is difficult to understand the value of such returns when they are compiled. Tabulated returns of the acreage of coffee are always looked upon as misleading, at any rate in most of the older districts, and indeed they must be misleading until we are able to deduct from the areas given the extent of coffee which has long ceased to be an element in the matter of crop. Not only are these figures misleading, but they are actually prejudicial to our good name as coffee producers, because these over-statements of acreage certainly reduce the apparent average of yield per acre.

With regard to attempting to tabulate cinchona areas without utterly misleading the public as to our future corps of bark, I maintain that it is impossible. In the case of coffee, readers of these returns are misled by what has died out and what has ceased to yield, with regard to cinchona they will be equally misled by figures representing what are never likely to produce crop. What practical end can be attained by counting all the chinceona plants in the island in 1881, when a half the number may not live to see the next year, or at any rate may not live to see their fourth year, I regard all this attempt at arriving at correct data as simply so much trouble thrown away.

I am equally at a loss to understand what the Chairman of the Association intends to convey in telling us that whereas a good many years ago there was a difference in the value of plantation, coffee equal to 20 shillings the cwt, a greater part of which difference has now ceased to exist, and yet immediately afterwards tells us that the quality of Ceylon coffee has not deteriorated. Now if this difference in value has disappeared, it does not require much argument to shew either that some of our coffees have declined in value, or that others have very much increased in value. How otherwise is it possible to account for this equalisation which we are told exists at the present time. No doubt cultivation has been improved of late years and so likewise the preparation of our crops in Colombo. I wish I could say that this was the case in all instances. It is to be feared however that if the natural quality of our bean has not degenerated in growth, some influences in Colombo godowns are at work unfavourable to the market value of the article, because I have been told by friends who have made the experiment, that portions of their corps shipped by some firms have realised at home far higher prices than other portions shipped by different firms. How is this to be explained is the question. If the able and experienced Chairman of the Association could throw any light upon this matter, it would be of more practical value than attempts at framing planting returns which are bound to be misleading.

PROPRIETOR.

May 23rd.

AGRICULTURE IN INDIA.

(To the Editor of the Madras Mail.)

SIR.—Agriculture in this country, as an art and a science, has been neglected. No improvement or advancement has yet been affected. There can be no doubt that the wealth of India lies buried in her soil, which, by judicious cultivation, can be raised therefrom. From time immemorial, not only has the soil been cultivated in the rudest possible manner, but the first principle of agriculture, *i.e.*, to give back what is taken from it, has been disregarded. In no land, more than in India, has this law of restoration been ignored, for her soil, from being once fertile, has become impoverished, and the once renowned garden of the East has become sterile. The fact that most of our fields are deficient in the food necessary for the proper development of grain, and that this has been caused by the processes of exhaustion continually going on, cannot be disputed in the face of statistics showing the relative outturn of the past and the present. To make it clear in the seventeenth century the average produce of rice, of wheat, and of lint cotton, amounted to 1,340lbs., 1,155lbs., and 228lbs. per acre respectively. But in the present century, the produce has been, of rice 800lbs., of wheat 660, of lint cotton 53lbs. per acre. Looking at these figures, are we not surprised to see the

condition to which India has been reduced by the neglect of men of intellect, who are, for the most part, mirasdars (landholders). These men forget the fact that kings have risen to the throne from the plough, and have left the cares of the State amidst the blessings which an agricultural life affords. 'The Roman Consul Cincinnatus, the saviour of Rome, took to the plough, resigning the cares of the State, and instances can be multiplied.

It is not only the time-honored custom and the superstition in India that hinder any progress towards improvement in agriculture, but, to a certain extent, the present system of education. The blessings which education has conferred on the public are manifold, but the disadvantage is that young men, studying in the colleges established by Government, have for their goal, only Government employ, and cast a disdainful look on agricultural life. Many, unlike those in America and Germany, in pursuit of their livelihood, are called to the bar, encourage litigation, and extort from the ignorant ryot his small earnings, won by hard and honest labour, and hoarded by an economy that involves semi-starvation. Others wander up and down the street, haunt the houses and offices of the head officers of the district in quest of employment, and thus waste their time in the wild hope of obtaining high positions in the public service. Day by day such a state of things is increasing, and professional studies are uncared for. I do not mean to say that no professional study is encouraged. Civil Engineering and Medical Colleges have been established for this purpose. The Civil Engineering College turns out a body of trained men, and the Medical College sends out each year young men well versed in the science and practice of medicine, who are useful to the country. Noble as these professions are, there is another which contributes greatly to the well being both of nations and of individuals, but which, it is to be regretted, has received but indifferent attention at the hands of the rulers of this purely agricultural country. Education in agriculture, which is the backbone of the prosperity of a country, has been neglected to a sad extent, and the result is evident in the recurrence of famines, aggravated by the pressure of a fastly increasing population. The Court of Directors of the Honorable East India Company, in their despatch of the 19th July 1854, on the education of the people, observed, "No single advantage that could be afforded to the vast rural population of India would equal the introduction of an improved system of agriculture." Since that time no step has been taken towards this end. The indispensible necessity for an advanced agriculture to the comfort and wealth, and to the very existence of a nation, renders it an object peculiarly worthy of the attention of those who desire that India should regain the prestige which she once possessed. It is, therefore, incumbent on the rulers of the country to give their earliest attention to the dissemination, among all classes, of a sound agricultural education.

A FARMER.

THE AGRICULTURAL DEPARTMENT.

(To the Editor, Pioneer.)

SIR,—What is the first duty of the department at the head of which Mr. Buck reigns? Is it to introduce "improved" ploughs, copied from American and English models to work in the tiny plots which make up the small and scattered Indian holdings? Is it to stir up the fleeting effervescene of native enthusiasm in an agricultural show? Is it to write reports on the grain trade of the N.-W. Provinces? Or is it after all to improve the soil, so that it may produce to perfection the superior food grains and staples of the country? A few thousand "improved" ploughs may be sold every year without in any way increasing the yield per acre. An Indian Agricultural Show comes and goes with the only result, that a decided feeling of relief comes over all concerned when the improved threshing machines, pumping machinery, steam ploughs, and patent manures have left the district. And a report on the grain trade of the province is met with the reply from those interested in the matter. "We knew all that before, but please show us how to get cheaper and better wheat. So it resolves itself into this that the permanent improvement of the physical condition of the soil is the subject which deserves the greatest attention from the Agricultural Department, although as a matter of fact it is the one which is most neglected. Nevertheless it is the one thing in Indian agriculture over which the Government has almost perfect control. The condition of millions of acres of the land in this country can be changed from bad to good at the will of the Government; and yet without doubt it is shown that this condition is slowly progressing from bad to to worse in extensive tracts of country in the N.-W. Provinces. This fact is well known to all who have studied the subject, and in the following words, it is put before the public by Mr. Hume more strongly and truly than ever I could put it:—"Yet again, from another and distinct source, ruin and desolation, more palpable and speedy in its course, though more limited in its operation, await vast tracts in Northern India, unless the voice of reason can gain a hearing and science be allowed to guide agriculture. In Oudh, the Punjab, and the N.-W. Provinces the soils mostly contain an appreciable admixture of saline particles. With the construction of high level canals, the subsoil water level is raised, the surface flooded, the earth yields up its soluble salts to the water, which again restores them (back on the surface) as it passes away in vapour. At first the result may be good and marvellous are the crops that have been raised in the Doab on the first introduction of canal irrigation, owing to the first slender doses of potash and chloride of sodium. But Nature works on blindly and unceasingly. The water below searches out one by one each soluble particle in excess of the particular soil's capacity of retention, and as it slowly creeps up by capillary attraction, leaves those ever behind it on the surface. Time passes on, some crops begin to be unprofitable; in the hottest time of the year, a glimmer, as though of a hoar-frost overspreads the land. The land grows worse and worse, but ever night and day Nature works slowly on and the time comes when, abandoned by the cultivator, the land glitters white and waste as though thickly strewn with crisp new fallen snow; never, alas! to melt away, except under the rays of science. Along the little old Western Jumna Canal thousands of fields are to be seen thus sterilized. Along the course of the mighty Ganges Canal—a work, as it were, but of yesterday—the dreary wintry-looking rime is already in many places creeping over the soil. Come it quickly or come it slowly, the ultimate result here also is certain, and unless a radical change is effected in existing arrangements, we know as definitely as we know that the sun will rise to-morrow, that the time must come when some of the richest arable tracts in Northern India will have become howling saline wastes." I make no excuse for quoting so extensively from Mr. Hume's excellent little pamphlet on Agricultural Reform in India. The above-mentioned sentences should be printed in letters of gold and hung up in every Irrigation Officer's office. This little pamphlet attracted considerable notice when it first appeared, and probably these lines which I have just quoted were read by nearly every European interested in the agriculture of Northern India; but have any steps been take to check the evil which is so graphically described by the late Secretary to the Government of India in the Department of Agriculture? It appears not as we actually find that summer irrigation with canal water is increasing in the N.-W. Provinces: indigo factories are springing up on all sides; and the demand for water is only limited by the supply. A well-known native gentleman from Cawnpore (who is himself a large indigo planter and seed merchant), speaking to me the other day of this increase of indigo cultivation under the influence of canal irrigation, mentioned that the zemindars of a certain district were asked if they would like the canal system extended to their estates. They objected, saying "God forbid! we do not want our wheat and barley fields ruined for the sake of indigo." A horrible satire this on the efforts that are being made by the Government to protect the country from the ravages of famine, and yet it is the pith of the argument against canal irrigation during the summer months in Northern India. These finely divided alluvial soils may be likened to a huge sponge of exquisite texture. When high level canals are run through them, the subsoil is water logged and the spring level is raised; then irrigation by natural flow, particularly in the hot weather, adds to the evil; and capillary action goes on unceasingly to an alarming extent so as to increase the saline efflorescence to such an extent that the land eventually becomes barren, more particularly in those tracts where the rain-fall is partial and light. It is a fact that no saline efflorescence is found on land where the rivers or canals overflow their banks annually and leave a plentiful deposit of silt; the surface soil is renewed and covered, and capillary action to a great extent is checked; and this probably will account for the soil in Egypt being so fertile; besides the temperature there is low. But the porous alluvial tracts of Northern India, which are exposed to the action of a burning sun from one year's end to the other, are bound to suffer from the evils arising from excessive capillary attraction, particularly when the subsoil is fed with water from a network of high-level canals. Too little attention has been bestowed upon the physical property of soils in India, and yet it is the most important question of the day as it affects the condition of millions of acres of land in our most thickly populated districts. The only measure to check the evil is a heroic one; and that is to drain the canals and their distribataries of water during the hot weather, from February to October; and during the *rabi* season to allow canal irrigation by lift only. Will the Agricultural Department have the courage to propose such a course! I am afraid not, as unfortunately the independent action of the authorities in this country is trammelled by the ignorant interference and criticism of people at home, who think the country is on the road to ruin if they do not see a profitable balance sheet; and as indigo and sugar-cane are the two crops which make the canals of Northern India pay, the very idea of prohibiting the summer irrigation of these crops from

the canals is enough to take the breath away from an ordinary N.-W. Province official. But until this is done, the outside public will scarcely consider that the Agricultural Department has done its duty. There is an increasing knowledge springing up among both Europeans and educated natives in this country regarding the principles which guide true agricultural practices; and unless Mr. Buck's department wants the finger of scorn pointed at it for ever, it had better bestir itself to check the evil now being perpetuated by summer irrigation from canals.

AGRICULTURIST.

NOTICE.

SUBSCRIBERS to the STATESMAN, FRIEND OF INDIA, *and* INDIAN AGRICULTURIST *are informed that arrangements have now been made by which these journals will for the future be published under the general superintendence of the undersigned.*

All communications regarding literary matter should be addressed to the Editor of the paper for which it is intended.

All communications concerning the general business of the STATESMAN AND FRIEND OF INDIA *Office, Advertisements, and Subscriptions to the* daily STATESMAN AND FRIEND OF INDIA, weekly FRIEND OF INDIA AND STATESMAN, *and* INDIAN AGRICULTURIST, *should be addressed to the MANAGER,*

WILLIAM RIACH.

13th June 1881.

The Indian Agriculturist.

CALCUTTA, JULY 1, 1881.

IRRIGATION.

MR. BUCKLEY'S work on irrigation in India supplies a want which has long been felt by those interested in that most important and difficult subject. The author tells us that when employed as an Executive Engineer in Bengal, he often found the greatest difficulty in obtaining information concerning any irrigation works other than those to which his own services were given, while he often heard the wildest statements made as to the profit made by Government on canals in distant provinces. This experience was by no means peculiar to Mr. Buckley, and the general ignorance was excused by the fact that there existed no book which gave any comprehensive account of our canals. The volume before us deprives all of this justification for want of knowledge. In the clear, easy style which sometimes characterizes the writings of distinguished or rising Engineers, it gives a detailed description of the nature of each irrigation work, both from a professional and a financial point of view. A map at the beginning of the volume and elaborate statistical tables at the end illustrate and condense the information which it contains. The Indian system of furlough gives departmental officers the leisure necessary for the preparation of such useful works, and in this instance all must acknowledge that it has been well used.

Among the subjects connected with India which have formed the subject of Parliamentary controversy few challenge attention in a manner so marked as that of irrigation. The works already executed have this pre-eminence, that of their kind they are undoubtedly the largest which the world has ever seen. The ancient aqueducts on the Tigris and Euphrates, the canals which at present intersect those regions and the more fruitful parts of Central Asia, as Bokhara and Khiva, the watercourses constructed on the slopes of the Alps, the Pyrenees, and the hills of Cashmere, the works of the Hindu rajahs in ancient Hindustan, are all on a smaller scale, while the dykes of the Netherlands have been made with a different object. There are at present in India 12,750 miles of irrigation canals, besides distributaries watering 6,310,000 acres, and made at a cost of twenty millions and a quarter sterling. These figures indicate works of a magnitude never undertaken by any State for a purpose absolutely unconnected with defence or aggression.

It may be supposed that canals, however numerous, can have little professional interest for the engineer, as being monotonous and tame. There is certainly nothing striking or picturesque in a series of big ditches intercepted by locks. But the headworks, as they are called, of each irrigation system, are magnificent monuments of engineering skill. Before water can be distributed to fertilise the plains, it must be caught and stored where rivers debouch from the hills, and this is a work of no ordinary difficulty. The wizard Michael Scott is said to have "bridled the Tweed with a curb of stone," and this is exactly what our engineers have to do for rivers compared with which the Tweed is but a rivulet. The Ganges and Jumna canals have at their commencement to be carried at right angles across the drainage of the country, sometimes above, sometimes below the beds of mountain torrents, through or round the spurs of mountains. At Cuttack a clear and beautiful lake has been formed in front of the city and at the foot of the surrounding mountains by three large rivers whose united length is nearly three thousand miles. This is certainly the most picturesque sheet of water in Bengal. Nearest to it in beauty is the lake formed at Dehree by the longest weir ever built in one unbroken line of masonry, the Soane having been fairly "bridled," at the foot of the Kymore hills. That these works are by no means simple in their nature is proved by the fact, witnessed by abandoned locks and altered lines, that grave mistakes have from time to time been committed in their construction. Thus the Ganges Canal was constructed by Sir Proby Cautely on a system entirely wrong, which had to be remodeled at great expense.

Mr. Buckley disputes the assertion of the House of Commons Committee of 1879 on Indian Public Works, that "the financial results of works of irrigation are the best test of their utility." It is true that the canals act as famine preventatives, and this is a benefit independent of the returns in money. Moreover the State may not take from the cultivator the whole of the additional produce which irrigation causes. Where such is the case, a canal not remunerative to the State may be of use to the people. It is, however, a fact that financial success is the only test which the public can apply, and it is an excellent one. The cost of constructing canals has been defrayed from borrowed money, the interest of which is discharged out of the products of taxation. As long as any part of the revenue of the country is derived from a source so tainted as that of the license-tax or the salt duty, it must be said that the loss caused by a canal which does not pay its way has to be covered by unpopular or objectionable imposts. The exchequer has not the means of securing for fragments of the population here and there, who chance to live near the best rivers, extraordinary protection or profit at the expense of their less fortunate fellow-subjects. Moreover, now that the total outlay on public works for each year is limited, canals come into direct competitions with railways, as whatever is given to the one is taken from the other. Now railways, which run in all weather, and bring grain to every district, are more powerful for the relief of famine than canals, which dry up when the rainfall is very scanty, and they are therefore wanted most. It is therefore absolutely necessary to criticise every new proposal for the extension of irrigation with the greatest care, from a financial point of view. And in order to do so, we must acquaint ourselves with the pecuniary results of the works already constructed.

We will on a future occasion review the general financial results of irrigation works as shewn in Mr. Buckley's book, but for the present we must confine ourselves to the history given of the undertakings not taken in hand directly by the State. We hear a good deal at present of the necessity for encouraging private enterprise, and in 1858 it was thought politic to do this in the practical form of a guarantee of five per cent. interest on capital to the Madras Irrigation Company. This was certainly an excellent scheme for the investors who obtain more than the usual interest for money in Government securities, with the patronage of management and the chances of any surplus which there may accrue. The result to the public has not been beneficial. While the other irrigation works in Madras, constructed by the direct agency of Government, have been extraordinarily successful, yielding an average

of twelve per cent. a year, that of the Company has never paid anything and cleared its own working expenses in one year only. The works cost more than twice the amount of the estimates, and when finished were open to serious strictures in details. They were practically complete in 1871, and in the following year the Madras Government reported that to pay the guaranteed interest it would be necessary that they should irrigate seventy-eight acres for every one irrigated at that time. The Secretary of State for India wrote in 1872 that "no public advantage whatever, but on the contrary, very serious disadvantage, has accrued from the recourse which for so many years continuously has been had to the co-operation of the Company, in the construction of irrigation works; and there is no reason for supposing that anything would be gained by either the Government or the people of India from further perseverance in the same course."

The East India Irrigation Company was more spirited, inasmuch as it undertook its work without a guarantee. Government engaged to pay the cost of acquiring the land and to collect the water-rate, the Company in other respects acting for itself at its own risk. Sir Arthur Cotton made the designs, and the estimate was for a net profit of thirty-one per cent. The field of operations being Orissa, in which there is an ample rainfall, which does not fail more than once in a century, it will be apparent that the investors, and those who made the estimates, belonged to the class known as sanguine projectors. Water was available for irrigation in 1865, but no one would voluntarily take it at the price offered, and there were scandals as to its being forced on those who did not want it, but were made to pay for it, on a futile pretence that they had "used" it. The receipts were almost nothing, and did not approach the working expenses, which were extravagant. In 1868 Government came to the rescue, buying up the works almost at cost price, though they were at the time a losing business, and worth nothing in the market, except what the land might fetch and the blocks. The net result up to the time to which the accounts are given by Mr. Buckley, April 1877, was a loss of nearly a hundred thousand pounds on the working expenses, besides interest and compound interest, if the latter should be wanted. Great pressure has been brought to bear on the cultivators to make them take the water at about one-fourth of the price at first demanded, which seems to be its real value, and with some success. It seems, however, doubtful if the present receipts, which but slightly exceed the working expenses, can be maintained. The obvious conclusion is that private enterprise, where it has been applied to the formation of irrigation companies, has been unfortunate, the only two such associations formed having hit upon works which must have resulted in the bankruptcy of the Companies, had they not been saved by a Government guarantee or assistance. The loss has fallen on the tax-payer.

IRRIGATION IN INDIA.

FROM time to time the old proposal is brought forward of employing the wind for the purpose of lift in India. Various inventions have been patented in this view; the utmost ingenuity has been displayed; but the great desideratum has not yet been attained, of rendering the motive power constant. The fact is that irrigation by lift is the agricultural stand-by of this continent. Flow of irrigation is a delightful luxury, but it is not everywhere attainable, nor always available. But the zemindar who has his well is independent of all circumstances: he possesses that which under any stress, will give him ten to fifteen acres of cultivation. Of course there are large tracts in India, at any rate in the Punjab, where well irrigation is not possible, owing to the depth of the water below the surface. In such regions, if the rainfall is also inadequate (as it is every where above 76° latitude and between 30° and 23° longitude) canals are absolutely necessary and profitable. "In Sind," write the Famine Commission, "we find a large province in which, without irrigation, agriculture and population would be alike impossible; but the province which, with this protection, has 1,800,000 acres of cultivated land has reached, a fair condition of prosperity, and gives complete evidence of far greater capabilities for progress in future." Now in Sind well irrigation is only possible along the immediate banks of the Indus, as canals are the sole resource. But where the rainfall is ordinarily not inadequate, a zemindar whose holding is protected from drought by a well, is independent of canal irrigation. When water is within from 25 to 40 feet of the surface, such a well will supplement rain irrigation in from thirty to forty acres, and will absolutely protect, in case of failure of rain, from ten to fifteen acres. The cost of such a well is from three hundred to five hundred rupees. The bullocks and men that are employed thereon, have to be maintained in any case for agricultural purposes, and the additional cost in this respect of a twenty-five feet in depth well, with Persian-wheel, is perhaps one man at Rs. 50 a year and a pair of bullocks. Estimating the prime cost of the latter at Rs. 80, and their period of work at five years, and allowing something for their feed (which, however, they really raise for themselves) such a well costs about Rs. 2 an acre for maintenance and Rs. 6 an acre capital cost. For a forty feet in depth well both items may perhaps be doubled. Even in the latter case the cost is by no means so great as that of flow irrigation. The cost of the latter in water-rate is from Rs. 2 to 6 an acre, added to which are the perquisites demanded by the various officials of the Irrigation Department. These cannot be estimated at less than a rupee an acre, putting aside the actual bribes paid for value received in the form of illicit irrigation. The water advantage rate on canals is balanced by the special irrigated rate paid by well lands; nevertheless, the actual water charges on the former may be assumed, on an average, as about double the cost of well irrigation. Of course when rain falls it is worth much more. In such case the cultivator with canal water will get a crop from his whole forty acres instead of from only fifteen, but failure of rain is exceptional in the greater part of the Indian continent, and to provide against it, at the cost of perennial canals, like Sir Proby Cautley's vast work, is not desirable when the same object can be effected by merely lending money at interest for the construction of wells.

The great irrigation measure of the future, then, should be the extension of wells. Two things at present stand in the way of such extension by the unaided efforts of the agriculturists. One is the lack of capital and the high rate of interest charged by money-lenders. The other is want of security of tenure in the cultivators of the soil, and the apathy, short-sightedness, and greed of Indian landlords. Both these matters have been dealt with in great detail by the Famine Commission in the second part of their interesting and most valuable report. Lack of capital among the agricultural classes can only be remedied by prosperity consequent on the improvement of agriculture; but the high rate of interest charged by the bunnia, which is the consequence of bad security, might certainly be lowered by such measures as the Commission recommend. "The aim of all remedial measures as regards the land-holder, should be to make his dealing with his banker fair and open, and while protecting him from extortion or oppressive measures of coercion, to constrain him to pay his just debts to the full extent of his means, but by less cruel and ruinous expedients than imprisonment and the sale of all he possesses. The means available to these ends are cheap and accessible Courts which shall give full consideration to the equity of every claim and a simple method of recovering debts." "As a supplement to cheap and accessible Civil Courts, the assistance of the revenue officials in the repayment of agricultural debt, is probably the greatest benefit to both debtor and creditor which the Government is able to offer." The revenue authorities, it is proposed, should, in each case of decree, decide what is the amount of owner's profit and of cultivator's profit in the land, and, leaving the zemindar the latter, should collect the former with the land revenue and pay it to the creditor "who would thus be freed from all trouble in executing his decree, and from almost all risk." The risk being thus lowered, it is but reasonable that the rate of interest should be reduced. "A mortgage should not be an agreement entered into privately, and on very onerous terms, between the money-lender, taking all risks, and the landowner, assenting to terms he does not understand, but might with advantage to both parties rather be an agreement openly made between them before the Collector, and on terms sanctioned, and to be enforced, by him. Any mortgage not so

made, would rank only as a simple unsecured debt, and no cognizance of it would be taken by the court which alone would have jurisdiction in respect of landed debts." "Unsecured debts, it is proposed, should not be recoverable from the land, and no claims on the land should be recovered except by the Collector and none except those thus openly arranged before him." Further, he "should be empowered to refuse his sanction to a loan incurred for an extravagant and merely ceremonial purpose, or for any cause but one of agricultural improvement or necessity."

By adoption of these carefully-considered proposals—not merely temporarily and locally, as the Commission tentatively propose, but generally and permanently—the improvident borrowing and debt which is the curse of the Indian agricultural classes, and the clog on all improvement, would be restricted, and capital rendered available for purposes of improvement at a very much lower rate of interest than the 24 to 36 per cent. now "commonly paid by agriculturists." The want of security of tenure in cultivators and the apathy and greed of landlords is also remedied by the proposals of the Commission. "It has always been an accepted principle," they write, "in India that the occupant of the soil is entitled to remain there from generation to generation, provided he pays the portion of the produce which may be demanded from him by Government or by some superior holder or landlord, and this proportion has generally been fixed by local custom." Unfortunately, however, under our rule "English ideas of proprietorship were allowed to obscure the important limitations to which, in India, proprietorship was subject, and a tendency arose for the landlord to become an absolute owner, and the cultivator a rack-rented tenant at a competition rent." The tendency of legislation since 1859 has steadily been to remedy this, but there is much diversity in the law of different provinces. The Commission now proposes that these diversities should be reconciled and that a general legislative enactment should give occupancy rights to all cultivators of 12 years' continuous tenure. It is further proposed that at settlement, or, in the case of Bengal, every thirty years, rents should be fixed, field by field, for the term, and the assessment based on a fixed proportion of this rent-roll. Occupancy tenants falling into arrears should be allowed suspension of demand by the revenue courts on account of accident of season, or, if ejected, should be allowed the value of their beneficial interest in the land. Every form of oppression now common among landlords should be encountered by a special procedure to be devised for the purpose, and illegal distraint especially should be rendered penal. Tenants being thus protected, the Commission would further prevent those with rights of occupancy from becoming in their turn rack-renters. While permitting sale or mortgage of the holding, they would prohibit temporary transfers by enacting that the occupancy rights in the land shall pertain to the person in cultivating possession of it, and shall pass from those who fail to cultivate.

Under these provisions cultivators will have a strong incentive to improve their lands, and will be able to procure capital for the purpose; but this is not alone sufficient, for at present the tenant cannot improve the land without the landlord's sanction. On this head the Commission merely says: "We think that more distinct legal provision is required to secure that every occupancy tenant may effect in the land he occupies material improvements of the kind contemplated in Act XXVI. of 1867, without requiring him to obtain the sanction of his landlord and without endangering the security of his tenure, * * further, every tenant, who is ousted by his landlord for failure to pay rent or other causes, should obtain compensation for unexhausted improvements." This is a matter easily arranged. Every tenant desiring a well or other improvement of his land should have the right to call on his landlord through the revenue courts to construct it. On failure the tenant should be entitled to construct it himself, acquiring thereby, if an occupancy tenant, immunity from enhancement (however near may be the term of the settlement) for thirty years; if a tenant-at-will, a thirty years' lease at the rates paid by the occupancy tenants of the neighbourhood. Such a measure would give an enormous impulse to the construction of wells and irrigation works. It would be perfectly just, for the landlord would have the option of constructing the work himself, and the compulsion placed upon him in the matter would be nothing more than is due in the interests of the two other parties equally interested in the land, *viz.*, the Government and the cultivator.

Finally, the Commission propose that Government should supply money much more liberally and readily than at present for agricultural improvements. The difficulties at present thrown in the way are "the obstacles created by insufficient native subordinates to whom the granting of such advances gives extra trouble; the delay and expense of the initial procedure, under which the first application has to be stamped, the bond for repayment stamped and registered, and a minute and troublesome inquiry has to be made into the nature of the applicant's tenure and its value; the necessity of paying interest, which is usually fixed at 6¼ per cent. per annum; the small number of years over which repayment may be spread, and the consequent largeness of the annual instalments; the early date at which they begin to fall due even before the improvement has begun to realise a profit; and the rigidity of the rules for punctual repayment." We consider that the loan should by law be secured on the applicant's interest in the land, and be recoverable by sale of that interest like an arrear of revenue. With this precaution all present difficulties in the way of making these advances might be swept away, as the Commission proposes; and certainly as the money is to be applied to improving land in which the Government is directly interested, the interest might be fixed, as the Commission suggests, at only so much as Government itself has to pay for the money: the instalments might be spread over a period extending even to twenty years, and commencement of their recovery might be postponed till the work was completed and gave results.

In the words of the Famine Commission, "there are numerous localities in which wells might profitably be made, but in which their construction has hitherto been prevented by the absence of capital or by circumstances connected with the conflicting interests of co-proprietors and the unsatisfactory relations of tenants and landlords. In such cases the only way in which it is likely that wells will be constructed, is by some systematic action of the Government which may either supply the capital or overcome the difficulties which stand in the way of mutual co-operation." We have reviewed the proposals for rendering the capital available both from private money-lenders and from the Government treasuries. We have shewn how the Commission propose so to increase the interests of the cultivator in the land as to render him desirous to improve it, and we have suggested that in default of the landlord's effecting improvements, even the tenant-at-will should be permitted to do so. The Commission further propose "to stimulate well construction by extending the practice of Bombay and Madras to Upper India, so far as to rule that the assessments of land irrigated from a permanent well should not be liable to enhancement on account of the well at any revision of the settlement provided the well is kept in efficient repair." We have stated, however, that we would limit this protection to the period of thirty years. In all this we have not gone so far as might appear from the subject with which we commenced our article. Irrigation by lift is incomparably the most important factor in India's future agricultural progress, and to this subject all that bears upon wells, whether the improving of the credit of the ryots who may construct them, or the facilitating of their working by harnessing thereto the winds, is equally cognate.

TRADE WITH AUSTRALIA.

MUCH attention has been drawn of late to the subject of opening up commercial relations with the Australian colonies. This has, of course, been the result of the late Sydney and Melbourne Exhibitions. These were directly intended to assist in increasing the commercial relations of the colonies with the rest of the world. Busied as we were at the time of the Exhibition at Sydney with the Cabul war, and partly, doubtless, owing to the novelty of the proposal as well as incredulity at the wealth and greatness of Australia, which before this

was but imperfectly known even to the best informed of us, we made at first a very poor show indeed. Had the industrial and other trade resources of India been only such as they appeared at the Sydney Exhibition, they would not have attracted any further attention in Australia. The Indian court was, we are informed, simply the most disreputable one—perhaps it would be more correct to say the only disreputable one—in the building. This was so noticeable that attention was repeatedly drawn to the subject in the press there, but nothing came of that. But the Melbourne Exhibition came to supplement the Sydney one, and the Indian Government, being thoroughly roused by this time to the importance of the interests involved, made a real attempt to make a show, and actually did succeed. So well indeed did it succeed, that the Indian court was reckoned one of the best, and a full account of it is yet a thing we have not had. What with the interest of the show, and Mr. Buck's inherent energy, the Indian court became towards the end the best known and appreciated of any. Public attention thus being drawn to Indian goods, the subject of Indian trade with Australia came to the front, and has attracted much attention since both in Australia and in India. It may be well therefore, now that the exhibitions have closed, to take a glance at the subject of Indian trade with Australia, and how it may be furthered. At one time, during the early history of New South Wales, the trade, for those days, was pretty large. There are old merchants now living in Sydney who can state that they had a brisk and profitable trade with India in days gone by. In the aggregate it was not nearly so large as at present, but the population there was very small and the trade passed through only a very few hands. The complaint, not well founded as we shall show, now is that there is hardly any trade with India. But it is to be remembered that for a population then of 300,000 souls, there is now one of nearly three millions ; that for one or two leading mercantile firms then, there are scores now ; that for one colony then there are half a-dozen now ; and that for a trade then with only India, Great Britain, and the Madeiras (for wine), there is now a traffic as widely and generally diffused as the countries of the globe. Australia trades now not only with England and India, but very largely with China, California, the South Sea Islands, Mauritius, and even to some degree with Japan, Germany, Singapore, and the colonies, one with another. In this general diffusion of traffic, the trade with India could not of course keep to its old proportion. Hence it is that though in the aggregate the trade with India in gunny bags and cornsacks alone now outweighs the entire former trade with India, it is true that there is much room for increase of traffic. In one article, however, notably the trade has actually declined. Though there is no good reason why it should have done so ; we refer to the trade in Australian horses for the Indian market.

As we state above there is a large amount of trade done at present, larger in the aggregate than at any former period. At the top stands the import into Australia of gunny-bags and cornsacks. These are of course very largely in demand in all the Australian colonies. Not only are they wanted for the whole wool trade of Australia, but the smaller and coarser kinds are being used everywhere for sugar, potato-bags, and a variety of other carrying purposes. Next to gunny-bags and cornsacks comes rice. There is a great import of rice into Australia, and although still it is used mostly after the English fashion, it is more largely consumed than in England for each head of the population. Besides, there are some fifty or sixty thousand Chinese in the different colonies who all largely subsist on rice. After these come Indian spices and condiments, and some other articles such as indigo and opium ; and, probably last as well as least, Indian tea. In return for these Australia exports to India a very few horses, a little pearl-shell by way of Singapore, small quantities (for the trade in it is just beginning) of blue metal stone cubes for building or road way purposes a very little tinned meat, and a quantity of gold sovereigns.

It will be seen from this that the balance of trade is in favor of India. Indeed, Australia requires, and will always want, a good many Indian articles, and the number enumerated above as imported from India may be increased. For all this Australia cannot for a long time to come make any return save in horses, blue-metal, and gold. Of course, the trade in pearl-shell may increase, and timber from Western Australia, and coal from Sydney may be exported to India. But from all appearances the balance of trade will continue in favor of India. The subject, thus, is one of considerable interest to our merchants and to India generally. There can indeed be no two opinions on this subject. Here is a poor and populous but producing country, and there we have a wealthy though as yet, small community still annually increasing in numbers, who require and will take many of our goods. It is, however, to the interest of both that the trade should increase. We undoubtedly want here a finer breed of horses, beyond mere cavalry requirements. The sorry specimens of horse-flesh to be seen in India, are a disgrace to any country. So we may note too, in passing, of the miserable specimens of sheep, horned cattle, and even dogs. It will do India good to have a better breed of horses. It will benefit the country, while paying the pockets of Australians, to have the blue-metal cubes for roadway and building purposes. So much money now sunk in brick and shabby soft sandstone would be saved here to us and the country. And were Australia to take to Indian tea, it would benefit both India and Australia. The trade in tea alone might amount to millions.

The trade of India with Australia is both stable and progressive. It began more than half a century ago, has considerably increased, and can only attain to larger dimensions. And there can be little doubt that new articles, such as linseed, safflower, &c., and even we may say Indian corn, will gradually take their place among the others. Tea alone has a doubtful future, notwithstanding the late March sales, which for certain reasons offer no criterion to base any hopes upon Indian tea with all its purity, strength, and flavour, will make its way in Australia only under certain conditions which we do not see availed of. The Indian Tea Syndicate will have yet to rouse itself to obtain a practical knowledge of Australian ways. This, however, is too extensive a subject to take up at the end of an article.

EDITORIAL NOTES.

MADRAS has invariably taken the lead in matters agricultural, and it is perhaps in accordance with the fitness of things that her agricultural students have been the first to move in the direction of obtaining official recognition of their labours in the shape of a degree. The arguments they use are no doubt true as regards agriculture in the abstract. Agriculture is, no doubt, a most important subject of study, perhaps, in this country, *the* most important. For this very reason therefore, it behoves these students to avoid everything that might tend to bring their studies into disrepute. It may be argued that the bestowal of a degree would not do this. One thing it would do, it would bring to the classes a large number of students whose end-all and be-all would be the degree. Agriculture is a thoroughly practical subject, and partakes more of the nature of a great industry than a science. We do not for a moment wish to undervalue the science necessary to make a good agriculturist, but we affirm that what he requires most is being thoroughly grounded in the practical department of his work. When young men at home learn their professions, which they do by means of an apprenticeship of so many years, they become journeymen, that is to say, they are supposed to know their business thoroughly. This is the summit of their ambition. Degrees do not lie in their line, but only in connection with what are popularly known as the "learned professions." We trust, therefore, for the sake of the students themselves, and for the future success of the agricultural schools, that the Government will not grant their prayer.

ON this subject the *Madras Standard* says :—

"If the Senate deem it fit to grant the prayer of the petitioners, it will, we think, make the Agricultural College more attractive than it is to the youth of this and the other presidencies."

This is no doubt quite true ; the college would be more popular and attractive. That, however, is not the object of the college. The granting of the prayer would not draw together a better class of men, men whose sole aim was to become good cultivators. The future students might be more numerous, but they would

largely consist of young men, who had little further desire in life than to be able to write L. Agri. or some such rubbish after their names.

To get rid of caterpillars, an American agricultural journal recommends the following :—

"One pound of common salt dissolved in eight gallons of water will make a brine that will kill currant catterpillars. It should be sprinkled on the shrubs with an orchard syringe in the form of a spray. A watering pot with small holes in the nozzle of the spout will answer the purpose. Care should be taken not to dissolve a greater proportion of salt than that named, lest the brine injure the leaves, fruit, or other vegetation."

An esteemed correspondent from the Madras Presidency writes to us as follows :—

"In your issue of the 1st June, I find the following sentence :—The providing of manures for their crops, is quite beyond the ability of the ryots." Why is it beyond the ability of the ryots to manure their land with night-soil? Surely that is not too expensive for them. You seem to overlook the examples of China and Japan. History affords no example of an exception to the rule that the careful use of human excrement as manure ensures prosperity, and that its wash entails distruction." We have not overlooked "the examples of China and Japan," and have no doubt that if the ryots could be induced to utilize night-soil in this way, much good would be effected. The operations of caste, however, are so all-powerful in many parts of India, that we have not been inclined to include night-soil as a manure in connection with Indian agriculture. The Chinese and Japanese, we know, are not so fastidious in this respect, and have brought agriculture to a high pitch of perfection principally owing to their universal use of this agent. That the Indian cultivator can be got to use it, we have no doubt, with the examples of Poona and Trivitsur before us. This, however, will be after a long and hard struggle. Municipalities would materially aid this good work, and largely benefit their own exchequers, if they would turn their attention to *poudrette* manufacture. We are obliged to our correspondent for bringing this to our notice. He will see, however, why we did not consider night-soil as at present within the range of manurial agents.

Mr. Darwin's next work will be looked for with much interest. It is on "The formation of mould through the action of earth-worms." No one can have failed to observe how these useful creatures turn up the soft mould and leave it in little pyramids all over the ground, especially after rain. Mr. Darwin, will, as a matter of course, make his subject interesting.

"The Columbus (Miss.) *Patron* predicts that in less than ten years the bulk of the cotton crop will be converted into yarns within sight of the fields in which it is grown. This may be more than will be realised, but there is but one reason why cotton manufacturing should not be one of the most important industries of the South—that is, the neglect of the South in taking hold of it." Exactly, almost everything seems possible in America. Here, we only go in for new things after the most careful investigation, and seldom in fact until success has been assured at the expense of the investigators of other countries. There is no reason why every yard of cloth used by the natives of India, should not be made by them here. No reason, save apathy and want of enterprise. We have cheap cotton and cheap labour, all we want is enterprise.

This is the way some Government encourage new industries "A bonus of $25,000 is offered by the Municipality of Beauharnois, in Canada, to any company which will start a beetroot sugar manufactory." The only parallel to this in India, that we can recall to memory is the offer of a similar sum, £5,000 for a rhea cleaning machine, a couple of years ago. But this was a very perfunctory affair. Almost all exhibitiors complained that the raw material supplied them was of the very worst quality, and short in quantity, and altogether the trial was a very unsatisfactory one. The Canadian Municipality will, doubtless, be called upon to pay this bonus, and once the industry is fairly started, it will require no eleemosynary help. There is plenty of room for the establishment of several sugar factories in India, few countries being so favorably situated for the growth of the cane, and as we have frequently pointed out, labour is a cheap item, if the vicinity of the presidency towns is avoided.

As a contribution to the literature of the American wheat crop, we quote the following :—

"The Kansas *Farmer* says :—The general outlook for the winter wheat crop is considered favorable, with a prospective yield about the same as that of last season.

There are immense tracts of land in India, known under the designation of unculturable. Most of this is culturable, and almost every acre is at least able to bear fruit. Why then should we not utilise their vast tracts by planting out fruit trees. See what is being done in America. "It is reported in the *Engineer* that the Philladelphia capitalists who are about to reclaim the immense tracts of land in the State of Florida known as the Everglades, have completed their contract with that State, one of the main features of the scheme being the building of a ship canal across Florida. This project almost equals in importance that of reclaiming 12,000,000 acres of rich land. It would not only shorten the distance between the American ports on the Atlantic coast and all European ports to New Orleans, Mobile, and all shipping points on the Gulf of Mexico, but it would avoid the dangers to navigation which are experienced on the countless keys and coral reefs off the southern and south-western coast of Florida." Is there any reason why several million acres in India should not be brought with under the plough, or planted or with useful trees as mango, mowha, &c. We are not aware of anything hindering this save apathy. If the Forest Department officers are too busy, or consider such work beneath their dignity, it can be done by contract.

Viewed as a matter of economy alone, the throwing out of the bran is a fatal mistake. From careful experiment it has been found that Pennsylvania farmers claim that equal weights of wheat, bran, and corn meal, mixed together, will produce more weight in an animal than the same aggregate weight of corn meal; that is, 100 pounds of meal and 100 pounds of bran fed together will yield more increase than 200 pounds of corn meal fed by itself as grain food. What is good for farm animals is equally good for human beings in this connection, and there being nothing repulsive in eating the bran mixed with the meal, there is no reason why we should contrive to consume only the white flour. It is now becoming fashionable in some quarters to consume the whole meal as it is called, that is to say, to form the flour, the grain with the husk still adhering is ground. It is more nutritious, more wholesome, and quite as agreeable, and our rejection of the bran is the result of ignorance or pride.

Recent experiments with beans by a French observer M. Pauchon, give the result that to reach the same visible stage of development a black or violet seed absorbs more oxygen than a white or yellow one, though a more rapid germination is observed in the latter. On the other hand, the quantities of carbonic acid exhaled by white seeds are found to be considerably greater than those from the dark, sometimes even double. These differences are considered to prove that dark or violet seeds are better conditioned from a physiological point of view. In the natural state—*i.e.*, when the seeds germinate in light—the conversion of legumin into asparagin must go on much more easily in the coloured seeds than in the others. "The more frequent and pronounced pigmentation of seeds of northern lands is therefore," says M. Pauchon, "a favourable circumstance for the growth of these organisms, under the peculiar light-conditions to which they are subject."

Locusts are playing sad havoc in New Caledonia. The authorities have offered a reward for their destruction, and it is reckoned that 51 millions have been bagged. Some people say it is like trying to bale the sea with a bucket, they are so plentiful.

Dr. Rudal calculates, that the paper produced in the whole world—paper of all kinds, of hemp, of linen, of straw, of jute, of rice, &c.—amounts to 1,800,000,000lbs. Half of this quantity is employed for printing purposes, a sixth for writing purposes and the remaining part for divers uses. The whole may be thus categorised:—For Government purposes, 200,000,000 lbs. are used; for instruction, 180,000,000; for commerce, 240,000,000; for industrial manufacture, 180,000,000; for private correspondence, 100,000,000; and for printing, 900,000,000. For the production of these 1,800,000,000lbs. of paper there are 3,960 manufactories, employing 90,000 men and 180,000 women. In addition, 100,000 persons are engaged in collecting rags.

Mr. Wedderburn's scheme of agricultural banks is just now being discussed by the press. The *Hindoo Patriot* approves of the scheme, but would make them State institutions, and we are inclined to agree with our contemporary. We are averse to the State engaging in any undertaking which can be done by private enterprise; but this is, in our opinion, just one of those schemes which is beyond the reach of private enterprise. The amount of capital required would be so large, that we have no hesitation in saying that it could not be raised, unless by the help of a Government guarantee. This could be got over, we have no doubt, because under arrangements properly conducted, there is such a wide margin for profit, that there should be no difficulty in obtaining, nor any reluctance on the part of Government of granting such a guarantee. It is proposed to ask for a State guarantee to the extent of 4 per cent., and as the loans might safely be made at 6 per cent., there would exist a sufficiently wide margin. The *Hindoo Patriot* says "the ryot will gladly pay 12 or 15 per cent. for State loans." Doubtless he would, but we do not see the slightest necessity for his being charged more than 6. By the business being in the hands of the State, there would not be the same temptation to charge too high, the object in view being to help the ryot, and not to make a profit. With private enterprise, no such philanthropic object would operate as against the obtaining of a good return for money invested. This subject deserves a wider consideration than we can give it in these columns, but we shall return to it.

Recent experiments on this subject with beans by a French observer, M. Pauchon, give the result that to reach the same visible stage of development, a black or violet seed absorbs more oxygen than a white or yellow one, though a more rapid germination is observed in the latter. On the other hand, the quantities of carbonic acid exhaled by white seeds are found to be considerably greater than those from the dark, sometimes even double. These differences are considered to prove that dark or violet seeds are better conditioned from a physiological point of view. In the natural state—*i.e.*, when the seeds germinate in light—the conversion of legumin into asparagin must go on much more easily in the coloured seeds than in the others. "The more frequent and pronounced pigmentation of seeds of northern lands is therefore," says M. Pauchon "a favourable circumstance for the growth of these organisms, under the peculiar, light-conditions to which they are subject."

In order to rightly understand the *rôle* of heat in the growth of plants, it is important to know what part of the heat rays which strike the leaves is absorbed by them, what part is thrown back and scattered, and what part passes through them to lower organs. An inquiry of this nature has been recently made by M. Maquenne. Of his method we will merely say that he used, as constant heat source, a Bourbouze lamp (in which a platinum wire is kept glowing by a regulated mixture of coal gas and air); and for some experiments with low temperatures he employed Leslie's cubes. The results of the research are briefly as follows:—1. All leaves scatter a part of the heat they receive vertically to their surface; with the Bourbouze lamp this diffusion is about 0·25 of the whole heat, with the Leslie cube a small percentage. 2. Generally, the under side scatters more than the upper, but the reverse sometimes occurs. 3. Leaves absorb a good deal of the heat from the Bourbouze lamp, the absorption being due to the presence of absorbing substances, especially chlorophyll and water, in the tissue, and to the diffusion taking place internally at the surface of each cell; it is generally greater at the upper side than at the lower. 4. Thick leaves absorb more than thin leaves. 5. The absorptive power of leaves for the heat of boiling water is very nearly equal to that of lamp-black. 6. Leaves let heat pass through better the thinner or younger they are. 7. The radiating power of leaves with a great excess of temperature is pretty near that of lamp-black; it decreases a little when the inclination increases. 8. The absorptive power of chlorophyll is, on an average, equal to that of water for rays of the Bourbouze lamp, and increases proportionately to withdrawal, in one direction or the other, from the heat *maximum*.

The twelfth volume of the *Encyclopædia Britannica* just published contains an article on "India-rubber," by Messrs. E. M. Holmes and T. Bolas. We shall give this ere long, but mean while we give the figures for yield of caoutchouc from different varieties of trees. Para (*Hevea Brasiliensis*) yields 6 ounces in 3 days, the juice yielding generally 32 per cent. of its weight as caoutchouc. For Ceara *Manihot Glaziovi*) the yield is not given. Central American (*Castilloa elastica*): a tree 20 to 30 feet high to its first branches is expected to yield 20 gallons of milk, each gallon giving about 2lbs. rubber. Assam rubber (*Ficus elastica*); about 20 oz. milk collected in August gives 15 oz. caoutchouc, but the precentage is sometimes so low as ten per cent. From February to April the milk is scantier but richer in caoutchouc. Borneo rubber (*Urceola elastica*) yields sap in three years. Rangoon rubber (*Chavannesia esculenta*) yields 3½lbs. at 7 years. This is certainly very encouraging.

An American agricultural journal has the following mode of testing the vitality of seeds:—

The vitality of seeds may be very easily tested before the time of planting arrives. Simply place a few of each species or variety on a piece of moistened flannel, folding the flannel together, and allowing it to remain in some place near the furnace or kitchen range for a day or two. Those seeds that have lost their vitality will, in a few hours, turn dark or mouldy, showing unmistakable signs of decay. It is a law that pervades all organic matter, vegetable and animal, that the moment it ceases to live, disorganization begins. A dead seed, or a dead animal or vegetable, soon decays; but one containing the vital principle withstands the action of the elements for years.

Mr. L. Ordega, Consul-General of France at Trieste, has furnished, under date of August 10, 1880, some statistics relating to the amount of gum arabic which arrives at Trieste from Africa. The total importation and exportation during the years 1877, 1878, and 1879, was as follows:—

	Importation.	Exportation.
1877 ...	2,695,100 kilos. ...	2,707,600 kilos.
1878 ...	2,726,300 „ ...	2,796,400 „
1879 ...	4,638,400 „ ...	3,080,900 „

The gums are divided into thirty-two grades, the prices of which vary from about 75 dollars for the best, to as low as 13 dollars per 100 kilos. for the commonest kinds. The available stocks during 1877 amounted to 1,700,000 kilos., but, in 1879, they exceeded 3,600,000 kilos., and even this enormous reserve was hardly sufficient to satisfy the demands from the various markets of Europe. On August 1, 1880, the stock on hand at Trieste was as follows:—

	Kilos.
Arabic	387,000
Ghizira	57,000
Sennary	1,400
Suakin	318,000
Gedda	79,000
Total ...	838,000

The construction of new routes has rendered the transport of the Suakin gum more easily from its place of origin to the part of debarkation. Owing to the interruption of communication caused by certain rains called *kharif* in Egypt, no arrivals whatever from Suakin reached Trieste during the whole of last October.

THE Department of Agriculture estimates there are 1,000,000,000 pounds of butter and 300,000,000 pounds of cheese made annually in the United States. At 27 pounds of milk for one pound of butter, and 9½ pounds for one pound of cheese, the total amount of milk used would be 29,850,000,000 pounds; add 41 per cent. of the product for consumption, the total production is 60,952,325,000 pounds. The caseine in the milk used for making butter, if utilized for cheese, would produce annually 1,800,000,000 pounds.

COTTON manufacture in the United States is assuming huge proportions, and our American cousins are already formidable rivals in the greatest of our English trades. There are now at work in America 10,931,405 spindles, consuming 1,586,481 bales of cotton which we may take to produce—at 400lbs. of clean cotton per bale—934,592,400lbs. of yarn, per annum. To weave this the Americans have 231,159 looms the spindles and weaving together giving employment to 181,628 work people. To institute a comparison with our English trade, we may mention that we had in the United Kingdom at the end of 1878, 44,205,690 spindles and 514,911 looms, worked by 482,903 hands. In other words, while we had two and a quarter times as many looms and four times the number of spindles as the United States, we worked them with little more than two and-a-half the number of operatives; a proof this, of the superiority of the English operative over the American.

THE little kingdom of Sweden, with less than one-twentieth of the area, and scarce one-twelfth of the population of the United States, appropriates more than three times as much to the promotion of her productive interests as does the Government of the United States.

A DISCOVERY which promises to have important results has lately been made by a scientific gentleman in the island of Reunion, situated near the Mauritius. He claims to have succeeded in solving the problem of extracting vegetable fibre from the aloe or other leaes in an economical manner, and one which can be generaly adopted. The principal features of the invention are as follows:—The leaf is first placed for ten minutes in a bath heated to 95° Fah., and then removed to a second bath of water at its normal temperature, in which some inexpensive chemical substance (not yet made public) has previously been mixed. The leaves are allowed to remain some little time in the second bath, after which it is said that the fibre can be washed out by women or children without any trouble. A patent has been taken out for this process by its inventor. As the aloe is known to grow as freely as weeds in this colony, this discovery would appear to present the means of establishing a new and profitable industry for a very large proportion of our population. This is a subject of vast importance to India, which may be said to be a land of fibres. The aloe flourishes everywhere, and in India may almost be called a weed—as a rule it grows wild, and is never planted except for the formation of boundaries. If this invention turn out a success, the industry of manufacturing aloe fibre into ropes, matting, and cloth will receive a powerful impetus.

"A MERCHANT brought us a branch and a box of seed the other day taken from a tree which had yielded an abundant supply of milky juice likely to be of value when prepared as India-rubber. 'W. F.' writes:—'The branch you sent me is well known to me by its Sinhalese name Kirripælla, and is the Ficus infectoria. See what I say about it in Mendis' list No. 45:—'Kiripæ'la, Ficus infectoria, Will. Urostigma do. Miq. Thw. En. p. 265. C. P. 3,083. The bark of this tree is used by the natives for chewing with betel, but the timber of this tree and of most of the other species of Ficus are scarcely ever used for any valuable purpose. They are all nearly worthless. All the figs and we have about 23 species in Ceylon, are natives, but is the rubber from them worth the expense of collection?' That is just the point which only a practical test can settle: our mercantile friend is right in trying the experiment." This extract is from the *Ceylon Observer*. There are doubtless many trees growing wild which yield a milky juice which would form a good substitute for India-rubber. The common villages as a rule know all about them and a little intelligent inquiry would elicit much useful information.

THE export of this dry fruit, if we may so call it, is attracting a little attention at present. The Divi Divi plant grows in many of the outlying villages of Madras, and up to a recent date no one cared to collect the dried fruit. Now, however, that it is found to be a valuable article for tanning purposes, large quantities are shipped to Europe, and in fact many persons have begun to pay some attention to the cultivation of the Divi Divi plant. A consignment of 88 bags was shipped to London in the steamer *Duke of Buckingham* last month, and large shipments would probably go forward if greater attention were paid to the cultivation of Divi Divi.

FEW crops are so valuable as Divi Divi. It is the *cesalpinsa coriaria* of botanists, and a member of the Babul family a pod grows as the tree similar in appearance to that of the Babul, and the tannin so much valued by leather curers is in this pod. The trees should be raised in a nursery from seed, and planted out about 15 by 15 feet, thus giving 173 trees to the acre. For the first two years they must be guarded for cattle treading on them, after that they require no looking after till the seventh year, when they bear pods, and speedily pay their way. An acre in full bearing will yield fifty cwts of pods which are worth in London fifteen shillings per cwt, and as the cultivation and care cost literally nothing after the trees are in bearing, it is a most profitable crop. Another good quality it has, it will grow on almost any soil.

THERE is a belief among up-country natives that the flowering of the bamboo and an abundant mango season portend great sickness and famine. It appears that the same belief holds good among the Burmese. The *Rangoon Times*, alluding to the subject, remarks:—"Both these beliefs prevail in Burmah and among the Burmese, and what is more to the point, Burmah may be added to the list of provinces where this year the bamboo has flowered, and the mango crop has been exceptionally abundant. And the belief among the Burmese at the present moment is that great famine and pestilence are threatened. The fact remains that the prevailing beliefs among the Burmese are, as in India, that the flowering of the bamboo betokens famine, and the abundance of mangoes, pestilence; and these beliefs are at the present moment productive of no small amount of anxiety and foreboding among the people."

EVERY thousand pounds of fat cattle sold from a farm carry away one and-a-half pound of potash (neat cattle two pounds), which must be restored in order to keep the land in as good condition as it was before commencing to raise or feed the stock. Wood ashes, which are usually permitted to go to waste in the West, contain a large percentage of potash.

IN the course of a recent lecture at the London Institution on the above subject, Sir John Lubbock, M.P., remarked that the seed of the Sycamore, the Maple, the Elm, the Birch, the Pine, the Fir, and the Ash was attached to a leafy wing and carried to a considerable distance. In many cases the fruits and seeds were dispersed by animals. The animals were attracted to them by their brilliant colours, as in the case of the cherry, the peach, the raspberry, and the strawberry. These coloured fruits formed a considerable part of the food of monkeys in the tropical regions of the earth, and we could not doubt that these animals were guided by their colours, just as we are guided in distinguishing ripe and unripe fruit.

The fact of the seeds being a temptation to such animals as mice and squirrels was not altogether a disadvantage, as the seeds were thereby often carried and buried in the ground, and they could very well afford to spare a few seeds for the squirrels and the mice. Some seed-vessels, such as the Martynias and some others, had very formidable hooks attached to them, which had been known even to kill a lion. These hooks adhered to the skins of animals, and the seeds were thus dispersed.

THE subject of opium is at present occupying the public mind, both here and at home. As to the morality of our government being concerned in the intimate relation existing between it and the monopoly; we are not concerned here to consider. The following table shows the average outturn per beegah in both agencies for the last five years:—

	Behar. Seers.	Behar. Chittacks.	Benares. Seers.	Benares. Chittacks.
1875-76 ...	5	13¼	6	4
1876-77 ...	4	14¾	6	9
1877-78 ...	3	5½	5	1¾
1878-79 ...	3	15½	5	7¾
1879-80 ...	4	10¼	4	0½

The following statement shows the cultivation and produce in each agency for the last two years :—

Season.	Land sown for cultivation.	Net cultivation.	Produce at 70° consistence.
Behar.	Beegahs.	Beegahs.	Mds. s. c.
1878-79 ...	500,371	415,289	41,268 1 4½
1879-80 ...	473,550	461,086	53,593 23 1
Increase ...		45,797	12,325 21 12¾
Decrease ...	26,821	......	......
Benares.			
1878-79 ...	416,015	395,820	56,636 35 8¼
1879-80 ...	451,641	438,531	35,476 37 0¼
Increase ...	35,626	42,711	......
Decrease ...	......	......	11,160 38 8

From this it will be seen that the crop is much like other, very fluctuating as to outturn. It is a crop which the cultivators grow readily, and if Government think of dissociating themselves from the monopoly, they will naturally fall back on an excise duty pure and simple, and this after all will perhaps be the best thing that could be done. Where it can be avoidid at all, monopolies should be done away with.

The success which has attended the experimental shipments of ripe fresh fruits from Australia has set the West Indians on their mettle, and several planters have turned their attention to the cultivation of oranges, pine-apples, bananas, and other fruits, especially for shipment to Europe. America has hitherto been the chief customer of the West Indian Islands for fresh fruits, but there is no reason why England should not share in the fruit produce of her nearest tropical colonies. At the present time the trade in pine-apples is pretty well monopolised by the Bahamas, from whence we receive the cheap fruits which are displayed in a more or less damaged condition on the costermongers' barrows in the streets of London during the summer months. But if more care were taken in selecting and packing the fruit, pine-apples might be received in excellent condition from all the West Indian Islands, and not only pine-apples, but bananas and oranges. The greater expense which would be incurred by a little more care in packing the fruit, and the additional cost of freight, would be more than covered by the higher prices which would be realised for ripe oranges, for instance, which could be sold at the time when such a luscious fruit would be most highly appreciated, *viz*, during the summer months, and at a time when the ordinary supply of European oranges would not be in the market. One enterprising cultivator in Jamaica, who has lately taken to growing pine-apples for export, has realised as much as £80 per acre. The trade in bananas is also increasing, at least, so far as Jamaica is concerned, and last year nearly half a million bunches were exported from that island, valued, at over £38,000. In the case of oranges the value exported last year from Jamaica was over £11,000. Is there absolutely no interprise in India?

A Bombay contemporary says :—"The Punjab has long had the reputation of being a great wheat producing country, but as yet it has not taken any conspicuous place in the matter of exporting beyond sea." This is easily explained, the Punjab is a great wheat-producing country, and the reason why it has not taken a conspicuous place in the matter of exporting beyond sea, is that the railway freight from the Punjab to the sea, is almost prohibitive. The American exporter can convey his grain from the grain-producing states to Liverpool for less than the Punjab wheat costs to convey to the seaboard. This, and we believe this alone, prevents the Punjab from taking a prominent place among grain-exporting districts.

The following are the reports on the state of the season and prospects of the crops for the week ending the 13th June 1881 :—"With the exceptions of Sind and Guzerat, rain has fallen in all the reporting districts and states, and it seems clear that the rainy season has now generally set in. The fall has been especially heavy in Burmah, Assam, Eastern Bengal, and the Central Provinces. In a few districts of the two provinces last-named the wet weather has, to some extent, retarded sowings; but preparations for the autumn crop are now in active progress in most parts of the country. Agricultural prospects continue good. No information has been received from Mysore and Coorg, or from Rajputana."

We have received a copy of a memorial which has been forwarded by the students—past and present—of the Sydapet Agricultural school, to the Senate of the University of Madras, praying that some degree may be conferred on successful students in the Agricultural College. We are afraid that this memorial affords practical proof that the real objects of such colleges are misunderstood. An agricultural student is not so much like an ordinary university student, as an apprentice to a trade. When an apprentice serves his 3, 5 or 7 years, he is supposed to be thoroughly well posted up in his business, but it never enters into his head to ask for a degree, with its accompanying insignia. The mistake arose from calling it a college. It ought to have been called a school. The agricultural students will, we fear, derive little benefit from their attendance at this useful institution, if they make a degree a *sine quâ non*, or even a desirable accompaniment to their curriculum.

On the subject of agriculture, the *Pioneer* tells us that Mr. E. C. Buck, as was confidently expected, has been appointed Director-General of Agriculture for India. We hail this appointment with satisfaction. With Mr. Buck's well-known and properly directed energy, we may hope for better days for the cultivators of India, as we trust the object of the department will be to avoid all hobbies, and to direct attention to the most comprehensive measures for the benefit of the great bulk of the people, who are the agricultural classes. It is not for us to formulate a line of policy for the new department, but we may be permitted to express a hope that only schemes of practical utility will occupy its attention. The *personnel* of the department will doubtless be as well selected as the head has been, and if so, nothing but good to India can result.

The introduction of opium cultivation into Persia, which took place a few years ago, has proved of great benefit to that country. Efforts are being made to increase the area under crop. The great difficulty in the way being the want of irrigation, and as the people are finding the industry a profitable one, they will doubtless contrive to get over this difficulty. The *Civil and Military Gazette* says on this subject :—"Yezd is said to be capable of producing very fine opium. The possible competition of Persia has sometimes been dreaded by politicians who lament what they call the instability of the Indian revenue from the drug. But the best authorities on the subject say that Persian opium is on the whole as inferior as the Chinese drug. So long as this is the case, the Indian article will find its millions of eager customers in China." We have no wish to be pessimists, but there is no getting over the fact that Persian opium is steadily increasing in favor with the Chinese consumer. A very few years ago it was only worth about half the Indian drug, now the latest quotations are as follow :—

Malwa, old	...	$710	to 720
Do., new	...	660	„ ...
Patna	...	570	„ 572½
Benares	...	567½	„ 570
Persian, best	...	560	„ 565
Do., low	...	435	„ 535

These prices seem to point to an early assimilation, in point of value, between the Indian and Persian varieties.

The United States Commissioner of Agriculture proposes to test the tea-producing capacity of the South Carolina soil. Two

hundred acres near Charleston have been leased for twenty years from a gentleman much interested in the project, and 17,500 tea-plants will be set this season. The experiment is in charge of a gentleman who for many years was engaged in tea culture in India. The Commissioner avers that, in three years' time he will have as fine a crop of tea as ever was raised.

Yes, this intimation is not by any means new. We have heard it before, and we recently learn that an old Assam planter has actually manufactured a sample from the American leaf. We have all along held the opinion—and we do not even now see occasion to change it—that tea will never become on American industry—at least so far as the Cotton States are concerned, we are unable to speak with the same confidence regarding the pacific States, as we are without information as to the climate and rainfall of those States. That tea will grow in America we do not doubt, or for the matter of that we see no reason why it should not grow in the southern counties of England, but the question is not one of absolute growing ; it is a commercial one, and we have to ask, will it grow to pay and here we at once find that the rainfall of America being deficient, the leaf will not be produced in sufficient quantity to make the speculation a profitable one.

SELECTIONS.

MANURES: MORE ABOUT POTASH.

(Mr. M. Cochran in the Ceylon Times.)

IT may help towards a more intelligent use of artificial manures, if we examine the composition of Ceylon-made cattle manure. Two samples of this substance received from Mr. Joseph Fraser, of Damboolagalla Estate, Matale, had the following composition. No. 1 is the analysis of cattle manure from cattle fed upon cocoanut poonac and guinea grass, bedding being manna grass : No. 2 is the analysis of manures from cattle fed, upon guinea grass only, the bedding being manna grass.

	No. 1.	No. 2.
Moisture expelled at 212°	80·187	74·674
Organic matter and combined water ...	14·412	19 877
Ash	(5 071	(6·149
Insoluble silica	1·805	1 661
Soluble "	·209	·193
Oxide of iron, alumina, and phosphates ...	·563	·410
Lime	·497	·7 7
Magnesia	·007	·171
Potash	·951	1·068
Chloride of sodium and soda	·575	·827
Sulphuric Acid	·159	·2 7
Carbonic Acid and loss	·239	·862
	100·000	100 000
Nitrogen	·416	·611
Phosphoric Acid	·250	·192

The most striking feature in these analyses is the fact, that of the four chief manurial ingredients, *viz.*, nitrogen, phosphoric acid, lime, and potash, by far the most abundant is potash which averages fully 18 per cent. of the manure ash. The proportion of potash is much higher than in English farm yard manure, is indeed double as great. Analyses of the ashes of manna grass, guinea grass, and cocoanut poonac separately, would be desirable to ascertain the proportion of potash and other ingredients derived from each of these sources. The percentage of potash in the manure from cattle fed on guinea grass only, is slightly higher than in the other, when calculated into the weight of the manure as it stands ; but if calculated into the weight of the ash of the manure, it is slightly higher in that from cattle fed upon both poonac and guinea grass. The latter manure has a very decided advantage in respect of phosphoric acid. It was contrary to my expectation to find No. 2 richer in nitrogen than No. 1, and in the case of a substance so difficult to sample, from its want of hemogenity, as cattle manure, more analyses are desirable before accepting this as a general fact.

It was, however, to some extent confirmed by analysis of dung from cattle fed on guinea grass only (analysis No. 3) and that from cattle fed on cocoanut poonac as well (analyses No. 4).

	No. 3.	No. 4.
Moisture expelled at 212°	73·500	75·186
Organic matter and combined water ...	20·253	21·195
Ash	(6·247	(3·619
Insoluble silica	3 667	2·221
Soluble "	·328	·159
Oxide of iron, alumina, and phosphates ...	·499	·438
Lime	1·037	·464
Magnesia	·078	·086
Potash	·213	·091
Chloride of sodium and soda	·076	·043
Sulphuric acid	·112	·078
Carbonic acid and loss	·237	·039
	100·000	100·000
Nitrogen	·529	·392
Phosphoric Acid	·189	·174

Here again we notice that in the dung from cattle fed upon both cocoanut poonac and guinea grass, although the percentage of ash is much lower, yet the phosphoric acid is higher than in the guinea-grass-fed cattle dung. When guinea grass is the only feeding material, it would appear that both the dung and the manure are much richer in time than when cocoanut poonac is used as well.

From the large percentage of potash in Ceylon-made cattle manure, those holding different views regarding this substance will, most likely, draw opposite conclusions as regards its place in artificial manures. Thus the nitrogen and phosphate manurists will argue. that the very fact of cattle manure being richest in potash, shews that the soil from which it was derived, is best able to supply this ingredient, and there is therefore no occasion to add it in our artificial manures. The nitrogen, potash, and phosphate manurists, on the other hand, will argue that since potash is such a conspicuous ingredient of cattle manure (the stand by of the planter) it is wise to introduce a considerable proportion of it in manures for coffee of which it forms by far the most abundant mineral constituent. The balance of what little experimental data is as yet before us decidedly favours the latter view. We have the testimony of Mr. Graham Anderson and Mr. Tolpert, founded on actual experiments, in its favour, said experiments, moreover, having been carried out on soil richer in potash than those of Ceylon. In the March number of the *Journal of the Chemical Society* an extract from a leading Continental Scientific Magazine informs us that "experiments, which were carried on at Potsdam, shewed the most suitable manure, for fruit trees, to be a mixture of potash sulphate and supesposphate, which increased the number of blossoms considerably." Mr. Fraser also, I understand, has found that on Damboolagalla estate those fields at least, the analysis of which shewed a lower percentage of potash, responded very well to sombereorum, which is essentially a mixture of potash sulphate and superphosphate.

Of the commercial salts of potash, besides wood ashes, our choice for pecuniary reasons, is probably restricted, to the nitrate, muriate, and sulphate. The first can be had from India. A very good sample of nitre for agricultural purposes submitted to me by a Colombo firm, contained nearly 90 per cent. of salts of potassium, the nitrate constituting nearly 80 per cent. Much of the crude Indian nitre however is greatly inferior to this, containing much common salt, but if cheap enough useful as a manure. Nitre of 80 per cent. furnishes fully 11 per cent. of nitrogen, which thus constitute s it a highly nitrogenous as well as potassic manure.

Commercial muriate of potassium contains about 88 per cent. of muriate, and costs about £3 or less per ton. A crude muriate of potassium and magnesium called carnalite can be had from Strassfurt in Prussia for less than a third of the cost of the purer salt; but as it only contains 25 per cent. of muriate potassium, the purer salt would be cheaper. Kainit is a crude potash sulphate which comes from the same mines at Strassfurt. Voelcker's analysis of it is as follows:—

Moisture	3·36
Water of combination	10·88
Potassium sulphate	24·43
Calcium sulphate	2·73
Magnesium sulphate	13·23
Sodium chloride	30·35
Insoluble silicious matter	·71
	100·00

A cheaper source of sulphate of potash if still near its former price of £8 per ton is that made from kelp known as p'ate sulphate. The following are Dr. Richardson's analysis of the commercial salt made on samples taken from parcels of upwards of 100 tons.

	Irish.		Scotch.
Sulphate of Potash ...	77·43	75·28	83·06
Do. soda ...	22 31	20·80	14·89
Do. lime ...		·80	
Chloride of sodium ...	·76	·54	·67
Insoluble matter ...	trace	1·04	
Moisture	·59	1·55	1·44
	100·09	100·10	100·06

Sulphate of potash has this advantage, for agricultural purposes, over the nitrate and muriate that it is less soluble in water.

The muriate dissolves in three parts of water at 60°, the nitrate in seven, and the sulphate in eleven. The sulphate moreover has been shown to have a certain amount of curative effect on diseased coffee A good deal more might be done by analysis, to ascertain whether or not, there is any correction between leaf-disease and a deficient supply of potash to the coffee plant. The coffee leaf, not being of direct commercial importance, little has been done, as yet, in determining the composition of the ash in the different stages of the leaf's growth. The tea leaf, on the other hand, has been analysed in all its stages, and it is remarkable the extent to which potash disappears from the leaf as it grows old. So much so, that Zoller affirmed "that the age of tea leaves may be determined from the analysis of the ash. Thus young leaves of which the best teas consist, contain much larger amounts of potash and phosphoric acid than the older leaves, which are comparatively deficient therein, while they become richer with age in lime and silica. The ash of a sample of young tea grown on the Himalayas amounted to 5·63 per cent., and it contained in 100 parts 39·22 of potash 4·24 lime, 4·33 oxide of iron, and 14·55 of phosphoric acid." (Hassall). In marketable tea, the amount of potash in the tea ash, varies to a

great extent as the following examples from Watt's Dictionary of chemistry quoted by Hassall will shew, and where potash is low it will be observed soda is high.

	Souchong.	Souchong.	Oolong.
Soda ...	25·46	1·70	40·00
Potash ...	3·70	44·96	12·38
Lime ...	11·36	8·77	7 68
Phosphoric acid ...	12 63	11·46	8·26
Sulphuric acid ...	10·14	6·96	8·27
Silicic acid ...	13·04	8·79	7·81

	Young Kyson.	Ning Young.
Soda	0·76	12·88
Potash	33·95	[illegible]38
Lime	8·17	8 39
Phosphoric acid	16 64	17·44
Sulphuric acid	4·89	4·76
Silicic acid	10·89	5·59

Potash being the dominant element of the ash, of the coffee seed, the formation of fruit must tend to drain the leaves of their potash, and if the supply is not equal to the demand, we can imagine an abnormal condition of the leaf to be induced, rendering it liable to the attack of *hemeleia*, while the seeds would be reduced either in number or size. Again, if at any stage of its growth, the coffee leaf, like the tea leaf, requires a much larger proportion, of potash than at other stages, and the supply be not equal to the demand, we may in this case also have an abnormal condition of the leaf and disease as the result. I think at all events that this line of investigation is worthy of attention.

HOW OPIUM IS PRODUCED IN INDIA.

OWING to the ever poverty-stricken state of the Indian ryot, or husbandman, the Government advances the means whereby he can engage in poppy cultivation. The nature of their engagements is about as follows:—The cultivator undertakes to sow a beegah, or about one-twentieth of an acre, with poppy seed. For this he is given the requisite amount of seed. If a well has to be dug, he is not only given a sum on loan sufficient to carry out his purpose, but also money enough to buy bullocks, in order to enable him to draw water from the well when it is finished. This is termed the first advance, and is simply given to prepare his land for the sowing of poppy seed. The second advance is given when the plant begins to shoot above the earth's surface, and the third when the plant is about to mature. In January or February the plant comes to maturity; in that state the seed pods are lanced in the afternoon. The opium is allowed to exude till next morning, when it is carefully taken off by an iron scraper. At the same time precaution is exercised to close the incisions by running the finger over the cuts. About five to six incisions suffice for the drawing of the juice.

The opium is placed in brass vessels, slightly tilted, so as to drain off the dew or any other watery substance. It is then manipulated and placed in new earthen vessels, and is thus kept till it is brought to the weighing station. The cultivator of poppies does not employ labour. His holdings are mere garden patches; so all the aid he requires, from the sowing of the seed to the maturing of the plant and the gathering of the opium, can be had from the members of his family. The whole of this work is done by himself, his wife, and his little ones. Many of these opium garden plots, worked by the man and family, amount to only one-sixth or one-twelfth of an acre, perhaps: in a few isolated instances one man is wealthy enough to own half an acre.

There are many reasons which conduce to this. First and foremost is that the native does not like to lease more land than he himself can plough and work. Even with the growth of opium, where so many untold advantages are offered for extended enterprise, the Indian husbandman prefers to give his attention to a tiny garden, rather than to be put to the expense of working, with paid help, a few acres. His outlay is nothing, and thus he is enabled, at tremendous profit, to grow opium for sale to the Government. He does not pay for help; manure is always handy, as human excrement only is used, and nothing is cheaper and more effective. Irrigation is equally simple. A rude well is sunk; two posts and a cross-beam, over which is placed a wheel, form the only apparatus for the drawing of water. A rope is passed over the wheel, and attached to it is a huge leathern bucket, which is let down and drawn up by bullocks. The water is emptied into a reservoir; running from this are numerous drains, which carry off the water and flush the lands requiring moisture. The stronger members of the family are engaged in this toil, while the children, who in other lands would be deemed infants, make themselves generally useful in picking weeds and many other duties necessitating light labour.

Before the sun gilds the horizon, and while the dew is yet fresh on the grass, the family are astir, and from early morning till evening their entire attention is bestowed upon their crop, either in weeding, watering, or picking during the day; and sometimes at night, in keeping wild animals from intruding and destroying in a single hour the labour of years.

The wants of the husbandman are but few. Four mud walls and a thatched roof compose the family mansion; and in such a hovel will he live for generations. A scant cloth tied round his loins serves for coat and pantaloons. When he desires to appear to advantage, a huge cotton sheet, thrown in graceful folds around his body, serves as gala costume on occasions of great festivity. His little children are in a state of utter nudity, even in the coldest weather; and when it is borne in mind that from October till February the weather is a great deal colder than it is in San Francisco, some idea of the hardy nature of native children can be formed. The women are somewhat better clothed; a simple petticoat and a gray-coloured sheet has for the last three thousand years formed their attire. But whatever money the husbandman gains, he converts into jewelry, which forms the real wealth of the native landowner, and is regarded by natives much in the same way as a European looks upon a bank account. In times of acute distress he can always part, even at a permium, with his wife's ornaments. The Hindoo religion demands that certain ornaments must be worn by married women. When the contracting parties are poor, they make them of lead; but directly fortune smiles favourably, they are exchanged for gold and silver. The small farmer lives with but three objects, that is, to load his wife with ornaments, to eat off brass platters, and to be able, on the marriage of his son, to make a grand display. To attain this end, he will suffer years of deprivation and inconvenience, and his many years' savings will be wasted in a single week of jollification.

We can imagine how glad must be the ryot when the poppy plant has begun to exude opium, and when his opium has all been gathered he waits patiently for the order of march, with the fruits of his labour, to the weighing station. It depends entirely upon the season as to when the cultivators can bring their opium to the Government stations to be weighed.

As a general rule, the month of April is the commencement of the weighing season. Intimation is then given to the opium cultivators that they must present themselves on a certain day with their opium, in order to have it tested and weighed. In the districts where the poppy plant is cultivated all are astir, and grand preparations are made for a general exodus. The opium is collected safely in red earthen pots, which are put in wicker crates, and the whole family, with burdens on their heads, make for the weighing stations. The picturesque Indian lanes are crowded with these men, marching like sheep to their destination. They only travel during the night: the sultry heat of midday forces them to seek the grateful shelter of the gardens and groves so liberally planted along the dusty highways. Directly a halt is called, and preparations are made for the daily meal. After this is finished, some lively spirit starts a story, recounting the savage doings of the stranger who rules the land. With terrified countenances and anxious ears they listen to these fabulous tales; but inwardly they bless the "white face," as they think of the money he is soon to disburse.

Many of these ignorant cultivators have never seen in their life a European, and accept with easy credulity anything detrimental to the character of their governors. No wonder is it, then, that the native approaches the *sahib*, or gentleman, with the most abject fear painted on every limb. He holds his breath when he hears him speak, and is ready to faint at the slightest display of anger or impatience. These sensational stories are generally propagated by rascally natives, who profit by the credulity of their countrymen in order to extort money. These men represent that nothing can be done without the *bakshish* or blackmail present, and they are the agents for the *sahib*, sent by him to collect toll. If the ignorant wretch demurs, his torturer paints a picture to which the torments of hell are but a trifle. The poor fellow, anxious to escape such calamities as he is threatened with, pays the demand, and further presents his friend with a trifle in order that nothing should go wrong.

Early in the morning the weighing and testing commence. Notice is given to the cultivators, and they proceed to the factory, ranging themselves in a long line before the examining officer. Some men connected with the department then mix up the opium, and take out a small quantity for examination. The officer, after inspection, marks the quality on the side of the earthern basin in chalk. The samples are again mixed up and tested with a solution of tincture of iodine. If it happens that the cultivator has been attempting to adulterate his opium with farinaceous matter, the solution will discover the deceit. Experienced officers are alone trusted with this important duty, and it is expected of them to be able to distinguish the class of the opium as much by the feel and sight as by a chemical analysis. The consistency of the opium is easily told by a man who has been long at the work by simply turning the opium over with his hand, or with the aid of a knife. If the opium is of a first-class quality, the colour is a rich brown, and it is so stiff that there is some difficulty experienced in turning. The poorer the quality, the blacker the colour and the thinner the consistency.

After the opium has been weighed and filled in the separate jars according to its quality, they are sealed up and dispatched to the factory, where all the opium is again mixed up to a certain consistency and made into balls ready for exportation and sale at Calcutta. After the opium has once been delivered into the hands of the Government officer, the cultivator has nothing more to do. He is paid so much by the pound; his former advances are deducted, and the connection between the ryot and Government closes. When the balls are made, they are packed into boxes called "opium chests," and sent down to Calcutta.—*Journal of Applied Science.*

BEETROOT *vs.* CANE-SUGAR.

THE perusal of M. Deleit's valuable paper on the sugar-cane, and the advantages to be derived from careful selection, has afforded me much satisfaction. It is generally admitted by experienced planters that in many instances the sugar-cane has deteriorated. This has been the result of a variety of causes, prominent among which are careless cultivation, unsuitable soil and climate, and want of care in the selection of plants. In other instances where a careful system of cultivation has been pursued and a judicious selection of plants made, the most successful results have ensured. This can be safely asserted from the results of an experience of many years in the experimental cane nursery established in connection with this department. That the establishment of experimental nurseries of this description in the whole of our sugar-producing colonies would be a source of benefit to all those engaged in this industry cannot be denied. Since the formation of this one in 1862, numerous applications for cane plants have been received, and many thousands of plants supplied; not only to the planters within the colony, but to others of Mauritius, Java, Honolulu, Figi, America, and other places, as far as the supply would admit of. They are furnished free of cost to the applicants, but there appears to be no reason why these experimental plantations should not be made self-supporting by adopting the Mauritius plan, where a small charge sufficient to cover the cost of production is made, and cheerfully paid by the planters.

At the present time we have seventy-eight varieties of sugar-cane under cultivation, no additions having been made during the past year. These varieties are now very generally distributed throughout the colony, and increased observations and experience confirms me in my previously expressed opinion, that soil and climate greatly affect the quality of the juice, and materially influence both in quantity and quality the sugar produced by the plant. This is shown by the fact that a variety of cane, strong, healthy, and yielding profitable returns in one district, when removed to another within fifty miles, has been known to lose many of its good qualities.

With regard to the selection of cane plants, the best developed and most vigorous plants should be chosen, as imperfect or diseased plants are not likely to produce good canes. The age of the plants from which the cuttings are selected is not of so much importance as favourable vigorous growth and well-formed joints and eyes. In the older sugar-producing countries the cane tops, most probably in the first instance from motives of economy, have been used for plants. Some growers prefer them, considering that they produce earlier plants than cuttings from the matured portion of the cane. It is very probable that this practice of planting the immature portions of the cane has been in some measure the cause of its deterioration; but whether the most saccharifcrous joints of the cane produce the most profitable plants is, I think, an open question, for it must be borne in mind that the amount of saccharine matter contained in the sugar-cane does not remain the same throughout the year, at some periods the amount being hardly preceptible; but experience has not shown that cuttings taken when the cane is in this condition have produced worse plant canes than those taken when the density of the juice was at its highest. Something more than the saccharine matter contained in the cutting is necessary for the support of the young plant, for we find that upon planting a cane cutting, when the eyes shoot forth at the same time a number of roots are thrown out around the whole circle of each joint. Their uses are to supply the young plants with sustenance until they are sufficiently advanced to form their own roots. This sprouting of the eye and the simultaneous formation of roots, at the joint constitute the effort made by the cane to reproduce itself. If the cutting be deprived of these roots, the young shoots will continue growing for some time, and eventually die away before they have become strong enough to form roots of their own. From this we may safely infer that something more than sugar and gluten is necessary for the nourishment of the young plant in its earlier stages.

Whether the cane plant has lost its habit of seeding from the causes mentioned in your article of August 2, 1879, or whether even it ever possessed it, is in the absence of reliable evidence purely a matter of conjecture. As far as my knowledge of the plant extends, I am disposed to think that "cane seed" has not yet been found, although in Bruce's travels he mentions "that in the East cane may be raised from seed." This statement, however requires further confirmation, for although Porter repeats this upon Bruce's authority, subsequent investigations have not proved its existence. Numerous endeavours have been made to become possessed of it, but without success. The Royal Society of Jamaica took up the subject many years ago, and instituted a system of careful and comprehensive inquiry in order to settle this at that time doubtful point.

The result of the inquiry was "that no variety of sugar-cane was known to perfect its seed (or indeed to produce anything like seed) either in the West Indies, China, the Straits of Malacca, Egypt, or even in the South Sea Islands, as in all these countries the cane is entirely propagated by cuttings."

Numerous methods have been tried and many experiments made to induce the cane plant to perfect its seed, but hitherto they have proved unsuccessful. Attempts have also been made to get the flower of the guinea corn and Indian corn to impregnate and fructify those of the cane. The experiment succeeded as far as the growth of the plants, their flowering together, and the production of the seed upon the arrow of the Indian corn was concerned, but no seed appeared, and subsequent microscopic examination showed that no change had been effected as regarded the formation of the seed.

There is, therefore no well authenticated instance of the plant having been raised from seed, and Bruce's statement most probably was a mistake caused by his imperfect acquaintance with the language. This being the case, it would be beside our purpose to speculate upon the probability of inducing this plant to perfect fertile seeds, but rather to devote our attention to the varieties we already possess; and there can be no reasonable doubt that with judicious selection and careful cultivation very superior and fixed qualities may be obtained in the sugar-cane as freely as they have been in other plants.

That "sugar-cane has therefore rather deteriorated than improved, and it is only very recently that it has been perceived that unless some change can be introduced the cane will, by degrees, degenerate at the same time that the beet is progressively improving. The result would in time probably be the destruction of the great tropical sugar manufacturing industry," is, I venture to believe, not likely to become the case, for in this colony our sugar canes have improved through careful cultivation under suitable conditions, and this has also been the case in the Mauritius with many varieties of cane forwarded from here, as is shown by the fact that the Director of the Botanic Gardens mentions in his last report that the cane garden has been discontinued in consequence of the planters being fully supplied with new varieties. Admitting, as stated, "that the cost of carriage is greatly in favour of Europe, while the beet refuse is useful for cattle-feeding, and the root enables a good system of a succession of crops to be introduced on the continent, where this sugar industry vastly increases the production of meat and corn in the districts where it is commenced, in addition to giving very profitable employment in the agricultural season;" but on the other hand it must be admitted that the element of success in beetroot cultivation, upon which so much stress has been laid in the competition between sugar-cane and beetroot, is the value of the refuse material for cattle-feeding purposes. Even granting that the weight of the pulp is 18 per cent. of that of the beet, and the yield of pulp from an acre, of land is 72 cwts, large quantities of manures of various descriptions, and some of them costly ones, and only procurable with great difficulty at a distance from manufacturing centres, and in the cases of sugar-growing countries at a cost that precludes their use, are required to preserve the fertility of the land; whereas in the case of sugar-cane, where the trash and megass is returned to the field and buried while in a green state, no further manuring is required. In this colony in no instance that I am aware of is the megass used for fuel, and many planters are now becoming aware of its value as a manurial agent in the preservation of the fertility to their lands, and are now using it for that purpose.

The success of the beetroot would be very problematical in this and most other sugar-growing countries as the 45th degree of latitude in the Northern hemisphere appears to be the southern limit of its successful cultivation in reference to the extraction of sugar.

The growth of plants in any country, supposing the description of soil to be favourable, depends—*1st*, on the temperature: *2nd*, on the amount of sunlight; 3rd, on the degree of moisture, and its presence at the time when most required by the plant. Climate is a great consideration to the growth of succulent plants, and, as a rule, an abundant supply of moisture is required; yet on soils too humid the beetroot grows large, but with much less sugar in it.

Another argument in favour of cane is its superior power of withstanding drought, which in the case of similar weather with a beet crop would result in a total loss. Our climate is as a rule too dry, and also too uncertain in the quantity of rain that falls, to allow of beet being ever generally adopted as a crop to supersede cane.

Another objection is that beetroot cannot be grown continuously upon the same land with profit, but must form one crop in a rotation. I have no data as to what the cost of working an acre of beetroot would amount to in this colony; nor has it yet been cultivated upon a sufficiently large scale to admit or even an approximate calculation. Beet cultivation was commenced, and a factory established some years since in the neighbouring colony of Victoria, but operations were suspended after the second season, the results not being sufficiently satisfactory; and the company has since been dissolved. In this instance the juice did not contain as great a quantity of saccharine matter, but contained a much larger precentage of saline impurities than the juice obtained in the beet-growing districts of Europe. No claim has yet been made upon the Victorian Government for any portion of a sum of £5,000 granted for "the encouragement of the manufacture of beetroot sugar grown within Victoria." This sum was to have been awarded at the rate of £10 per ton to the producers of fifty tons or more of beetroot sugar.

The area in which the culture of the beet has proved a commercial success appears to be circumscribed, as its cultivation and manufacture has been unsuccessfully attempted in England, Ireland, New Jersey, California, Canada, and Victoria.

Owing to the smaller quantity of saccharine matter in beetroot than in sugar-cane, and also owing to the more complex combinations in which it is found, it requires greater ingenuity and a more careful application of scientific principles in the extraction of the sugar. Putting on one side the question of profitable cultivation, this fact alone in cane-sugar producing countries would in most instances prevent its cultivation, for the producer would have to erect all the complicated and expensive

apparatus of a beetroot sugar refinery, in addition to that required for the extraction of the juice, and then to work the plant only during crop time—say for 100 days—and attempt to compete with European sugar refineries, which would be to enter upon a severe and unnatural competition which no probable yield would justify.

In fact the planter instead of an ordinary cane sugar producing plant will have established a sugar refinery, which working only quarter time will be so heavily, weighted that it must be hopelessly beaten in the race, and the profits from beet culture, if any, will be absorbed by the losses in refining. But in addition to this, a larger amount of both scientific and practical knowledge is necessary. The beetroot manufacturer must not only be a through practical agriculturist, but he must also be a good chemist, and familar with mechanics and engineering, in order to carry out improvements suggested by experience, and thus keep pace with the progress of other manufacturers.

The time may not be far distant when cane agriculture and manufacture will be conducted on more advanced principles than are usually applied at present: it is possible that the cheapness with which sugar can be made from cane will lead to the extension of its growth to such a degree that the price of sugar will fall to a point at which beetroot sugar manufacture ceases to be profitable.

From a careful consideration of the subject, I think we may safely arrive at the conclusion that in cane-producing countries the sugar-cane is not likely to be supplanted by the beetroot; and in cases where the cane plant has degenerated we must devote our attention to the discovery of the cause and its remedy, and not to the introduction of other sugar-producing plants.

That the degeneration of the cane plant does not proceed solely from the use of immature cuttings, we may infer from the fact that good results have been obtained from diseased canes when transferred to new country. From this we may reasonably infer that the exhaustion of the soil may have something to do in the matter. This exhaustion of the soil is the results of defective cultivation and insufficient manuring, and it is upon improved methods of culture and careful selection of plants more than upon new varieties of cane that the planter must mainly rely upon; at the same time there is no question, but that the introduction of new varieties of cane, and the adaptation of species to soil and climate, are important points in the general improvement of cane agriculture.

This article may well be concluded with the words of a West Indian planter of many years' experience:—"Modern improvements in agriculture have doubtless raised the yield of beetroot crops, and may do it still further; but in a similar degree is the agriculture of sugar plantations capable of further important improvements, and the yield of cane capable of being considerably increased. * So far as the production of sugar is concerned, the advantage is so greatly and obviously on the side of the sugar-cane that the decision against beetroot cultivation is arrived at as an *à priori* judgment, which has hitherto been held with considerable tenacity by the majority of the agriculturists in this country."—*Walter Hill, Director of the Botanic Garden, Brisbane Queensland, in Journal of Applied Science.*

SUGAR INDUSTRY IN QUEENSLAND.

FROM a report on this subject by Mr. Henry Ling Roth, it appears that the crops of sugar in this colony amounted in 1879, (that is 31st April 1879 to 31st March 1880) to about 18,200 tons, or about 4,500 tons above that of the previous year. The approximate output of the four sugar districts was :—

Southern district	... ... about	2,200 tons.
Central ,,	... ... ,,	5,750 ,,
Mackay ,,	... ... ,,	9,500 ,,
Cardwell ,,	... ... ,,	750 ,,

The output for 1880 is estimated at 21,000 tons, which is considered a low estimate. As far back as 1823, the late Mr. Thomas Scott grew the sugar-cane successfully under the patronage of Sir Thomas Brisbane, then Governor, and succeeded in obtaining 70 tons in 1827, at Port Macquire in New South Wales. This venture was carried out with the aid of convict labour placed at Mr. Scott's disposal by the Governor, but on the removal of Sir Thomas, the sugar establishment was broken up. Various attempts were subsequently made to establish the sugar industry without effect. Throughout Morton Bay previous to its separation in 1859 from New South Wales and its formation into Queensland, the sugar-cane was cultivated in the gardens of several people, so that there was little doubt as to the possiblity of its culture.

The first sugar known to have been produced in Queensland was made by Mr. Buhot, of Barbadoes, from cane grown in the Botanic Gardens, Brisbane, in May 1862. In 1868, Captain L. Hope had twenty acres under cane and the Society of Arts offered a medal for the first ton of sugar made in any of the colonies. By the end of 1867 there were 20,000 acres under cultivation for cane, and the six miles in existence manufactured 168 tons of sugar. At the close of the season of 1869 there were 28 mills at work crushing the cane from 1,280 acres, out of over 5,000 acres under cultivation. In 1875, the season turned out very bad, the cane, nearly drowned in wet, became unhealthy and died, giving next to no returns. In the course of time the evil effects of 1875 passed away, and the sugar industry has been since then, more or less of a success. The average yield of sugar per acre in Queensland, for the ten years ending 31st March 1879 (and including the rust year 1875,) is as follows :—

	cwt.	qrs.	lbs.
Southern district	24	0	25
Central ,, ...	24	2	9
Mackay ,, ...	27	0	23
Cardwell ,, ...	30	1	2
Queensland ,, ...	25	3	0

These figures may be compared with the yield of other countries, as in the following table :—

Country	Average yield per acre. lbs.
Domerara	4,480
Louisiana	1,200
Mauritius	3,500 to 5,500
Jamaica	1,344
Philippine Islands ...	2,800 (This has been stated as only 1,080 lbs.)
India	896
Rio Janeiro	2,100
Java ... ... about	3,360

Mr. Roth writes respecting these figures :—"According to Porter, virgin land used to give 5,000lbs. of sugar per acre, and Edwards in his 'History of the West Indies,' speaks of soil in Jamaica, which with plant cane will produce 2½ tons (5,600lbs.) of sugar to the acre. Now, in Queensland, 3½ tons and over, or above 7,840 lbs. per acre, have occasionally been obtained from soils newly broken up, but such a yield is exceptional." The manufacture of rum has increased at the same rate as that of sugar. The total production since 1867 was 1,842,322 proof gallons. Up to 1876, the yield was at the rate of over 2 gallons of molases fermented to 1 proof gallon of rum distilled. For 1877, it was at the rate of 1-4/3 to 1, and in 1878, at the rate of 2 to 1.

The mean consumption of sugar in Australasia is greater than in any other part of the world. The consumption of sugar and molasses in England for 1878 was at the rate of 62½ lbs. per head Australasia, however, consumed 78·71bs. per head, or 16 lbs. per head more than England did. Of the colonies, Queensland is the greatest, and South Australia the smallest consumer, their consumption being 92·13 and 71·31lbs. respectively. Australia draws her supplies from various quarters. Of the 91,500 tons which went into consumption in 1878, one-sixth was prodcued by Queensland, and one-twelfth by New South Wales, thus one-fourth of the sugar consumed in Australasia is produced in Australia itself. The remaining three-fourths are imported chiefly from Java and the Mauritius, supplemented by small supplies from the minor sugar-producing countries.—*Journal of the Society of Arts.*

ARUNDINA BAMBUSŒFOLIA.

ALTHOUGH neither the hills nor plains of India can boast of the more gorgeous species of Lilium—(those magnificent ground orchids that are furnished by Mexico and South America)—there are several that will be even perferred to them by many from their greater delicacy of bloom, and the first place must be given to the really handsome flower whose name stands at the head of this paper. As far as my experience goes I do not believe that either of the three varieties are found in any other place but the Khasia and Garrow hills, although there is no reason why it should not be indigenous to many parts of the Himalayas, round about Katmandu especially, and even Darjeeling. On its first introduction to England, it attracted universal attention, but has since fallen out of favor (or fashion), in fact, like many of the East Indian orchids, it has been sent home in such quantities as to become rather a drug in the horticultural market. Another reason for its present disfavor is, that people at home do not know how to treat it, and this remark is applicable to most of the Indian varieties. Many orchid fanciers are at length awaking to the fact that their gardeners are unable to comprehend that Indian orchids comprise both hot and cool varieties, and are insisting on treatment more in accordance with the natural habits of the plants entrusted to their care than has been the case hitherto. The orchid fancier in India possesses immense advantage over his European compeer, for he gets his plants fresh at a nominal cost, and if unacquainted with their proper treatment, can obtain all necessary information within a day or two. To return to the *Arundina*. The first variety grows to an average height of four feet, having stout red-like cane stems as thick at the base as a man's index finger, tapering gracefully upward till it ends in the flower spike about six inches in length, bearing usually from eight to ten buds about an inch apart. The sepals and petals are in this variety rose-colored; the lip paler, but beautifully splashed towards the edge with

* This has already been done, as I find that under date February 5, 1877, Mr. J. F. V. Minchin, of Aska, writing to the Editor of the *Indian Agriculturist*, says, speaking of the diffusion process, "By this process I extract 87½ per cent. of the 90 per cent. juice the cane contains. I send you by dak a sample of sugar turning out to-day." The editor adds : "The sugar is granular, and of good quality."

crimson spots or blotches, with a pale canary bloom towards the base. This large Arundini is seldom found above 1,200 feet, and not very frequently lower down, although my experience is not to be taken as a hard and fast rule. The plant requires leaf mould, sand, and a small proportion of crushed limestone. In Calcutta the best means of growing this (which, for the sake of reference, may be called *A. majus*). would be in shallow pots with about four inches of soil upon a layer of corks or lumps, or broken brick. Subject as the plant is to a rainfall of some 300 inches, it will require copious watering in addition to what it will get during the rains in any part of Lower Bengal, and during the hot weather it must be kept in a cool shady part of the verandah, allowing just sufficient water to keep the soil moist. As soon, however, as the rains regularly set in, the pots should be put out in the open, so that they can get all the light and air possible. The plants will flower all through the rains, and as a rule, up to Xmas, if kept free from dust; then comes a period of rest till about the middle of April, when they should be taken up, the new bulbs and stems separated, and all reported in fresh mould. The flowers usually unfold themselves in couples, but in one very robust plant that the writer manured, four and five came out at times. They last usually four days, and may be nipped off as they begin to fade, unless the seed is required. Removing the drooping blossom tends to open out the new buds, and by a little attention to this a continuance of pairs of these beautiful flowers may be had daily for six months of the year. For transport from the hills all that is necessary is to pull up the plant, knocking off he superfluous mould, and wraping some moss round the roots. It is quite unnecessary to cut down the stems, as many people do, for the plant will not only travel much better with them intact, but if potted and washed on arrival, the leaves rapidly recover from the effects of the journey; and, though blossoms need not be looked for until the rains, the plant is an attractive object even without them, far more so than an unsightly leafless stick.

In and about the same locality, but in more shaly places than those in which *A. majus* delights, is found a diminutive species, that to an amateur would present the appearance of being a young shoot of the former, but it differs both in foliage and blossom. The bulb is about the size of an ordinary spring onion, the stem, which is but six inches in length, and is succulent and almost leafless. This may well be called *A. minor*. The flowers seldom develope more than one at a time, and are small, of much less delicate hue than *A. majus*, and the lip is almost a uniform colour with the rest of the flowers, but is longitudinally striped with scarlet, the canary bloom in the other variety being represented by a deeper though less brilliant shape. This is not a desirable plant, although improvement might possibly be effected by hybridising with the pollen of some of the white orchids, such as *D. formosum*, or still better *Plisone maculata*. No plant that I am acquainted with would be benefited by being hybridised with the pollen of *A. minor*; with the exception of required shade the cultivation of this plant is the same as the one alluded to above.

In addition to the two plants just treated of, there is another *Arundina* with a flower precisely similar to that of *A. majus*, but borne on a slender whip-like spike about a foot in length from where the leaves terminate. The whole plant seldom attains two feet, and when not in flower is, from the resemblance it bears to the numerous grasses around, most difficult to distinguish. Considering that the flower is in all respects like the large variety, I am inclined to conclude that the dwarfed proportion of the plant is due to the greater elevation and more exposed parts of the country which it inhabits. In the month of August the whole country (from the top of the precipitous face of the hills, abutting on the southern plain, from 1,500 up to 4,000 feet or, to put in more intelligibly, say from the 21st mile stone on the Jaintiapore road till one reaches the quartz formation about five miles from Jawai is covered with those beautiful lily-like flowers interspersed with some white and yellow *Calanthi* and numerous other flowers as yet unclassified. During this month the rain is almost incessant, and penetrates to the skin, driven, as it is almost horizontal, the tremendous downpour would rot the bulb of almost any plant were it not for the natural drainage, and the *Calanthi* alluded to are found in places so very like swamps that a cursory observer would, at a first glance, be inclined to classify them as semi-aquatics. The bulbs of the *Arundina* retain moisture sufficient, out of this abundance, enabling them to go on flowering for months after the cessation of this deluge; and, though the plant may be said to have its home within the rainbelt, I have come across isolated plants nearly 6,000 feet above the sea; and when found at this elevation, I invariably noticed that, though the flower is of the usual size, the whole plant does not exceed four inches in height, so that, for presents for friends in Europe, they would be admirably suited. In packing for the trip home, it is simply necessary to lay the entire plants in an oblong box, and as a hundred will go in a case, four feet by two by two, there ought to be little difficulty in getting a large proportion home in good condition.

ALTHOUGH *Thunia alba* does not come in due alphabetical order, still as it is a ground orchid, it may as well be placed here. This plant is found in perfection in the vicinity of the numberless streamlets that come tumbling down the hill side during the rainy months; and, though in most cases it flowers before the actual rains set in, it is readily found, as the peculiar shape render it conspicuous even amidst the tangled mass of vegetation it delights in, springing from a small bulb; the pale green stem jointed at intervals of an inch or so, grows to a length of about eighteen inches, although in favourable localities plants are occasionally met with double that size. The leaves are long and lance-like, projecting from the joints, and the flower resembles a white lily when fully developed, about three inches across, but from the slenderness of the stem, it is seldom the flower is found, except in a drooping position, and so is hardly ever seen developed in its native state. The lip is striped, longitudinally, with vermilion. This is an instance among plants that proves that improvements in Nature can be made, for when taken from the moist steamy ravine and potted in crooks with but the least possible amount of moss and dead leaves, the drooping stem kept in an upright position by a stick, *Thunia alba* shew to great advantage; the leaves become broader, and the whole plant assumes a much more robust appearance than any one looking at a freshly imported one from the jungles would believe possible; the flower opens out thoroughly. As noted above, a very small amount of soil—if soil it can be called—is required for this plant, which, in its own home, is found adhering to the fibres of washed-out moss and leaves matted together by the action of water. Cocoanut fibre is suitable, if it has all the smell thoroughly washed out of it, but if used fresh, it undoubtedly possesses some ingredient detrimental to most orchids, extensively used though it be. Although the plant will grow well under the shade of a tree, it will thrive better in pots, for during the hot weather it should be kept in the coolest place in the verandah, and where water is available, a spray should be kept playing during the day imitating, as far as can be artificially done, the mist that it receives in its native ravines. All orchids, even ephytical *Dendrobiums* should, I am of opinion, be grown in pots, baskets, or on blocks of wood in preference to being established *in situ* on trees in the compounds (where they can only be seen by daylight, while, if grown as suggested, they can always be moved and rendered available for decorative purposes, either in the house of the proprietor or hired out for special occasions, while, when the time comes for returning home, the small quantity of established orchids one can collect about them will take up but a small space for freight, cost little, and if not required by the owner in England may be sent to a nurseryman until the ill-effects of the voyage are remedied; when, at auction, they should realize enough to pay one's passage; but it is as well to mention here that, what are called in England "imported orchids" those just fresh from the ship hardly pay their freight in the present day, for this reason, that the great fanciers at home do not care for the trouble of recovering them from the journey, and also run considerable risk in buying them in their dormant state of getting varieties other than what they believe they bid for. Hence, so far as freshly arrived plants are concerned, the trade is entirely in the hands of the dealers, who apparently, to judge by recent sales, have some understanding among themselves by which they control the auctions.

OSWIN WEYNTON.

AUSTRALIAN WINES AT THE EXHIBITION.

AFTER reading over the published list of awards made by the wine jury, some of our wine-growers may have experienced a feeling of disappointment that none of the Australian wines had attained to the highest honour, a first-class order of merit. Such a feeling, to those engaged in the wine producing industry and desirous of promoting it, is very natural, and has our warmest sympathy. A knowledge of the conditions under which the awards were made, and a little reflection on the very high standard of excellence, it was necessary to reach in order to secure a first award, will, we feel confident, dispel the feeling of disappointment, and cause a feeling of intense satisfaction to take its place. True it may be said "Australian wines received first awards at the Paris Exhibition in 1878, where they were judged by thoroughly competent jurors, how comes it that they are now beaten on their own grounds?" The answer is, here they were judged upon quite a different standard. The first awards at Paris simply meant the best quality of Victorian, New South Wales, or South Australian wines respectively. Those prizes did not even carry the weight of prizes gained at an intercolonial exhibition of wines. At Paris the wines of the various colonies did not compete with each other nor with the wines of the old world. The wines of each colony were judged by themselves. Victorian competed with Victorian, South Australian with South Australian, and German with German. Thus it will be seen that the award made at the Paris Exhibition differed but little from the awards made in the various colonies when the wines were selected except inasmuch as those awards were made by a foreign, and it may be assumed, a more competent jury. The principle on which the judging has been carried out at the Melbourne Exhibition is altogether different. Wines, as well as all other exhibits, have been judged by an international standard. Hence our Australian wines had to compete with the choicest vintages of France and German—in fact of the whole world. Under these circumstances it was scarcely to be expected that our vignerons would be able to take up a place in the front rank. It is no small honour—an honour vastly superior to the first awards gained at Paris or elsewhere—that Australian wines on their merits should be found ranking with the best brands of Austria, Italy, and the great majority of French and German wines. In the old world, generations of experience have enabled the vigneron to select the variety of vine best adopted to the soil and climate in different districts and different countries. The most suitable vines have been planted in quantity. In the after-treatment of wines, continental wine merchants possess an accumulated store of knowledge, the result of long experience. Both as regards the best and most suitable varieties of the grape vine for different districts, and also in the after management of wine in this climate, it is no disparagement to say that our

vignerons are as yet merely experimenting. Those who know most are readiest to admit that they have yet much to learn. Considering the youth of our wine industry, and the conditions under which it has been so far developed, there is every reason to feel proud and satisfied with the position occupied by Australian wines at the Melbourne International Exhibition.

PAPER MANUFACTURE IN FOOCHOW.

A COMPARISON of the manufacture of paper in China with that of foreign countries shows a wide difference. While in foreign countries paper is made by machinery from cotton and linen rags, hemp and straw, it is made by hand in China from the shoots of bamboo (not the edible ones) and upon illustrating the process of manufacture it will be found to be quite simple.

The bamboo trees usually produce shoots as soon as spring commences *i. e.*, in the 3rd moon (April to May) when the owner of the groves of bamboos proceeds to collect the full grown and tall shoots which are leafless. After being gathered, these shoots are each split into four parts or slices and are placed in an empty cistern underground formed by planks so as to prevent the water which is placed therein from afterwards leaking. The cut shoots are placed in the cistern together with unslackened lime or *chunam* in alternate layers. Water is then introduced and the cistern filled; the immersed shoots remain in the pool for forty days, at the expiration of that time, the lime water is withdrawn, and clear unadulterated water is placed therein and allowed to remain for fifty days. When this latter period has elapsed, the bamboo shoots are removed to a large circular stone vat without water, and a buffalo is then employed for the purpose of trampling the entire mass into pulp. After being sufficiently reduced, the pulp is removed to a sort of wooden trough, called by the Chinese a Chih-tsao, measuring about 8 feet (*Chihs*) long by 4 broad, and clean water again is introduced. After becoming properly decomposed, the coarse pulp is removed from the wooden trough with an iron scoop strainer and the fine decomposed dust remains in the water. A sort of grass called "Lan Tsao" previously well soaked in water, is then added to the pulp, and the entire mass is then stirred up with a bamboo broom. The pulp is now ready for being made into sheets of paper. A man with a square sieve dips the same into the trough and a sheet of paper is formed thereon, which is handed to another workman ready to receive it. The wet sheets are then taken to the fire or drying house, where poles placed obliquely, in tent-like form, about 15 feet apart at their base are ready to receive them; and upon each side of which 30 sheets of the wet paper are spread, whilst underneath the tent of paper if we may use the term, a pan of charcoal fire is kept constantly burning, in order to rapidly dry the sheets of paper. While a special kind of bamboo shoot can only produce paper, its manufacture greatly depends upon the various manipulations of the workmen employed. All kinds of Chinese paper are dried in the manner as described above, except the qualities used for umbrellas and the coarse kinds, which are dried in the sun. The coarse refuse of the paper pulp is sent to the various seaboard cities and towns to be used as oakum for caulking purposes. There are two small paper manufactories lying some distance back of Po-Ney-Shan, but these are principally engaged in *coloring* paper.

There is no province in China which can compete with Fohkien in its paper manufacture, and after tea and poles, paper by far is the largest item of export.—*Foochow Herald.*

MAURITIUS.

VANILLA; this bean has been the object of a brisk demand since the receipt of the mail, the advices to hand by which of a further advance in prices having rendered speculators in this market most eager to make purchases. Failing a sufficient stock of matured vanilla to meet the demand of our buyers, recourse has been had to 'time bargains' for green vanilla, to be delivered during the ensuing season and prices for the bean in this state have ruled from about Rs. 2·50 to Rs. 3 or even Rs. 3 50 per half kilog. The earliest purchasers in the field were able to enter into engagement for a certain quantity at the first named figure, but the growers have become less anxious to sell, and will not now quit their next crops on easier terms than Rs. 3 to Rs. 3·50, according to length of bean.

Matured and well prepared vanilla is in many cases held for Rs. 18 to Rs. 20 per half kilog, though we should mention that some indifferent parcels have changed hands at lower figures.

The preparation of last yield is now concluded, but it is an extremely difficult matter to arrive at an exact estimate of the quantity of vanilla made, which can only be determined in a reliable manner on its exportation. We shall not be very wide of the mark in estimating last yield at 18,000 kilogs, or perhaps even a little over.

The exportation of vanilla pods, per the mail steamer *Dupleix* is stated to be as follows:—

For England, 5 cases weighing 200 kilos.
For France, 44 cases weighing 1,446 kilos, 250 grammes.

CULTIVATION OF VANILLA.

THE high price of vanilla should encourage the cultivation of this plant in many of our colonies, which are well adapted to its growth—*e g.*, Ceylon, Queensland, New South Wales, the West Indies, British Guiana and Honduras, Fiji, and parts of New Zealand. Some portions of South Africa and many districts in India would no doubt, also prove capable of yielding an abundant supply of excellent vanilla. Mauritius is at present our only colony where the culture of this plant is systematically carried on, though small experiments have been made, with encouraging results, in Jamaica.

As it requires special treatment, a few remarks upon its cultivation may be of interest to those who may be tempted to make the experiment.

In Mexico, vanilla is planted either in a forest or in a field. In the former case the underbrush, climbers, and large trees are cut down and removed, and young saplings only preserved to serve as supports to the vanilla plant, preference being given to trees having a milky sap; near each tree two cuttings of the vanilla plant are placed side by side in a shallow trench 1½ inch deep, and sixteen inches long, three knots of the stem being laid in this trench and covered with dead leaves, brush, &c. The rest of the cutting to the extent of three or four feet is placed against the tree and tied to it. The supporting trees should not be nearer than twelve or fifteen feet apart, to give sufficient room for the development of the plant. After a month the cutting will have taken root and must be carefully kept free from weeds and briars of all kinds. In the third year the plant begins to bear fruit which it continues to yield for many years.

When the vanilla is cultivated in a field, the Mexicans first plough the ground thoroughly, and raise on it a crop of maize. In the protection afforded by this plant, a number of young milk-bearing trees of the fig family grow, which in about a twelve or eighteen months are large enough to answer the purpose of supports to the vanilla plants, which are then placed as above described. In Mexico and Guiana the plant is allowed to climb up the trees, the fertilisation of the flowers is left to Nature, and a large number of flowers consequently remain unfertilised, and the yield of vanilla is small. In a few days after fecundation the flower falls off and the fruit continues to grow till the end of the first month, it takes, however, another five months before it is completely ripe. Each pod must be gathered separate and not the whole cluster at once, the time to gather them being indicated by the pod cracking when pressed with the fingers. If too ripe the pods split in drying, changing in colour from yellow to brown and black. If not ripe enough the fruit will lack fragrancy and proper colour. The ripe fruit has no odour. At first the agreeable odour of vanilla being developed by a process of curing. While the fruit is drying, an unctuous dark red liquid, called balsam of vanilla exudes.

In Mexico the pods are collected and placed in heaps in a shed to protect them from rain and sunshine, and left there for a few days; they are then, if the weather is warm and clear, spread early in the morning on a woollen blanket and exposed to the direct rays of the sun; at about mid-day the blanket is folded round the beans, and the bundle left in the sun for the remainder of the day. In the evening it is enclosed in tight boxes to "sweat" all the night. The next day the same treatment is adopted, and the beans, after exposure to the sun, acquire a dark coffee colour, the shade being deeper in proportion to the success of the "sweating" operation.

If the weather is cloudy, the vanilla is collected into bundles, a number of which are packed together into a small bale, which is first wrapped with a woollen cloth, then with banana leaves, and finally with a stout matting, which is firmly bound and sprinkled with water. An oven is then heated to 144° F. (60° C.), and the bales containing the larger beans are placed in it. When the temperature has fallen to 113° F. (15° C.) the smaller beans are introduced and the oven closed tightly. Twenty-four hours afterwards the smaller beans are taken out, and twelve hours later the larger ones. The vanilla has then acquired a fine maroon colour.

The drying operation then commences. The beans are spread on matting and exposed to the sun every day for about two months. When the drying is nearly complete, it is finished in the shade in a dry place, and the pods are then tied up in small bundles for sale.

In the Island of Reunion a different method is adopted.

In the first place the vanilla plant is never allowed to grow out of human reach, the different trees on which it is supported being connected by pieces of bamboo or other wood, placed horizontally, so as to form a kind of lattice, on which the vanilla can spread freely. As the vanilla loves a moist soil, and will not bear a burning sun the trees are never cut down. If grown in a field the support chosen is usually the physic nut *Jatropha curcas*, on account of its rapid growth and abundant milky juice.*

When the trees are of sufficient size to shelter the plant, the cuttings are set between the trees in a trench, eight inches deep, and covered with dry leaves, straw, and a little soil. This is generally done in the rainy season, as the cutting requires frequent watering while it is taking root. The shoots are trained on the lattices when they have begun to grow freely, and in two years are in full bearing. A length of stem of twelve to twenty-six inches in a state of Nature, although it may produce more than forty flowers, rarely yields more than one pod—the flowers being only capable of fertilisation by the aid of insects.

A man named Edmund Albins, a former slave in Reunion, discovered that if the pollen of one flower was made by artificial means to fertilise the stigma of another flower, it was possible to obtain more than 3,000 pods from a single plant, although this would cause the death of the plant before they could ripen. The method adopted, therefore, is to choose on each cluster the finest flowers, and only fertilise these

* How far the irritating property of vanilla which is sometimes manifested in vanilla ices, &c., may be due to the growth of vanilla on an acid euphorbiaceous plant may be worthy of inquiry. The use of fig-trees, as in Mexico, would seem at all events to be safer and more judicious.

presenting a large and fleshy peduncle. These are known to be successfully fecundated, if the flower, instead of dropping off, remains and dries on the top of the fruit. When this is observed, the rest of the flowers are cut off.

When ripe, the pods are sorted according to length, and scalded. The long ones are dipped into water at 194° F. (90° C.) during ten seconds, the medium ones fifteen seconds, and the shorter ones, one minute or longer. They are then exposed to the sun between woollen blankets until they acquire the characteristic maroon colour, which occurs in about six or eight days. The pods are then spread on hurdles, and placed in garrets to dry gradually. As in this colony the roofs are flat, and covered with tin, the garrets are in reality drying closets with a stream of warm air continually circulating through them. When the drying has proceeded so far as to allow the pod to be twisted easily round the finger, the operation called "smoothing" begins; and this requires great care, as every bean must be passed through the fingers from time to time, so as to spread the oil which exudes on the whole length of the bean, as the formentation proceeds, for the lustre and suppleness of the vanilla depend upon this treatment. The beans are also turned frequently, so as to ensure their drying equally on both sides. In a month the pods are dry and are then sorted according to their length, and into the three following varieties: 1st.—Fine vanilla, from eight to eleven inches long, glossy, dark brown, and unctuous, and soon covered with minute, frost-like crystals, technically known as *givre*. 2nd.—Woody vanilla, from six to eight inches long, lighter in colour, not glossy, presenting grey spots on their surface and having very little *givre*. These generally come from pods not quite ripe. 3rd.—Vanillon, consisting of two varieties, both of which are short. The best are obtained from ripe fruit and are covered with white crystalline efflorescence; the inferior are obtained from abortive or unripe fruits, and owe any odour they possess to having been in contact with those of better quality.

A slightly different method of drying is adopted in other vanilla-growing countries. In Guiana the pods are placed in ashes and left there till they begin to shrivel. They are then wiped, rubbed with olive oil, tied at their lower end, and hung up to dry in the open air. In Peru the vanilla is dipped into boiling water tied at the end, and hung in the open air; after twenty days the pods are rubbed over with castor oil, and a few days later are pressed into bunches.—*Colonies and India.*

WHY WE USE QUICK LIME UPON THE LAND.

ALL cultivated plants contain lime in their ashes, and it is considered necessary to their proper growth. But as soils generally contain enough lime, and we apply it for its action upon the soil, lime acts upon it and greatly aids the decomposition of organic matter in the soil. It is thought to neutralize the organic acids contained in what are called 'sour-soils.' In a complicated manner it aids in the fixing of ammonia It also acts upon the inorganic or mineral constituents of the soil, and aids in converting them into forms in which they can be taken up by the plants, especially in liberating potash from its combinations. The effect of lime upon the mechanical condition of the soil is an important feature. Upon heavy clay soils its effect is most marked: the particles lose their adhesiveness, and allow air and water to enter. These are the leading effects that follow the use of lime. In view of the claims made for ground, unburned limestone, it is an important question how far it can produce the above effects. That the unburned limestone will supply the demands of the plant for lime, that it may slowly neutralize organic acids, and help the mechanical texture of the soil, seems very probable. But that it will perform one of the most important offices, the decomposition of organic matter in the soil, and convert that into plant food, seems improbable, because the ability of lime to do this depends in a great measure upon its avidity for carbonic acid, while limestone, being already a carbonate, has no need of more. That limestone cannot produce all the effects of lime is shown by the well-known fact that soils underlaid by limestone, and naturally containing a large proportion of finely divided carbonate of lime, are as much benefited by the use of quicklime as are soils deficient in limestone. The advertisements of ground limestone that we have seen, make great use of the experiments of one person in Pennsylvania, who states that his yield of wheat, created with ground limestone, was more than double that to which slaked lime has been applied. He also claims to have found it a much cheaper fertilizer than lime and bone dust, and more profitable than guano and superphosphate. These statements have been sent by several who ask our opinion. Our 'opinion' is that we do not accept as final the results of any one experimenter, when they are in direct opposition to the accumulated evidence of those whose practice runs through many years. In nothing more easily than in agricultural experiments can an effect be ascribed to the wrong cause, and when we see the fertilising value of ground limestone placed above guano or superphosphate, we do not accept it.—*American Agriculturist.*

HEMP CULTIVATION IN MEXICO.

THE hemp industry in Mexico has, within the last ten or twelve years, attained considerable proportions, and one of the chief articles of trade in Yucatan, is the fibre extracted from the hemp plant, or American aloe, commonly called by the Indian name of "henequen." Consul [illegible] states that the plant is found in profusion throughout Yucatan, and forms the nucleus whence all the present hemp plantations have been formed. The hemp tracks are divided into "mecates," which is a Mexican measure of 24 yards square. After all the shrubs and weeds have been burned during the previous dry season, the Indian labourers proceed to dig small pits, in a straight line, from six to eight feet apart, and between each line of pits, a path about nine feet wide is left clear, in order to give the labourers sufficient room to cut the leaves when they have attained their full growth. As soon as the required quantity of land is thus laid out, the young plants are cut close to the ground, and, without any further process, are simply placed in the pits prepared for them, with a little loose earth, and are left to take care of themselves. Each "mecate" contains about 96 plants. Twice a year the ground is cleared of the underwood. As the plants grow, a stem shoots out from the centre, and the leaves gradually detach themselves from it in a spear-like form, with sharp prickles along the edges, and a strong, black, sharp needle-like thorn at the point. The plant requires from five to seven years to attain its full growth. At the end of this period, the leaves have an average length of four feet. A hemp plant will flourish from 10 to 15 years. Each plant has about 26 leaves during the year, 16 in the rainy season, and 10 in the dry; each leaf, four feet long, produces about three-quarters of an ounce of fibre; it requires, therefore, from seven to eight thousand leaves to make a bale, weighing four hundred pounds. As soon as the plant has attained its full growth, the leaves are cut from the trunk, commencing from the bottom upwards, only those being cut which are well developed. From the hemp beds they are carried to the scraping-machine, which consists of a strong fly-wheel, on which six or eight blunt brass knives are placed transversely. The leaves are placed one by one on a curved lever, which is raised or lowered in such a manner that the knives on the wheel only strike the pulp and lay bare the fibre. First, one end of the leaf is presented to the wheel, and as soon as it is scraped the other end is presented. Each time one end is introduced, the other is secured by a strong pair of iron pliers, which are attached to the machine. Each machine employs four men, one to place the leaves near the machine, one to attend the lever, one to introduce the leaves into the machine, and the fourth to carry away the pulp and refuse matter. As a rule, the machines are worked by steam-power, and can clean about four hundred pounds of fibre in one day. When the fibre is extracted from the leaf, it is taken to the drying-yard and hung on slender poles, which are stretched on wooden frames about three feet from the ground, and left to dry and bleach in the sun. If the weather is fine, it will become dry in four to five hours. While drying, the fibre loses its natural greenish hue and assumes a white, glossy appearance. It is then placed in hydraulic presses, and compressed into bales of the required size, which generally weigh three hundred and fifty, four hundred, and five hundred pounds. The fibre is then ready for shipment.—*Society of Arts Journal.*

DEEP PLOUGHING.

THOUGH experience at home has for many years proved the advantage of deep ploughing for all descriptions of crops, and in all sorts of soils, amongst the conservative agriculturists of India there have been, up to the present, a majority who have always argued that it was unsuitable to this climate, where the scorching sun would soon exhaust all the moisture from the too deeply loosened surface soil. Especially, they argued, would this be the case with rice and other plants, the roots of which penetrate but little below the surface. It is, therefore, a most important matter for all engaged in the cultivation of the soil in this country to learn the results of some experiments in deep ploughing, conducted last year at the experimental farm at Cawnpore, by Mr. Fuller, the Assistant Director of Agriculture in the North-West Provinces. The results obtained are all the more satisfactory for the supporters of deep ploughing, as the season was an unfavourable one. We are told that the failure of the autumn rains greatly interfered with the success of the experiments, especially in the case of those conducted to test the value of manures. "The rainfall, as measured on the farm between 1st June and 30th November 1880, only amounted to 6·06 inches (the normal for that period being about 27·6 inches), and was actually less by 3·07 inches than the rainfall during the corresponding month of 1877, the year of scarcity. As regards its *distribution*, however, the season differed broadly from the corresponding period of 1877, firstly, in that the rainfall was spread over more than double the number of days; and secondly, in that the month of maximum rainfall, was July instead of August, and the young plants received a start which enabled them to withstand, in some measure, the drought of subsequent months instead of as in 1877, being starved at the very commencement of their growth. A large number of the experimental fields were irrigated from the Ganges Canal, and fair crops gathered in consequence. But irrigation could not in many cases be given at the time it was required, since the farm lands depend for their water-supply on the tail of a distributary, and received it very irregularly. Maize suffered most conspicuously, and unfortunately this was the crop with which most of the experiments on manures were made. The manures experimented with were unable to produce their full effect in the absence of sufficient water, and the results which were obtained must be held unreliable.

But the failure of rain was not without service in another direction, since it brought out with extraordinary prominence the great benefit which results from a deeper cultivation of the soil than that generally in vogue. Experiments to test the value of deep cultivation with and without inversion of the soil, were tried with representatives of deep feeding and shallow feeding crops, *i.e.*, those which penetrate deeply into the ground by a tap root (*e.g.*, cotton and the pulses) and those which feed nearer the surface by a "crown" of fibrous rootlets (*e.g.*, maize, millets, and all other cereal grasses). The results have shown that it is the former class of crops which benefit most strikingly by an increase in the depth of their seed bed, while in the case of the latter class of crops the disadvantage resulting from the rawness of the fresh soil brought to the surface may, at the outset, more than counterbalance the advantage

they derive from the greater depth of tilth. This accounts for the numerous instances reported from Court of Wards Estates and elsewhere, in which the use of the English plough actually diminished the outturn since the experiment was invariably made with a cereal, and the results were judged from the crop gathered in the first season after the ploughing before the newly turned soil had had time to mature. The results of the experiments of the season under report appear to leave no doubt that tap-rooted plants derive an immediate and striking benefit from a deeper seed bed than that which is generally prepared for them. Details of these results are given in para. eight of the report, but it may be noted here that in one case cultivation with the English plough gave, on *unirrigated land*, an outturn of 860lbs. of cleaned cotton to the acre, while the ordinary cultivation of the country only yielded 150lbs., which was, if anything, above the average outturn for the unirrigated cultivated fields in the neighbourhood of the farm. *The use of the English plough, therefore increased the value of outturn by Rs. 4 per acre.*"

The result, therefore, may be said to be that those plants naturally benefit most which are deep feeders, and by means of a tap-root utilise a larger food-supply if made available by a deep stirring of the soil. Thus cotton benefited in a remarkable degree by deep cultivation, both with or without inversion of the soil, and similar results were obtained in the Rawatpur States managed by Mr. Harrison, Assistant Collector. On the other hand, surface feeders, as the millets and other cereals, derive but little benefit, the first year from deep cultivation, or even suffer from the rawness of the newly-inverted soil. But the experiments conducted by Mr. Fuller with *sorgho* show that, for shallow feeding plants also, deep ploughing may be beneficial, if the freshly brought up soil *has had time to mature*, and with this object the land should be ploughed early in May immediately after the *rabi* harvest. The hot winds and sun during May and June have the effect of fertilising the soil exposed to their influence. —*Asian.*

LAND PRODUCE IN THE UNITED STATES,

AUTHORITATIVE statistics recently compiled show the extremely productive character of certain States in the American Union. It appears that a group of States with less than a third of the population of the country produces five-eighths of the corn supply of the United States. These States are Ohio, Indiana, Illinois, Iowa, Missouri, Kansas, and Nebraska; and the following figures will show the enormous progress which has been made within the limits of a generation. The corn growth of Ohio in the year 1859 was 73,543,190 bushels, and in 1877, 97,000,000 bushels. The produce of Indiana had gone up in the same period from 71,588,919 to 96,000,000 bushels; Illinois, from 115,174,777 to 260,000,000 bushels; Iowa, from 42,410,686 to 156,000,000 bushels; Missouri, from 72,892,157 to 103,000,000 bushels; Khansas, from 6,150,727 to 98,000,000 bushels; and Nebraska, from 1,482,080 to 38,000,000 bushels. In 1877 the product of these seven States was nearly 850,000,000 bushels, and of all the rest of the Union only 491,558,000 bushels. Mr. J. R. Dodge, of the United States Agricultuarl Department, says that the wheat surplus is produced entirely in that portion of the country north and west of the Ohio river, in the central area lying between that river and the lakes and the Alleghany and Rocky Mountain ranges, and in a smaller area on the Pacific coast. There has been a great transfer of corn production from the South to the West, so much so that, while in 1849 fifteen Southern States produced 59 per cent. of the corn product of the country, the whole of the South now produces only one-third. This change is partly due to the increase in the cotton product of the South, but it is said that the South may yet regain its supremacy in the corn culture. It is a surprising, yet authenticated, fact that in fifteen years the production of wheat and barely in the United States has trebled; that of corn, cotton, and tobacco has more than doubled; oats have increased by two-thirds, potatoes have nearly doubled, and hay has increased by nearly one-third.

Mr. B. P. Porter observes that it may surprise many to find that only about 9 per cent. of the total American grain product, by bushels, is exported. But this is an immense item in the world's markets, and with cheapening transportation is capable of being greatly increased. Of corn as yet only about 6½ per cent. of the total product is exported, yet this is nearly double what it was ten years ago. But the figures as to the exportation of bacon and pork are astounding. In 1868 the exportation of bacon and hams only amounted to 48,659,664lbs., whereas in 1878 it had risen to the enormous figure of 592,814,351lbs. pork had gone up in the same period from 28,690,133lbs. to 71,889,255lbs., and lard from 64,555,462lbs. to 342,667,920lbs. But in addition to this, the exportation of live stock across the Atlantic has increased tenfold within two years only. The cost of transporting live animals across the Atlantic is being rapidly reduced; yet the only hope for the British and Russian farmer is the high rates of transportation from the United States ports, and the fact that the American farmers, through bad farming, are exhausting the soil. Such are the present arguments on this question; but it is affirmed that, in the area yet to be subdued between the Missouri and the Pacific coast, the proportion of the cultivated area devoted to wheat will be larger than in the territory already occupied. When all these available lands are taken up, remarks Mr. Porter, and population threatens to press upon subsistence, fertilisation with rotation will increase the rate of yield (as has happened in the most populous districts of Europe), and then the centre of wheat production may possibly recede slowly eastward, obedient to the impulse of improved agriculture. With regard to the 'railway monopoly,' it is alleged that this is not such an obstacle as some may imagine. The Western producers affirm that they will not give up the battle until equitable and steady rates of transportation are insured. As it is, during the season of 1879 grain was shipped from Chicago to Liverpool for 17 c. a bushel, a rate but little in excess of that which prevailed for the transportation of grain from Buffalo to New York by canal and the Hudson River ten years ago. Mr. Porter observes that careful estimates shew that the United States is capable of maintaining an area of 200,000,000 acres of corn land, which, with the average yield of the past ten years, would yield upwards of 5,250,000,000 bushels of corn. Turning from corn and wheat to cotton, it appears that the whole cotton crop of the world could be raised on a section of Texas, less than one-twelfth of its area; or could be divided between any two of the other principal cotton States without exhausting one-half of their good land. The agricultural productiveness of America is practically illimitable; and when the full importance of the agricultural interest is realized and profited by, it must exercise an important influence over England and the European continent.

THE NEED OF AGRICULTURAL TRAINING.

THE native "Farmer," whose letter on Agriculture in India we publish in another column, endeavours to show that it "is incumbent on the rulers of the country to give their earnest attention to the dissemination, among all classes, of a sound agricultural education." Our correspondent probably refers to all classes of the ruled; and it may not have occurred to him, that the class which stands in most need of the education referred to is the governing class. What is the real cause of the apathy that is shown by the Government in promoting the kind of education referred to? No pains have been spared to make Masters of Arts, Bachelors of Arts, and clerks for Government offices; but few pains are bestowed on teaching the people the agricultural wisdom. The basis of the Empire is not found in what passes for scholarship, but in agriculture: and the security of the Government, the well-being of the people, and the prestige of England, are bound up not with the generous production of graduates, but with the conservation and development of the agricultural wealth of the country. Yet, from the Viceroy downwards, European officials in this country, with few exceptions, seem to draw their salaries without giving a thought to the fact that those salaries are for the most part derived from the soil, and that it is incumbent upon the recipients to make some return to the soil for the personal benefits received thereform. No dallying with agriculture is to be thought of, nor do we desire to see officials making of the subject a hobby-horse similar to the one called education, on which, until lately, it was the fashion of officials of high degree to prance. The inexperience or apathy of the European officials is naturally reflected in an aggravated form by their native satellites, and it is reasonable to suppose that, when the former have more experience or practical knowledge at their command, the latter will do their best to follow suit.

The recognition of the need of technical agricultural training in the officers charged with the collection of the revenue from the land, is one of the many good features of the Famine Commissioners' report. The Commissioners considered that it was unnecessary for them to dilate on the importance of agricultural knowledge, both to the governing class and the governed. On this point, we take the liberty of differing with them. We believe that if there is one subject more than another, on which the Government of India and the minor Administrations need to be periodically stirred up, it is that of agriculture. Theoretically it is admitted, that agriculture "greatly preponderates over all other interests and employments in which the people of India are engaged;" but in practice the subject, though of vital importance to the country, is approached in a half-hearted way, and is soon wearied of. One of the chief causes of this is the short-sighted system of giving the prizes in the service to good scribes rather than to clever administrators. Men, comparatively young in the Civil Service, who may be warranted to a great deal of epistolary work, are drawn away from the Mofussil, to the head-quarters of the Government, and there they remain till the end of their official days, while men who are working up-country are to a great extent forgotten. Our present Governor is a case in point. He knows a good deal about the details of Government, about rules, precedents, orders, regulations, and so forth; but it is probable that since he left Canara in March 1854, he has seen no more of the processes of agriculture, than what he could not avoid seeing in the neighbourhoods of the Adyar, along the line of railway to the Neilgherries and at Ootacamund. He is for a time, the chief ruler of a country containing thirty millions of people, mostly agriculturists; yet it would be ludicrous to claim for him the possession of the technical agricultural knowledge that "can be called in to enable the productive powers of the soil to be applied in the most effective manner, not merely to add to the wealth of the country, but to secure a food-supply which shall keep pace with the increase of population." The Commission being composed for the most part of officials, naturally perhaps came to the conclusion, that there is nothing like a department for putting to rights the ignorance of the governing class on agricultural matters. We cannot follow them here. India is already the hot-bed of departments, and what she now wants is not any more corporate associations "with no bodies to be kicked, or souls to be damned," but practical individuals, who know what they are about who do not dread responsibility, and who have minds of their own. A

department is an admirable arrangement for paying large salaries for plausible reasons to mediocre individuals whose work is not always worth the large sum the country pays for it.

The Commissioners consider that there should be in the country "a certain limited number of persons possessing superior technical and scientific knowledge of practical agriculture, whose task it should be to aid the Government in its endeavour to introduce improved methods of cultivation." Why do the Commissioners wish to limit the number of these superior persons? Are they afraid of having too much of a good thing? The Commissioners indicate some of the work that might be done by the persons aforesaid in ascertaining the characteristics and capacities of soils, &c., and they then proceed to point to the need of "a body of public officers with sufficient training in scientific agriculture to see that the special and technical knowledge just spoken of is applied in the best way, to interpret instructions to the people, and to stimulate popular sympathy and interest in the efforts made to introduce them." Of course they recommend the employment of trained Civilians. They suggest that for the future more weight should be given in the competitive entrance examination to the attainments in the natural and physical sciences. The requirements in Indian languages, Indian law, and political economy might, they consider, be abridged, and the place of these subjects should be taken by agricultural and organic chemistry and botany. They urge that after two years' special study, selected candidates should be allowed to spend one year either at an agricultural college, or in the study, under proper supervision, of practical agriculture. They recommend that junior Civilians who have served four or five years in India, should be allowed to spend a year or longer in Europe, at a school of agriculture, the time counting as service in India, provided they pass a suitable qualifying examination at its close. This is, we believe, what it most wanted. Men who have entered the Civil Service, and been knocked about the country a good deal, may be expected to have learnt that the special course of study through which they struggled in England was ill-calculated to arm them for the battle of official life in India. It does not take long for the "Wallah" to discover that he had to put himself to great trouble to learn something about a lot of things which are of no use to him in India, and that he stands in daily want of an unpretentious acquaintance with the common facts of daily life. If he have good stuff in him, the discovery of his ignorance prompts him to exert himself to supply his deficiencies; but hitherto the Government have not come to his rescue nor have they offered him any suitable encouragement to fill up gaps in his experience that hamper with his discharge of duty. The Government have however taken a step in the right direction with regard to Forest and Irrigation officers going to Europe to work up their special subjects and a comprehensive scheme to encourage revenue officers to do the same, should be of immediate benefit to the country, and to the Civil Service. It is the "little knowledge" that "is the dangerous thing." A technical agricultural training for young Civilians before they come out should be regarded as indispensable; but it should if possible, be supplemented by a special course of study in Europe after a few years' service in India. The crude ideas of youth, would, by that time, have been corrected by actual acquaintance with India. If instead of 917 Civilians. only a small percentage of whom have had a special and technical agricultural training, India had 1,200 Civilians, of whom fifty per cent. had passed through a thorough course of agricultural education, and if the sum divided in salaries among the 1,200 amounted to no larger sum than is at present drawn by the 917, then would there be a fair chance of the preponderating interests of agriculture being duly recognised by the Government. The country can ill afford to wait until a new race of Civilians rises up who have had the special training in their youth that is necessary for the proper encouragement of agriculture. The men already in the Service, and who are likely to remain in the country for ten years and upwards, engaged in revenue work, should be urged by Government to follow the example of Mr. Pennington, who, on the eve of being appointed Collector of Tinnevelly, went to the Agricultural College at Cirencester to learn what he had seen it was essential a revenue officer in India should know. Proprietors of large estates in England do not usually appoint as their land agents, or stewards, men whose heads are crammed with odds and ends of school knowledge; but they select men learned in land, who have made the cultivation of land their study from boyhood, and who have had practical experience of agricultural processes. The Government of India, on the other hand, though they are proprietors of enormous estates, have hitherto committed those estates to the care of stewards who have had no training in agriculture, but whose best energies have been devoted to getting up a variety of subjects that have no bearing upon land. The Government are so far consistent that they often appoint to District Judgeships gentlemen who are not learned in the law, and who have not made law their special study. This is because good appointments are found for men more often than good men for appointments.—*Madras Mail.*

HOW TO LEARN BOTANY.

BOTANY is usually regarded as a very dull and difficult study, even for advanced students and of course quite too dry and hard for young children. This is all a mistake. Botany is really almost fascinating study for children or grown people. It is better adapted than almost any other to cultivate the very faculties which are not stimulated by other studies. The secret of success consists in making each student an independent explorer and discoverer. Taught by an enthusiastic teacher, botany awakens and strengthens powers of accurate observation, acute perception, and correct classification, such as are needed to make life useful and happy.

The study of botany may be commenced at any time. The best time is early spring. Suppose we start with a family of young people from 7 years old to 20. We meet every day. For our first lesson we study any plant or part of a plant, that we have at hand. Each makes a sketch on paper, and writes a minute description of it. Then we put some seeds, or grains, such as beans, corn, oats, &c., in warm water to soak till the next day. At the second lesson we open some of these softened seeds and observe their internal structure. The older and wiser ones tell the younger ones what they know about the seeds. Then we plant the remainder, some in earth and some between layers of damp cotton floating on a tumbler of water. While waiting a few days for these to sprout, we bring up from the cellar onions, potatoes, celery cabbages, &c. Each object is examined externally and internally, sketched and described in writing. Some of them are planted in earth and put in warm places, that we may study our growth. Looking out of the windows, we examine each tree and shrub in sight sketching and describing twig, branch, trunk, and bark, and telling bud. We cut cross sections, and compare them with cross sections of bamboo or palm stems as seen in common fans. We cut vertical sections, and compare them with the wood used in making furniture. The plants and flowers in the window are sketched and described down to the most minute particulars.

Now we begin to study a book on botany. Our seeds are beginning to germinate and illustrate the first lessons, and our leader takes care that in all our course our investigations shall keep in advance of our book lesson, that we may have the pleasure of making discoveries, and finding them confirmed. Each day we recite something previously learned, find plants to illustrate it, and others to lead in the direction of the next lesson. Then taking some plant (if possible, a complete one from root to flower and seeds we examine, sketch, and describe it. Then turning to the analytical table) we trace the description till we determine the species. We commit to memory and recite some of the distinguished characteristics of the family thus becoming so familiar with them that in future we need not go through with the tabular analysis. We press and preserve specimens of all plants analyzed. As often as possible we pursue our studies in the fields and woods. In each of these excursions we study one particular organ or part of a plant. Sometimes collecting the greatest possible variety of leaves, we sit down and compare the different forms. Some times we do the same with roots. Thus we learn a great deal about plants which we cannot analyze, because some part is lacking.

In studying botany in the ordinary way, very little enthusiasm is awakened, but studying in the way described, vastly more interest is excited, and much more knowledge gained. A thousand beauties are discovered which the books pass over unnoticed. Any young person who has studied botany for a single season could conduct a class on the plant I have described. It is a shame that country children should be allowed to grow up ignorant of natural subjects around them. It is time that educated people, school boards, &c., should see sciences worth studying. Agricultural societies would help to educate the the young people if they would offer premiums for proficiency in natural science, as well as for cattle, crops, and manufactured articles.—*Teacher in Country Gentleman.*

WELL CONSTRUCTION ON ESTATES.

A CIRCULAR emanates from the local Government, enjoining that the construction of wells and other agricultural improvements on estates under management, should be encouraged by district officers as much as possible. The circular in question goes on to remark that the Lieutenant-Governor and Chief Commissioner, has repeatedly, in his annual reviews of the revenue administration, in his orders on the budgets of wards' estates, and elsewhere, dwelt on the importance of encouraging, both directly and indirectly, the construction of wells in estates under management, and of treating liberally tenants who are ready themselves to make such improvements. Further in February 1878, he pointed out how far, in his opinion, it was admissible to restrain a tenant in respect of the making of improvements; prohibited the practice—of which some instances had been discovered—of requiring tenants, applying for permission to make wells, to sign agreements, resigning all claims to compensation as a condition of granting the permission; enjoined the grant of liberal terms to tenants desirous of making wells; and insisted on the advantage of distinctly recording those terms at the time they are agreed on. It has, however, come to his Honor's notice that his expressed views on certain points are not as fully known to the subordinates estates' officials and to the tenantry as they should be. Sir George Couper therefore deems it advisable to re-state his instruction on these points. The construction of wells and other improvements by tenants should be encouraged as much as possible, and it should be made known widely amongst the tenantry of estates under Government management, that this is the policy of Government, and that applicants need not fear that unreasonable restrictions will be imposed upon them. On the contrary, so far as the circumstances of the estates will allow, they will be aided liberally in making real improvements,

either directly with money or material, or indirectly by the grant of a long lease of the land improved, or the assignment of land for a grove, or by the loan of money on favourable terms, or otherwise as may seem best. His Honor considers it is unnecessary to say much regarding occupancy-tenants: they are few in number, and it is not usual to [illegible] in any way with the exercise by them of their discretion as regards the making of improvements. If it is possible to afford them either direct or indirect assistance in carrying out works of this kind, it should be readily given; and if necessary, an agreement should be taken, recording the nature and amount of the aid given, and the conditions on which it is given.

As regards tenants-at-will, there is no objection to the entry in the *patta* given to, and the *kabuliyat* taken from a tenant of this class, of a stipulation that the previous sanction of the officer in charge of the estate must be obtained to the making of an improvement; and that, if this is not obtained, the tenant will have no right to compensation for the work done without authority. But care should be taken to make the tenant understand that this is all that is meant. Under no circumstances whatever should a tenant, applying for permission to make an improvement, be required to enter into an agreement, renouncing unconditionally all claim to compensation in respect of the improvement. If there are good reasons for refusing the application, this course may, of course, be taken, the grounds for refusal being placed on record for future reference; otherwise leave should be given. Where no assistance, direct or indirect, is given to the tenant, the order allowing the improvement to be made should [illegible] approximately, the sum to be expended and set forth that the tenant will, in case of dispute, be entitled to compensation up to this amount [illegible] according to the provisions of the Rent Act. Where assistance in any shape is given, its nature and extent should be [illegible] recorded at the time permission to carry out the work is given, and the tenant may be required to enter into an agreement specifying how far it is to be taken as a set-off against any subsequent claim to compensation.— [illegible]

INDIAN WHEAT

WHEAT in India is chiefly cultivated in the North West. [illegible] statistics available on the subject [illegible] year 1877-78 when we find that in the Bombay Presidency [illegible] under wheat, 14,855 in Mysore, 61,2[illegible] in [illegible], 10,285 in Assam, and 1,608 British Burma. [illegible] Bengal in consequence of the permanent settlements, [illegible] official [illegible] the collection of statistical information concerning the actual area under cultivation with the different kinds of crops. [illegible] to the higher latitudes, we find that there were 1433[illegible] acres [illegible] wheat [illegible] cultivation in the Central Provinces while [illegible] the Punjab [illegible] than 6,9[illegible] acres. A "supplementary report on Indian wheat" which has just been presented to Parliament, makes [illegible] facts interesting. The report on Indian Wheat [illegible] Dr. [illegible] Watson in 1879, contained definite allusion to the prevalence of the [illegible] in the samples sent to England for valuation from the Punjab and Sind. In consequence of this a second series of samples were forwarded from the Punjab during 1880 for supplementary valuation and report. [illegible] samples sent numbered 192 in all, from [illegible]-two different parts of the Punjab, and although some of these samples were weevilled, they were not destroyed to such an extent as to prevent their approximate valuation, while the majority were in excellent condition. A few of the prices ruling in Mark-lane at the time of this second valuation may be [illegible]:— English red (per imperial quarter) 39s. to 43s., and white, 42s. to 47s.; Nicolaieff and Odessa Ghirka (per 496lbs.) 42s. to 46s., Australian, 50s to 51s., white American and Canadian, 46s. to 4[illegible]s., red winter, new, 47s. to 48s., and old 50s. to 52s., and of Indian wheats, other than Punjab, Calcutta No. 1 white, 48s. to 49s.; Bombay red and white, [illegible]s. to 50s., and Kurrachee, 44s. to 46s. The whole collection of Punjab samples were classified by the expert who valued them as follows:—

Denomination		Value: 48s 6d. and above.	Value: 46s. 6d. to 4[illegible].	Value: 40s and under
A.—Soft white	...	17	11	..
B.—Hard white	...	17	40	10
C.—Soft red	...	3	22	6
D.—Hard red	...	1	36	22
		38	11[illegible]	[illegible]8

These with four samples classified as mixed, make up the total of 192 samples. The supplementary report, referring to this classification, says:—"By computing the whole of the 192 samples at the rates quoted, always taking the lowest value where the range of 6d. or 1s. is allowed, the result is a very satisfactory one, as it gives an average value per quarter of 46s. 10½d. against 39s. [illegible]d for the whole of India in the previous valuation, or an advance of 7s. 2½d. which cannot be all attributed to advanced prices." Only seven samples were valued at or below 41s. 6d., which is scarcely 4 per cent., whereas in the previous valuation fully 14 per cent. of the total of samples valued were below 37s. per quarter. In the case under report most of the inferior samples were sent from Dera Ghazi Khan and Dera Ismail Khan, the low prices being occasioned by the "dirtiness" of the samples, the term "dirty" including an admixture of barley or other grain.—*Times of India.*

PUNJAB WHEAT.

THE Punjab has long had the reputation of being a great wheat-producing country, but as yet it has not taken any conspicuous place as exporting beyond sea. There has, however, never been a famine in India which did not cause a sudden activity in the markets here, and we need only recal the extraordinary state of our railway stations in 1877-78 to show the capabilities of the country in cases where export paid even a little. It is handicapped to a considerable extent in competition with other provinces by its distance from the sea, but the Indus Valley is fast supplying the missing link, and even with that little Egypt—Scind—this province will fully be able to hold its own. In 1878 came the Afghan war and this, combined with two years of natural scarcity, taxed the province to the utmost extent, but though we have had to complain of high prices and perfect stagnation of export trade we have not been reduced to seek charity or assistance of other districts, and we may safely conclude that the strain had been tided over. The harvest this year, [illegible] not a bumper one, has been very favorable, and from the high prices now ruling in the English market, it is not unlikely that after the raise a large export trade may spring to life. In 1879 specimens of Punjab wheat were sent to England to be reported on by experts; but it appears that these specimens arrived in such a weevilled condition, that it was almost impossible to form a general opinion on them or on the capabilities of the province. Last year, however, greater care was taken, and although some were weevilled, the specimens were generally satisfactory. The prices for other wheats, at the time these were valued, ranged in England from 41s. to 53s per quarter of 480lbs. Some Australian and Pomeranian wheat fetched 51s., but 50s may be called the maximum. This was an increase over the price of 1879 of about 1s. 6d per quarter, but in Russian Ghirka wheat the advance was as much as 8s. This wheat has the peculiarity of greatly resembling Punjab hard red wheat, and it is an instructive fact that the Punjab specimens were also valued at an increased rate in 1880 of about 7s 6d on the quarter. Indian wheats, not yet having acquired local names in the home market are divided into soft white, hard white, soft red, and hard red. There were [illegible] samples of soft white. These ranged in value from 4[illegible]s. 6d. to [illegible], equalling the very highest classes in the market, *viz* American, Australian and Chilian. Of hard white there were 67 samples ranging from 47s to 50s. From this lot we exclude five samples from the Derajat, which were valued at from 32s. to 40s on account of being very dirty and mixed with large proportions of barely.

A quarter of wheat, about six maunds can be purchased here for 11 or 12 rupees, equal to 25 shillings at home. Added to this, there are small charges for bags commission, and brokerage. Then there is railway freight to Kurrachee and shipping home, with some small broker charges at home. What the whole charges amount to we cannot tell at present though we believe they are not proportionately heavy, and in any case, this favorable report on Punjab wheat will not unlikely give a considerable impetus to exportation if dealers find that even a shilling or two can be made on the quarter. Two pice on the maund is sufficient here to wake the bunniah from the gorged boa constrictor state, into the most surprising activity.—*C. & M. Gazette.*

BAMBOO FOR PAPER-MAKING.

CONCERNING bamboo as a material for paper-making, the Trinidad (West Indies) *Chronicle* says:—"There are inquiries in town from America, as there lately were from England, as to our capacity to furnish a large and continuous supply of bamboo for paper-making. No difficulty in the least. It is here by the hundred thousand tons—a nuisance in its voluminous growth and practical ineradicability. We can ship it to any extent, at a week's notice. But, *cui bono?* It wouldn't be worth the freight, and if carried for nothing, the ripe stems would be so intractable that, with the earthy matters clinging to them, they would, as Mr. Routledge found, be more trouble to the manufacturers than the fibre prepared from them could pay. No paper-maker would touch the unprepared or even the crushed dry stems. What they want, as clearly laid down by Thomas Routledge, of Claxheugh, Sunderland, is paper stock or semi-manufactured stuff, to be prepared by crushing, retting, and combing by means of fitting mechanism at the place of growth—the material to be the young unripe shoots within a certain age (which we do not recollect at the moment)—so that a constant planting must be kept up and no bamboo be allowed to pass that age. Then, as paper material is a low priced article, far below the value of flax or hemp, this paper stock must be produced at a very moderate cost. The theory of the business is simple, and its requirements easy to master: but it will be seen that capital and mechanical skill are needed; that there is, in fact, a good deal to consider and contrive—and that an eye to cheap production is a most essential requisite. Once the paper stock is made at a reasonable price, perfectly dry, and baled in pressed bales as wool or cotton is, America is our great market that can rid us of any quantity we are likely to make if ever so largely gone into. England, too, on same terms, could take very large quantities, for, as Mr. Routledge has shown, no better paper material can be desired for general uses than such as he has made from bamboo fibre under adverse conditions of manufacture. A very large opportunity is open for an ingenious man (or many) to make a fortune [illegible] a simpleton will assuredly burn his fingers and mayhap give a bad name to a new and excellent staple."

AGRICULTURAL PROSPECTS IN BURMAH.

THE local Government has recently drawn up and submitted to the Secretary to the Government of India in the Home, Revenue, and Agricultural Department a long and interesting minute on the condition generally, and prospects of agriculture in this province, as the result of the Chief Commissioner's visit to all the districts of British Burmah, and in which the following statistics of agriculture appear :—

Population, *about*	3,700,000 people.
Total area	87,220 sqr. miles.
or *about*	56,000,000 acres.
Cultivated area, *about*	3,900,000 ,,
Area growing rice	3,300,000 ,,
Computed total yield of paddy, or rice in husk *about*	2,361,000 tons a year.
Average yield of paddy per acre, *about* ...	32 baskets or bushels.
equal to ...	1,600lbs
Number of cattle, including buffaloes which are used largely for agriculture ...	1,155,000 head.
Number of carts	225,000

Besides rice the areas of the principal crops in the province, according to the latest returns, *plus* 15 per cent. as above are—

Mixed fruit-trees	130,000 acres,
Danee palm (used for thatching and also extracting sugar)	30,000 ,,
Tobacco	20,200 ,,
Plantains	17,100 ,,
Vegetables	17,000 ,,
Areca nut	14,100 ,,
Cotton	10,900 ,,
Pulse	9,900 ,,
Sugar cane	5,900 ,,

Of course as rice forms by far the largest item of agriculture, the whole burden we might say of this minute or letter is about that product, for in recommending the establishment of an Agricultural Department in Burmah which would afford encouragement to various branches of agriculture, such as tea, coffee, cinchona, cotton, tobacco, garden produce, &c., the remark is made that "whatever an Agricultural Department might do in promoting or helping the introduction or extension of new products, the chief attention of the department would in the first instance, be devoted to rice, which is the great staple of British Burmah." The minute observes that "it may be doubted whether English agriculturists have much to teach the Burmese regarding the culture of their rice fields" and points out the chief usefulness of an agricultural department would consist in inducing the cultivators to adopt labour saving machinery and other improved appliances for ploughing, sowing, reaping, and winnowing the rice crops especially as labour is both scarce and dear in this province.

From the foregoing figures it will be seen that the computed total yield of paddy is about 2,361,000 tons a year; the minute shows by some calculations given that this quantity only about represents the requirements of the province itself, allowing so many pounds a year for each individual and cattle as well as for seed grain. Certainly there is ample scope for the expansion of the rice trade considering the very high prices obtained, and the fact that of the whole are only 6 per cent. is devoted to the rice cultivation.

To give effect to these views the Chief Commissioner who has made provision in the Budget for 1881-82 to the extent of Rs. 45,000, recommends the appointment of a Director of Agriculture holding a position analogous to that of Mr. Buck in the North West Provinces on a salary of Rs. 1,000 rising to Rs. 1,500 by annual increments of Rs. 100; also a Consulting Engineer whose duty as a supplement to his other labours under Government, will be to advise and assist the Directors in the introduction of suitable labour-saving machinery. His remuneration for this part of his duties will be Rs. 200 a month. If this arrangement meets with approval, Mr. R. Gordon, Executive Engineer in charge of the Hendasa embankment division will be appointed, and one better fitted for the work could not perhaps be found. His knowledge of mechanical engineering, he having passed through the workshops of a Mechanical Engineer at home and also closely watched the progress of this branch of engineering in America, eminently points him out for the post in question, and we are likewise glad to see that Mr. Bernard has been able to do justice at last to a meritorious officer. As it is proposed to start a model farm on the land now being taken up close to the Reformatory at Poungday, it is intended to make the services of the boys of the latter institution available for the farm, a dove-tailing of ideas and projects which is certainly to be admired.

There is no mention whatever in these proposals for agricultural improvements about a stock farm, a matter which affects in a most important degree the dearness of provisions and consequently of labour to a certain extent, for dear provisions are identical with dear labour; but we presume this will come with the model farm and a Director of Agriculture, who must recognise the importance of this department of agriculture on the well-being of the province.

Attached to his minute of the local Government is a memorandum of Mr. Hough, the Secretary to the Chief Commissioner, in the Settlement Department bearing on the matters touched upon, displaying considerable shrewdness and a knowledge of the people and their requirements which we hope to refer to in another issue.

In the mean time we may conclude by remarking that we must regard the foregoing matter as another indication of the active interest in the welfare of the province which Mr. Bernard has evinced ever since his arrival here.—*Rangoon Gazette.*

DECLINE OF THE EARTH'S FERTILITY.

IS the cultivated soil of the world steadily declining in fertility by the constant and long-continued succession of cropping? Countries of once fertile land, such as the valley of the Euphrates, and Palestine have before this apparently been exhausted, and have reverted to barrenness. In a series of excellent papers Mr. J. B. Lawes, F.R.S., argues to the conclusion that profitable farming involves a slow but continuous exhaustion of the soil, and that, as regards the relation of landlord and tenant in Great Britain, rent may be said to be paid for the right to remove without restoration, a certain amount of the stock of fertility in the soil. Mr. Lawes is a man of ability and unwearied research; but it may just be that he is wrong in his original premise that nitrogen is the sole source of fertility in land, and, if so, his deductions cannot be correct. His arguments have brought him to the conclusion that draining, fallowing, liming, and the use of mineral manures do not benefit land, except in the sense of being so many means of liberating, and making available for the growth of crops, the stock of nitrogen in the soil—and that such appliances increase the produce of the land, at the expense of its stock of fertility, and thereby hasten its exhaustion. Mr. Lawes compares the fertility in the soil to the coal in a mine, neither of them being of any value till they are turned to some useful purpose, but that cannot be attained without a diminution of the original stock. He says that the various restrictions as to course of cropping, inserted in leases, are made for the purpose of limiting, as much as possible, the tenant's removal of this stock of fertility. He admits that the use of manures containing nitrogen, such as that made in the farm yard, retards the process of exhaustion. Large quantities of cattle food also are imported, and find their way to the manure heaps, but he reckons that these are too small to have any effect on the general fertility of the country, and that an addition of only 1 lb. of nitrogen per acre to the 31,000,000 of cultivated acres of Great Britain would represent upwards of 500,000 tons of grain and cake. He states that the conclusion he has drawn from the experiments he has long conducted at Rothamsted near Harpenden, Hertfordshire, do not tend to lessen the difficulties to be contended with in providing food for the millions of India. In Britain the exhaustion of the soil is delayed by drawing manures from all parts of the world; but in India no external source of fertility are available, so that a decline of produce is slowly but surely taking place, and as population increases, and waste lands and forests which now form sources of manure for the cultivated area, are broken up, the exhaustion will increase. Mr. Lawes is further of opinion that with the resources available to him, the Indian cultivator manages to extract the greatest possible produce from his soil, and that under the circumstances science has nothing to teach him.

Mr. Lawes seems to have overlooked this rather important circumstance, that, even if it may be assumed that the soil of India is being exhausted by over-cropping, it is only the surface so far that has yet been operated upon. The native plough does not do much more than scratch this surface, and when more powerful cattle are to be had, heavier ploughs can be utilised and the upper soil will be invigorated by admixture with the underlying soil which has as yet hardly been touched. Of course, if the cattle used in agriculture are never improved, the decay of the soil, which is apprehended by Mr. Lawes is inevitable, for the native is not in a position to manure his ground to any large extent. It is a bold assertion that science has nothing to teach him, but there is some ground for it. The native agriculturist knows what he is about, rather better than is readily admitted by scientific agriculturists. It was quite recently believed by the latter, that you had only to give this country an abundance of water to make it grow anything. But the native did not take as kindly to the water as we expected he would do. He declined to believe that he would be the gainer in the long run from freely using it; and experience has shewn, that mischief has been done by the encouragement that irrigation has given to over-cropping. But no one would therefore say, that the solicitude of the Government to promote irrigation works is thrown away. The protection that those works afford against the consequences of drought is alone sufficient to justify their extension. But care has to be taken that too much importance is not attached to the increase of the outturn per acre of the crops. There is a strong temptation which should be resisted to draw too largely upon the agricultural resources of the future. Increased outturns that are obtained at the risk of eventually rendering the ground sterile, cannot be regarded as a gain to the country. What India wants is not so much more crop per acre cultivated as more and better cultivated acres. The want of water is a terrible drawback in many large parts of the country, that are now classed as culturable waste. If the area of cultivation could be extended there would necessarily be more food produced for the population, which is increasing so rapidly that it is impossible not to regard the future of this country with alarm. If in 1891, it is as much as the country can do to

afford subsistence to its 200 millions of inhabitants, what will be the state of affairs sixty or seventy years hence, when, according to statisticians, there may be 400 millions to support. We many console ourselves with the thoughts that "sufficient unto the day is the evil thereof," and that if we do the best that circumstances permit for the 200 millions, we may, with a good conscience, leave our successors to grapple with the problem of feeding twice that multitude. But we need to be careful not to draw upon the resources of the next generation or two, in order to improve the well-being of the present generation. The soil is forbearing, long suffering, and generous; but its patience, or its endurance, is not inexhaustible; and after giving abundant warnings the land goes out of cultivation, and extorts the rest it needs, by refusing to further meet the requirements of man. We have been over Mr. Lawes's experimental farm at Rothamstead. He has a large field there cut up into strips which have been planted with wheat for many years in succession. There is one strip which has not had the benefit of any manure all that time, and there are other strips which illustrate the results of the employment of a variety of manures. The wheat raised on the unmanured strip is naturally a very poor specimen; but it is highly interesting, as showing how Nature looks to man to restore to the soil some of the substances that he takes out of it.

We have alluded to the desirability of extending the area of cultivation in India, and we turn to the Famine Commissioners' report for information as to the quantity of waste land that is culturable. We find that the Punjab contains about 106,010 square miles. Of this about 35,000 square miles are cultivated, 30,000 square miles are returned as "culturable waste," and about 38,000 square miles are unculturable. In the North-West Provinces and Oudh, the cultivated area is half, and three-fifths respectively of the total area. The united provinces contain 51,000 square miles of cultivation, 19,600 of culturable waste, and 29,000 of unculturable. In Bengal it is calculated that 85,000 square miles out of a total area of 144,000 squares miles are cultivated. The Central Provinces have an area of 114,000 square miles, of which 30,000 are cultivated, 40,000 are culturable, and 44,000 are unculturable. In Bombay proper (excluding Sindh and the Native States) the total area is 77,000 square miles, of which about one-third pays no revenue, or only a quit-rent, 30,000 square miles are cultivated, and there is "ample margin for the extension of cultivation, but there are no large blocks of good land awaiting settlers, as in every case the best land has been taken up already and the poorest remains." In the Madras Presidency we have a total area of 138,000 square miles of which 50,000 belong to the great zemindars, and regarding which not much information exists. About 35,000 square miles of Government lands are cultivated, and about 10,000 of waste are culturable. The Commission found that there are considerable parts of India "in which the population is so dense, that it presses closely on the means of subsistence, and here unless the existing system of agriculture is improved, so as to yield a larger produce per acre, there is no room for an increase of the population." But there "is in most villages scope for a slow and gradual extension of cultivation, of what is now under tillage, and outside the villages there is an immense extent of land, which is more or less got fit cultivation." Unfortunately "much of it is poor land, and when it is not poor, either the climate is feverish, or else the conditions are so different from those that prevail in the densely populated places from which emigration might be desired, or expected to come, that settlers would be alarmed and discouraged."

In conclusion we may remark that, if Mr. Lawes is correct in his premises and deductions, the world will require no violent convulsion to bring it to an end, as the population will gradually shrink, with the decreasing means of subsistence, into a starved, scattered, and diminutive race. Nature is, however, as Mr. Squeers remarked, "a rum 'un" and it is possible enough that in her arcana there are more secrets than the scientific philosophy of Liebig, or Lawes, or Gilbert have penetrated. M. Georges Ville, a French chemist of high standing after lengthened experience of the same nature as that of Mr. Lawes, has come to a different conclusion, and does not leave us in such a slough of despond as our English teacher. M. Ville is of opinion that by returning to the soil one-half of the nitrogen extracted by the crops, (the other half being supplied from the atmosphere) calcic phosphate, potash, and lime, all these substantives being plentiful, we shall not only be able to prevent the exhaustion of the soil, no matter how heavy the crops may be which are grown upon it, but that we shall endow it with the maximum of fertility consistent with the climate and general local conditions. A translation of M. Ville's book is published by Messrs. Longman & Co., and it is well worth reading along with the remarks of Mr. Lawes. Both are able men, and neither have spared time nor money in experiments, which have led them to widely different conclusions. Probably the truth will be found midway.—*Madras Mail.*

ON THE PRODUCTION OF LAC IN HOSHIARPUR DISTRICT.

By W. Coldstream, C.S., Deputy Commissioner.

THE district of Hoshiapur lies between the Beas and Sutlej Rivers. Its surface is, roughly speaking, half plain and half occupied by the outlying ranges of the Lower Himalayas, corresponding to the Sivalik ranges east of the Sutlej. It may therefore be called a submontane district. Lac is produced in all parts of it, at least in the plains and in the valleys between the hills. It is more abundant in the latter.

It effects chiefly the Beri (*Zizyphus Jujuba*), and Kikar (*Acacia arabica*); but is also found on the following trees :—

Pipal	...	(*Ficus religiosa*)	
Siriss	...	(*Acacia Sirissa.*)	
Barh	...	(*Ficus indica.*)	... Banyan.
Pilkhan	...	(*Ficus venosa.*)	
Lasura	...	(*Cordia Myxa.*)	
Anjir	...	(*Ficus Carica.*)	
Dhak	...	(*Butea frondosa.*)	
Phagura	..	(*Ficus caricoides.*)	
Patajan	...		
Gular	...	(*Ficus Cunia.*)	

Thus it is found on six species of ficus.

The lac produced by the various trees differs in quality. The lac produced on the *Zizyphus* is deemed the best, and next to it comes that produced on Sirris, Kikar, and Pipal.

There are two seasons for production—February to April, and July or August. The crops are collected in June, and October or November. The same tree is said not to produce two crops in the same year. The autumn or October crop is considered the more valuable of the two.

The artificial propagation of lac is understood by very few persons, but seems to be occasionally practised. The method adopted is to tie a small branch with the insects on it on the tree which it is desired to effect. The writer has found it very easy to propagate lac on Beri trees in this manner. The twigs containing cells of the insect, were tied on to the trees in July; shortly after the new swarm appeared and spread over the nearest branches of the tree. There appears, however, to be among the people a great dread of the tree being injuriously affected by the spread of lac upon it, and this is probably the reason why propagation is not carried on to a greater extent. In cutting lac off a tree a few twigs containing cells are allowed to remain to furnish a crop for next year.

There existed a deep and widespread prejudice among Hindus against having anything to do with lac. This was particularly strong among the Bhabras (called in other districts Sarnogis.) Lac was considered a kind of disease or leprosy of the tree, and to be an unclean substance. Its red color and its animal origin are sufficient to account for this prejudice. It has disappeared, to a great extent, within the last ten years, owing to the great value which lac acquired in the market. There have been of recent years, many disputes in the Civil Courts as to the relative rights of landlords and occupancy tenants to take the lac from trees growing in an estate. The question was not discussed at the time of the Revenue Settlement of the district in 1852, lac having then but a small marketable value.

The crop of lac on roadside trees is sometimes sold by Government to a contractor, who is allowed to cut off twigs and branches of a certain thickness. In 1876 the lac on the roadside trees in Unah pargunnah was sold for more than Rs. 400. The crop, however, varies much in quantity from year to year, as does also the value of lac in the market.—*Indian Forester.*

TUBERS AND ROOT CROPS.

IN Northern Europe, root crops are the chief dependence in feeding farm stock, or at least they were before the introduction of ensilage taught the art of preserving green crops from winter forage. Efforts at various times have been made to induce American farmers to substitute root culture for grain-growing on stock farms. Many persons remember the earnest efforts of Prof. Mapes, in 1855, to introduce the cultivation of the carrot as a food crop for wintering stock. In the West two serious objections lie against the proposed change, and these have confronted us in every attempt to substitute roots for grain as winter food for stock. The first of these is our climate. Root crops require a cool, moist summer, while our summer atmosphere has almost the heat and dryness of the tropics. The turnip in this country is a fall crop, while in England and in Sweden, the paradise of the turnip, it is planted in May and grows all the summer. In a less striking degree the incompatibility of our climate interferes with the successful cultivation of the carrot, the beet, and the parsnip. Our intense summer heat not only arrests the growth, but it converts the starch and the sugar of the roots into indigestible woody fibre. Most of the succulent vegetables of Northern Europe can be grown in our climate, only in the early spring, or late fall months. But in the case of root crops this interferes with the full development and proper maturity of the root, and with this some corresponding reduction of its food value.

The other objection lies in the delusion of large crops. Ten tons of turnips or carrots per acre looks like an enormous pile of food, but when we remember that 90 to 95 per cent. of this is water, we must reduce our crop to 2,000 pounds of solid food which corresponds to 40 bushels of corn; but this has less nutritious matter than a corresponding weight of corn. An occasional feed of turnips, beets, or carrots will serve as a relish for grain food in long continued winter feeding, but as a constant diet, root crops cannot be economically used where maize can be grown so cheaply as it can be in our soil and climate.

The potato is not, a root, it is a tuber, or underground stem with true buds on it. Its food value varies very much with the variety of potatoes

used. The weight of solid matter in 100 pounds of potatoes varies from 24 to 32 pounds; and this has nearly the same fattening value as a similar weight of corn, though a little less of the flesh-forming material. In comparing this with our standard feed-crop, 200 bushels of potatoes will correspond to 40 bushels of corn, but the maize is the more certain crop and requires no more labor in its cultivation, and less labor in preparing it for feeding.—*American Paper.*

THE JAPAN PEA.

THERE is nothing in the list of forage plants that excels the Japan pea for our soil and climate. T. E. Martin and R. T. Rutledge, both progressive farmers of our country, tell me that the Japan pea is the most productive as well as good food that they have ever grown, for all kind of stock; horses, cattle, sheep, and hogs will eat the peas, stems, and leaves, if harvested before fully matured and cured like other hay, with as much relish as they do corn. Then there is no pea for the table, is soaked in water the night before cooking, that has a more exquisite flavor. They grow on a stout bushy stalk from two to three feet high, somewhat resembling the cotton plant. The main stalk, as well as the branches of limbs, are literally loaded with small pea pods filled with little yellow peas, similar in color, size and flavor to the English garden pea. They can be grown with the corn crop very successfully, by planting a hill or peas between each hill of corn at the second ploughing, same as the ordinary stock or field peas. But the way to get the greatest yield is to plant in hills two and-a-half feet each way, allowing but one stalk to the hill to remain after the first working. That will give you 6,960 stalks to the acre, and on ordinary land, cultivated the same as corn, will average at the lowest estimate, a pint of shelled peas to the stalk, or a fraction over 108¾ bushels per acre. I doubt not that with high cultivation and good soil, it would be an easy matter to double that yield, besides there is no other crop that will yield more hay to the acre. In fact, I know of no crop so remunerative as the Japan pea. It is a sure cropper, as clearly demonstrated by my experience with this season's crop. Neither wet nor dry weather materially interferes with the quantity or quality of the yield. —*Mississippi Patron.*

THE BAHRAICH AGRICULTURAL SHOW.

THE Saiyud Salar Mela at Bahraich attracted, as usual, immense numbers of natives from all parts of the surrounding country, and has been celebrated with as much devotion as display by believers in the efficacy of a visit to the shrine of the time honored and departed saint. The fair this year had an unusual attraction both for the European as well as the native community, in the shape of an Agricultural Show, wisely originated by the popular and esteemed Deputy Commissioner of Bahraich. It was the first of the kind, and like all new projects was we believe attended with grave difficulties at the outset,—which, indeed, at one time threatened to mar the complete success of the meeting; but it is a pleasure to find that both by the originator as well as those officers whose indefatigable labours made the scheme practicable, it was considered that the show was in every respect appreciated. It is hardly possible to overrate the benefits—remote and direct—which arise out of such meetings.

And the example set by Bahraich may be commenced to all the districts which have not as yet been enterprising enough to make the venture. Much if not all, of the success attending this Agricultural Show may be attributed to the skilful origanization of Captain J. Innes, the Secretary, who was left unfettered to plan as well as to carry out the whole arrangements of the fair; a task of no small magnitude, and one entailing so much mental as well as physical exertion that most men, at least in the month of May, would have declined it. It is certainly worthy of record that, owing to careful sanitary arrangements, not a single case of sickness occurred: and by the excellent supervision of the police merely two or three cases of petty theft were committed, the offenders being punished on the spot as an example to other would-be depredators. The site of the fair and Agricultural Show was well selected, and stood in the shade of mangoe topes about two and-a-quarter miles from the city.

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Cawnpore presented an entirely new industry by Tuck Harvey & Co., affording a striking example of the fruits of enterprise as well as the resources at our command in the country. A well arranged case of soaps in bars and tablets, made on scientific principles from indigenous materials—and a *bond fide* vegetable production throughout —the basis of oil, colored with the products of plants and richly perfumed with their flowers. These soaps attracted considerable attention on account of their being suitable for use both by the orthodox Hindu as well as Europeans,—and the entire case was purchased by the Rajah of Nanpara.

A great curiosity came from Hurdui, exhibited by Mr. Nahor—specimens of black and also white gram—never seen before in the Bahraich district. We were not informed whether there was anything peculiar to it besides the colour.

After a very agreeable time spent at the Exhibition (to which by the way admission was free to all comers) the visitors were invited to witness some good wrestling matches, which occupied several pleasant hours. Most of the wrestlers had come from long distances—Cawnpore, Lucknow, Benares, and even the Punjab. They were famous, yet they found in some of the Bahraich competitors a match of which the local wrestlers were not a little proud.

This pastime over, the crowds went to witness the trial of the water lift exhibited by the Department of Agriculture and Commerce, N.-W. P., and other implements of husbandry from various sources. The *Ploughs and Grubbers* shown by that department were perhaps the most worthy of notice. The natives, however appreciating a difference, exercised considerable discrimination in regard to these implements and the "Nawab" plough by Mr. Crawley of Cawnpore, for while purchases of only six were made of the former, fourteen of the latter were ordered on the spot.

A rather good winnowing or seed cleaning machine by the Department of Agriculture and Commerce, as exhibited by the Director, attracted attention, but no orders were registered for it, perhaps for the reason that it was only suitable for cleaning the larger grains and seeds. One is certainly required which will thoroughly clean all alike, large and small.

A mill for crushing sugar-cane was exhibited by Mr. J. Sinclair, agent for the patentees—Messrs. Thomson and Mylne of Beheea, and showed at a glance to the dense and admiring crowds its immense superiority over the ordinary native *kolu* or mill. We believe this machine was more appreciated by the Rajahs, Talukdars, and natives generally than any other implements exhibited.

The one shown was bought on the spot. The mill is simple enough and perfect of its kind. It most effectually crushes out the cane, leaving not a vestige of juice behind in the squeezed residue.

A visit to the cattle show completed the programme of engagements for the day. The ordinary breed of cattle in the district of Bahraich is superior to any in these parts of North-West India, but those exhibited were simply magnificent without exception—so much so indeed that selection for the prizes became no easy task. Talukdars of Bahraich have evidently given their attention to cattle-breeding from good stock, and have succeeded beyond their expectations; and encouraged as they have been in this matter they expressed at a meeting in Durbar their desire to effect still further improvements both in draught and plough cattle, if the Government would place at their disposal some suitable extent of its pasturage lands.

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On the 24th, at 7 A.M. another meeting was held in Durbar, when the various prizes were awarded by the Deputy Commissioner to those who had been adjudged successful exhibitors. Most of the prizes for cattle were awarded to Bahraich and its district. There was only one successful competitor from an outdistrict.

Among the agricultural implements, the "Nawab" plough was selected for the 1st Prize, which was awarded to its inventor, Mr. Crawley of Cawnpore.

In machinery, Messrs. Thomson and Mylne stood first on the list for their sugar-cane mill. The remaining exhibitors in this department were honorably mentioned. In cereals, there was almost a tie between the Bahraich districts and Hurdui, and the prizes were awarded accordingly. In manufactures Messrs. Tuck Harvey & Co. of Cawnpore, were selected for the 1st Prize. A large number of smaller prizes and "honorable mention" were awarded to other exhibitors, but these need not be particularised.—*Express.*

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AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The Monthly General Meeting was held on Thursday, the 26th May 1881.
W. H. COGSWELL, ESQ., *President, in the Chair.*

THE Proceedings of the last Monthly Meeting were read and confirmed.

The following gentlemen were elected Members:—

Messrs. A. H. Collins, C.S., W. Innes, Alfred Bridge, J. Anderson, T. S. Anderson, H. E. M. James, C.S., James Paterson and T. H. Korswill; Lieut.-General Dhoje Narsingha Rana Bahadoor; T. C. Pando, Rajah of Pakour; and the Secretary, Public Garden, Bhagulpore.

The names of the following gentlemen were submitted for Membership:—

His Grace the Most Rev. Dr. S. Goethals, Archbishop of Hieropolis, —proposed by Dr. G. King, seconded by Mr. M. Rustomjee.

Baboo Shamlall Sen, Zemindar, Goureepore,—proposed by the Secretary, seconded by Baboo P. C. Mittra.

A. A. Shircore, Esq., Barrister-at-Law, Jullundur City,—proposed by the Secretary, seconded by Mr. H. A. Firth.

Lieut-General Umber Jung Bahadoor Rana, Nepal,—proposed by Lieut.-General Dhoje Narsingha Rana Bahadoor, seconded by Baboo P. C. Mittra.

S. Gowan, Esq., Sirajgung,—proposed by Mr. J. G. Meugens, seconded by Mr. A. Wilson.

Edward Cleveland, Esq., Zemindar, Secunderabad, Zillah Bolundshuhur,—proposed by the Secretary, seconded by Mr. J. G. Meugens.

W. E. Crum, Esq. Merchant, Calcutta,—proposed by the President, seconded by Mr. H. A. Firth.

Hamilton Martin King, Esq., Goosbur and Barabanki Tea Estates, Julpigoree,—proposed by the Secretary, seconded by Mr. Meugens.

D. Cruickshank,—proposed by the Hon'ble A. B. Inglis, seconded by Mr. Wilson.

Dr. D. O'Brien, Romarie Factory, Debrooghur,—proposed by the Secretary, seconded by Mr. G. L. Kemp.

J. H. Barry, Esq., Merchant, Calcutta,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

W. Palmer, Esq., Examiner, Telegraph Accounts, Calcutta,—proposed by Mr. W. Stalkartt, seconded by Mr. J. F. Westfield.

Manager, Debrooghur Division, Upper Assam Tea Company,—proposed by the Secretary, seconded by Mr. Wilson.

Manager, Blackburn Tea Garden, Assam,—proposed by the Secretary, seconded by Mr. Wilson.

C. H. Moore, Esq., Merchant, Calcutta,—proposed by the President, seconded by the Secretary.

Rejoined—C. Brock, Esq., Calcutta, S. U. Phipps, Esq., Calcutta, and Rajah Kistorindra Narain Roy, Zemindar, Bolikar, Rajshaye.

CONTRIBUTIONS.

1. Records of the Geological Survey of India, Vol. 14, Part 1. From Government of Bengal.
2. Journal of the Bombay Branch of the Royal Asiatic Society, No. 38, Vol. 14. From the Society.
3. The Indian Forester, Vol. VI., No. 4. From the Editor.
4. Proceedings of Annual Meeting in March, and Proceedings for April 1881, of the Madras Agri-Horticultural Society. From the Society.
5. Journal Asiatic Society of Bengal, Part 1, No. 1 and Part 2, No. 1, and Proceedings for March. From the Society.
6. Memorandum on Dyes of Indian growth and production, by J. Liotard of the Agricultural Department. From Government of India, Department of Agriculture.
7. A few plants from Singapore, Orchids, Ferns, and Fruit trees. From E. Kock, Esq.
8. A small quantity of seed of *Sorghum saccharatum.* From Mr. R. B. West.

Mr. W. F. Westfield sent for inspection a plant of Bamia cotton raised from the seed which he has recently brought to the notice of the Society, and which gave so great an yield. The seed from which this

plant was raised, was sown in a large pot at end of February, and is now in a most vigorous state both flowering and podding: it is nearly 3 feet in height.

GARDEN.

A report was submitted by the Superintendent, of which the following are extracts :—

"There would have been very little of special interest to report this month, were it not for the severe storm on the night of 10th instant. The damage to well-grown plants in the orchard and ornamental plant portion of the garden has been considerable, very many trees having been entirely blown down. Such as are likely to recover have been propped up. The damage to the three plant sheds (covering 250 feet by 50 feet) was great, all of them having been blown down, &c. The plants which were sheltered under same have been considerably injured, one of the sections of shed to west of residence measuring 60 feet, 40 feet has been reconstructed since, and the rest will be shortly completed.

The glass houses suffered considerably by the storm as well, but have been repaired since.

The injuries caused by this storm, and time occupied in repairing damages, have necessarily retarded the distribution of plants to Members whose applications were registered, but we hope shortly to recommence work.

REPORT ON FLAX RAISED ON THE CAWNPORE EXPERIMENTAL FARM.

Submitted a letter from the Officiating Director, Department of Agriculture, N.-W. Provinces, and sample of the Flax therein referred to for an opinion as to its quality and value.

Submitted the following notes of the Fibre Committee thereon :—

Mr. W. H. Cogswell.—I consider this well grown and nicely prepared, of good strength, but the staple is very irregular in length and size, soft fibre and bright color, altogether a very good and most desirable product and easily saleable in the European markets and would command good prices. Some of it has been too much combed, imparting almost a towy appearance, and it would have been better had the sample been divided in order to separate the long from the short and irregular staple. Its value per ton is somewhat difficult to arrive at unless a large sample of it was sent to England; approximately I should say it might be worth £35 to £40 a ton. No mention is made from what seed this has been grown, nor result per acre in weight. It would be desirable to give such details whenever samples are sent for report.

Mr. W. Stalkartt.—Sample dressed flax, long and short mixed, quality appears very good. As no other flax ever comes to his market, it is difficult to give a valuation. If all long flax it might be worth £35 to £40 in the English market.

Mr. S. H. Robinson.—I agree with the above remarks as to the want of regularity in the fibres, and their general character, but would not value them so high. Last month's Dundee quotations were £29 to £37 per ton, the latter for the *best* Archangel. Probably £30 to £32 per ton would be a more correct valuation, being the rate for good Riga.

MANILLA HEMP.

Read a letter from the Assistant Secretary, Government of Bengal, Financial Department, Agriculture, forwarding copy of a Memorandum by Surgeon-General Balfour, on the cultivation of Manilla Hemp in India, with reference to the Report by Mr. Liotard, of the Agricultural Department, on the materials in India, suitable for the manufacture of paper, and requesting the favor of any remarks which the Society may have to make on the subject.

The Secretary read the following note, and stated that Surgeon Balfour's Memorandum had been introduced in the Monthly Proceedings of February last :—

"From the Transactions of the Society, it would appear, that its attention was originally drawn to the Manilla hemp plant (*Musa textilis*) so long ago as in the year 1822; some useful papers regarding it were subsequently published in 1840. An attempt was made to cultivate this valuable fibre-yielder in the Society's old garden in 1836, but after trials for three or four years, the cultivation seems to have been abandoned. From this fact, it may be assumed, that it did not succeed, though there does not appear to be any record to this effect. It may be that Lower Bengal is too low for its profitable culture, for hilly land would seem best adapted for it. Attempts might be made to cultivate it in some parts of Upper Bengal (Monghyr for instance) where there is a fair elevation.

The Society would, however, be glad to renew the attempt in the spot, in its present garden, which has been recently set apart for economic cultures, if the Government would obtain a supply of plants from the Philippine Islands, or from the Andamans, where there is a plantation, on the produce of which a report was furnished last year by the Society."

In connection with the above, the Secretary laid on the table, applications from the Superintendent Botanic Garden, Sharunpore, and the Superintendent, Public Garden, Hoshungabad, Nurbudda Division, the former requesting plants and the latter plants and seeds of the Manilla hemp, plant and instructions in aspect to soil, mode of cultivation, &c. The Secretary intimated he had afforded partially the information required, and stated that there were no plants in the Society's Garden.

PLANTAIN FIBRE.

The next papers brought to notice were a letter from the Secretary, Chamber of Commerce, forwarding the specimens of plantain fibre with a letter from the Government of India, and requesting on behalf of the Chamber, a report on the same.

The following is the letter from the Government of India :—

"I am desired to bring to the notice of the Chamber of Commerce the accompanying paper* by Mr. Liotard, of this department, describing a process which he suggests for the extraction of the fibre of the Manilla hemp. It will be observed that it is also proposed to apply this process for the extraction of the fibre of the varieties of the Plantain tree which are found in hill tracts or elevated plateaux in India.

* Paragraphs 1 to 22.

2. Some fibre has been extracted by this process from the Bengal variety of the Plantain tree, called in the vernacular *kanch kella*; and I am to forward herewith a sample of the fibre thus obtained for submission to the Chamber of Commerce. It is known that the fibre produced from this variety is inferior in quality to that of the upland or the Philippine species, besides being relatively less in amount; but it has been operated upon because it was readily available with the object of putting the process suggested to a practical test.

3. The Government of India would be glad if the Chamber of Commerce would favour this department with its opinion on the value of the sample, stating whether it would be marketable as material for paper manufacture, or for cordage and textile fabrics, and what the price of the stuff would be per ton in this country and in England. I am also to invite any remarks the Chamber may see fit to make upon the paper by Mr. Liotard.

Note by Mr. W. Stalkartt.—These specimens are very prettily got up, are much too good for paper making, but might be useful for cordage. It is impossible to quote values on such minute specimens.

FIBRES.

The Secretary next called attention to some fibres prepared from certain Malvaceous plant (*Abutilon, Urena, Hibiscus,*) which had been forwarded by the Forest Officer at Kolhapore (Bombay Presidency) for report. He had informed him, in reply, that these were of little or no value, except for local purposes.

Letters were read—

From Clements R Markham, Esq., C.B., dated London, March 27th, in reply to an application for seed of Cuzco Maize and Quinua seed for trial in the Himalaya, as suggested by Captain Pogson.

"A good supply of quinua seed",—writes Mr. Markham,—" was sent out to the Government of India in 1874, which I obtained through Messrs. Antony Gibbs and Sons of Lima." Mr. Hume said it was *bathu*, but this is a mistake, *bathu* is the "Chenopodium album," of the Punjab, which grows on the plains and is not a hill product. Quinua is the "Chenopodium Quinua," which is cultivated at very great elevations. I suppose the Government gave a portion of the quinua seeds, sent out in 1874, to the Agri-Horticultural Society of India. [The Society did not receive any.] I trust this was so for I fear that, in the present state of affairs in Peru, it will be difficult to get fresh supplies for some time to come. All the chief ports are occupied by hostile Chilian forces, there is no communication with the interior, and many of the merchants have left. It is quite uncertain how long this will last, but I will bear in mind your wishes both as regards Cuzco Maize and Quinua. Meanwhile I will consult Messrs. Gibbs as to the prospect of renewing communication with the interior of Peru.

From P. deLavol Lennox, Esq., of Bhawarees, Punjab, forwarding a quantity of leaves of a *Potentilla*, a supposed remedy in certain cases of cattle disease. This has been transferred to Messrs. O. Steel & Co. for division among their tea gardens which are chiefly affected.

From L. A. Berneys, Esq., late Vice-President of the Queensland Acclimatisation Society, tendering his best acknowledgments for election as an Honorary Member of this Society. I hope it will be remembered —adds Mr. Bernays—that my services are always at the disposal of the Society, and that it shall at all times be happy to receive and afford my best attention to any communications which may be addressed to me on its affairs.

GARDEN.

AN experienced nurseryman writes :—" We have grafted thousands of trees with scions cut from bearing trees, and many other thousands with scions cut from young nursery trees from two to four years old, and have planted trees grafted with each in orchards and watched them for years, and could never see that the two kinds of scions made a particle of difference in any way. We think apple root-grafts made from the scions from healthy young trees make a better 'stand' than those from old orchard trees, and that such scions give a cleaner, healtier growth than scions taken from old orchard trees, simply for the reason that old orchards are, as a rule, full of these hidden microscopic diseases and parasites that are seldom found in fresh young nurseries. We believe there might be a slight difference in top-grafting in bearing trees as to early fruiting with scions taken from bearing trees, but we also believe that this extra early fruiting is not at all desirable in the long run. Young trees as well as animals, should grow, not bear, and we have often heard the views here given publicly expressed by our most observing horticulturists of experience."

SOMEBODY writes to a society paper about orchids. He says :— "I see 140 guineas was given for an orchid root at a sale last week, the purchaser being willing to take all the chances of accident or disease injuring it before it come into bloom. The special charm of orchids always seems to me to consist in their looking like a bad imitation of anything else than a flower; they have neither *perfume nor beauty*, but they are, fashionable and therefore those who do not admire them had better learn to do so as quickly as possible." Whoever wrote this paragraph could never have seen a Ceylon orchid! Anything more delicately beautiful or with a more delicious perfume, I cannot imagine.

CALIFORNIAN BEE CULTIVATION.

THERE is ground for supposing that there were no bees in the New World prior to the invasion of the European. The Indians agree that the busy little insect is never found far distant from the outskirts of civilisation, and there is a recorded tradition that the invasion of California by the backwoodsman was predicted by a warrior of the Gumas tribe, on discovering a bee-tree on the Gilla River. As civilisation advanced, however, its pioneers soon learned to value the honey; and a race of hunters grew up, who made it their business to track the flight of the wild bees to their nests in old hollow trees, and then, by smoking the bees out, and cutting down the tree or its branch, with a hatchet, obtaining the combs, which were carried away in buckets and tubs. It is only in recent years, however, that anything like bee culture has been attempted; but so rapidly has the system extended, that it has now become quite an important industry, more than thirty-five millions of pounds of honey being annually produced and sold in America. The trade is principally carried on by large capitalists who have often from 2,500 to 5,000 swarms of bees, and even larger numbers, one firm having as many as 12,000. Perfect organisation is necessary for the management and care of the little workers. In the United States the bees are "farmed out," *i.e.*; apiaries of say a hundred swarms are placed in the grounds of farmers, the distance between each apiary being generally from three to four miles. The farmers receive either a fixed rent or a share of the honey for the accommodation. The bee-owner has a staff of skilled workmen who clean out the hives and remove the boxes of surplus honey as they are filled. In addition to these experienced bee-men, occupation is afforded for many other people in manufacturing the boxes in which the honey is transported to the different markets, one firm alone, we believe, finding, finding employment for nine men and two steam saws during six weeks of the year in cutting up the timber for the 72,000 boxes which they require. The glass-makers also find some custom from the honey dealers, the slides and ends of the boxes being of glass. On an average one acre is estimated to support twenty-five swarms of bees, and the yield of a swarm is generally about 50 lbs. of honey; so that the trade is evidently capable of yet further development. Much attention is paid to the improvement of the breed of bees, and, with characteristic ingenuity, the Americans have introduced many contrivances to save the time and labour, not only of the honey dealers, but of the bees themselves.—*Graphic.*

USEFUL GARDEN RECEIPTS.

(From the Gardeners' Year-book.)

TAKE two parts of very dry lime rubbish and one part coal, ashes, also very dry, and both sifted fine. In a dry place on a dry day mix them, and leave a hole in the middle of the heap, as bricklayers do when making mortar. Into this pour boiling hot coal tar; mix, and when as stiff as mortar put it down 3in. thick to form the walk. The ground should be dry and beaten smooth. Sprinkle over it coarse sand; when cold pass a light roller over it, and in a few days the walk will be solid and waterproof. 2. An old gravel path will only require to be swept clean; a new-made one to be well beaten and rolled. Choose a warm day (the warmer the better); let the tar be boiling hot; use the common, long-handled, iron-bound tar-brush and iron kettle, holding about a gallon, for the purpose of taking only so much tar from the boiler at one time as can be used in about a quarter of an hour, and paint over with a good coat. Let a lad follow with dry sifted sand, throwing over enough to prevent the tar sticking to his feet, and then go over with the roller. Two men tarring will employ a lad to follow with the sand, and another to attend the fire and supply the tar as fast as used. This repeated every three years, the surface will become quite hard, and the paths will always be perfectly dry and pleasant to walk upon even in the worst of weather.

If iron garden tools are laid for a few minutes in a solution of soda they will be protected from rusting for a long time, even if exposed continuously to a moist atmosphere.

Take a large watertight hogshead, and cover the bottom with about 6in. deep of dry soil; on this put a layer of bones of the same depth, and cover them entirely with wood ashes; on these another layer of bones, then ashes, and so on till the hogshead is full. Leave it exposed to the rains all summer and winter till spring. Then on removing the contents of the hogshead, the bones will crumble to powder under a slight pressure, and form one of the most valuable manures ready for immediate use.

Coarse weeds such as plantain, docks, thistles, and dandelion, may be removed from lawns by the application of oil of vitriol. Take an old blacking-bottle with a wire round it to carry it by, and a stick to dip with. The stick should not be pointed, but notched round for an inch or two at the end, the better to hold the liquid. Just one drop quite in the heart of the weed is sufficient to cause death, and the notched stick will contain at one dip enough to destroy three or four plants. If the acid is good (it varies in strength), the work of death can be both seen and heard, for the vitriol hisses, and it burns up the weeds in a moment.

Grafting wax is very much used on the Continent for protecting newly-made grafts instead of the clay and horse droppings formed into a plaster, such as is used in this country. It is also of great service in covering fresh wounds in trees, made either by accident or design, and is a much more cleanly substance, as well as a more neat application, than the ordinary grafting clay. I have here furnished various formulæ for making the grafting wax or mastic, and as I have used them all at various times they may be relied upon to answer the purpose for which they are intended. The first five require to be melted in an earthen pot over a fire and to be applied warm, but not so hot as to injure the tissue of the bark with which it may come in contact. 1.—Rosin 1 part, yellow wax 1 part. 2.—Black pitch 5 parts, rosin 1 part, yellow wax 2 parts. 3.—Burgundy pitch 1lb., black pitch, 4oz., yellow wax 2oz. resin 2oz., mutton suet, 2 drachms. 4.—Yellow wax 2 parts, suet 1 part. 5.—Black pitch 1 part, yellow wax 1 part, suet 1 part, pounded brick 3 parts. The following has not the inconvenience of requiring to be applied warm, and may be prepared and used without being heated. 6. Yellow wax, [illegible], turpentine 1lb., Burgundy pitch 6oz., mutton suet 4oz. Melt all together and mix thoroughly, and leave them to cool. Form the mass into small balls, as it will not stick to the fingers, and use them when opportunity offers.

LIQUID GRAFTING WAX:—This is a very useful application and is perhaps, the most convenient for the purpose of all the mastics used for covering wounds and grafting, of the consistency of varnish, and is applied very thinly with a brush. Care must be taken not to lay it on thickly, for the surface hardens so rapidly the alcohol is prevented from evaporating. Rosin 1lb., beef tallow 1oz., spirits of turpentine 1 tablespoonful, alcohol (95 per cent.), 6oz. Melt the rosin over a slow fire, when melted take it off and add the beef tallow, stirring it constantly; let it cool down somewhat, mix the spirits of turpentine little by little with it, and at last the alcohol in the same way. Should the alcohol be added while the mass is too hot, much will be lost by rapid evaporation; if, on the contrary, it is too cool, it will form a viscid lump and must be slightly heated again. Stirring briskly is indispensable to mix the ingredients thoroughly. In well-corked bottles it keeps for years. If in course of time it becomes too thick, the addition of some alcohol will make it liquid again. For this purpose it must always be warmed. It is a good plan to put the bottle containing it in boiling water or hot water to accomplish this.

TOMATOES.

(From Hogg's Gardeners' Year-book.)

THE love-apple or tomato (*Lycopersicum esculentum*), is a native of Mexico and South America, but it is also found in the East Indies, where it is supposed to have been introduced by the Spaniards. The Malay name is tamatte, and in Mexico it is called tomatl. The whole plant has a disagreeable, acrid, and nauseous odour; and its juice inspissated over the fire emits a vapour so powerful as to cause vertigo and vomiting. The fruit, which are the only part used as an esculent, are extensively used in Spain, Italy, and France, in soups, sauces, and pickles; and even in their natural state they have an agreeable acid flavour. In our own country the cultivation of love-apples is becoming much greater than formerly, and the more the community becomes acquainted with the many agreeable forms in which the fruit can be prepared the wider will the cultivation be extended. For soups, sauces, ketchup, preserves, and confectionery they are equally applicable, and the unripe fruit makes one of the best of pickles. By analysis the fruit of the love-apple has been found to contain a particular acid, a volatile oil; a brown, very fragrant, extracto-resinous matter; a vegeto-mineral matter; muco-saccharine, some salts, and in all probability an alkaloid. According to the analysis of Foderé and Hecht the tomato was found to contain:—1. A peculiar acid which is destroyed by a distilling heat, and which is combined by a bitter principle, probably solanin. 2. A volatile oil difficult to separate, and which evaporates with great rapidity. 3. An extracto-resinous brown matter, of a pitchy consistency, having a strong smell and a bitter-sweet taste, soluble in water and partly soluble in alcohol and ether. 4. An albuminous matter which readily putrifies. 5. A little mucous sugar detected by the smell of caramel at the commencement of combustion. 6. Sulphate of potash, a little chloride of potassium and calcium, pure potash, and probably a vegetable alkaloid, which resides much more abundantly in the leaves than in the fruit. Professor Church gives the following quantitative analysis of the tomato. Ripe tomatoes contain in 100 parts:—Water, 89·8, albumen, 1·4; sugar, 6·0; malic acid, 0·7; cellulose and pectose, 1·3; mineral matter, 0·8. In 1lb.:—Water, 14oz. 91gr; albumen, 98gr.; sugar, 420gr., malic acid, 49gr.; cellulose and pectose, 19gr.; mineral matter, 56gr. For one part of flesh-formers in tomatoes there are about four parts of heat-givers, reckoned as starch. Few products of the garden have increased so rapidly in popularity as the fruit of the tomato. A few years ago the demand for tomatoes was extremely limited. In many private gardens a few plants trained against walls afforded all the fruit that was required, but now plants are largely grown under glass, and a supply of fruit is expected all the year round. In markets, too, the demand for tomatoes was of the slightest, and where a hundredweight was sold a few years ago, a ton is sold now; indeed it is not unusual for a London fruit salesman to dispose of a ton of tomatoes in a day. Since the tomato has become so popular, and as it is unquestionably wholesome, it would not be inopportune to refer to the various modes of using the fruit.

COLENSES.

IMMENSE improvements have of late been effected in the habit, style of foliage, and the colouring of these. A few years ago the sort known as Verschaffetti was, and had been for long, unrivalled among the dark leaved sorts; now it is not only rivalled, but surpassed, by such kinds as Mrs. George Simpson and Duchess of Edinburgh. A few of the best for small collections, besides the two just named, are Harlequin, Miss Ronina, Magic, and Aurora. The coleus is one of the easiest of plants to cultivate. It must be grown in heat, being properly a stove plant; but from this time till the end of August, it will do freely and well in a greenhouse. The propagation should be done by cuttings in a hot-bed, the young freely growing shoots being the proper kind of cuttings. Insert them in sand and leaf mould, and place them in moist heat, and they will root in a week. They should then be potted into a mixture of loam and leaf mould, and be grown liberally till they occupy the size of pots they are ultimately intended to fill. If to be grown to large sizes, they should be pinched to induce branching, and must be tied and staked in accordance with the size and shape desired. Keep them, well exposed to light, to induce intense colouring.—*N. B. Agriculturist.*

ON FUCHSIAS.

THE popularity of the fuchsia does not wane as time goes on. Although grown by market florists by the million in this country annually, its graceful style and attractive colours are as much appreciated as if it were newly introduced or a very rare plant. There are a good many species in cultivation all more or less beautiful, but it is the lovely, free flowering varieties of the florists, which have resulted from careful hybridizing and selection, that are the great favourites with the people. The simple culture of this popular plant has no doubt much to do with its hold on the appreciation of the thousands of amateur gardeners who, one and all give it a place in their greenhouses, or, for want of such perfect accommodation, in their windows. It is easily propagated by means of the soft growing points of the branches placed in brisk bottom heat; or in the absence of that, it will do quite well if kept close and moist in a case of any kind in an ordinary

room. If a greenhouse is available, it is no difficult matter to keep up a supply of the fuchsia in flower for eight or nine months in the year. For this purpose the first batch of cuttings should be inserted in January and another and successive batches in February, March, April, and May. When rooted, the plants should be pushed on without check of any kind. Beautiful little plants should be flowered in pots five inches in diameter, but of course, if they are to be grown in larger pots, they must not be allowed to become pot-bound till they are placed in the size they are finally destined to occupy. When a fuchsia begins to flower its tendency to grow becomes less, the processes of growing and flowering cannot be promoted together in the same plant; so that if the plants are intended to be grown to a large size, they must be liberally encouraged by ample pot-room, rich soil, and abundant moisture in both the atmosphere and at the roots. After the pots become well filled with roots it will be necessary to maintain the strength and vigour of the plants with regular supplies of liquid manure. The soil for the fuchsia should be rich and open or porous, so as to admit of the freest percolation of moisture. Rich loam of a very fibrous texture that has been stacked for six or eight months, layer on layer with cow or horse manure, is the best that can be used. It should be chopped up roughly, and not sifted, breaking is rather with the fingers to such a degree of fineness as will suit the size of shifts that is to be given. In growing them in small pots much care has to be given in the matter of watering; but indeed this applies to any size of pot after the roots have fully occupied it, only in small pots the risks are greater if any shortcoming in the supply of moisture occurs.

Staking should be carefully attended to as the plants grow and in varieties that do not naturally branch freely, it will be necessary to stop the leading shoots, so as to induce branching from the base of the plant. The natural form of the fuchsia is somewhat pyramidal, and this is the form in which its pendent inflorescence is best exhibited; so that, without laying down any rigid rule, it may be said to be the best way in which to train the fuchsia.

The list of varieties of fuchsias is now almost endless, but the following are some of the best for free flowering, and especially for window culture. Mrs. Welsh and Mrs. Marshall, with waxy white flowers and deep rosy scarlet corollas. Try me O! and Sedan. La Crinoline, and Daniel Lambert are among the most useful and beautiful of the dark red varieties for window culture. These are all single flowered sorts. Among the more free growing sorts, which are better adapted for greenhouse culture, and for being grown to large size, either for conservatory decoration or for exhibition purposes, some of the older sorts are yet unsurpassed. Avalanche, Sir Colin Campbell, Rose of Castile, Mrs. Bennett, Vainqueur de Puebla Dr. Jephson, Lucy Finnis, Marquis of Bristol, Mrs. Cannwell, Little Bo Peep, and Black Prince are all distinct types, and include the principal characteristics of choice fuchsias. An exceedingly distinct form recently introduced is Lord Beaconsfield, which in habit and foilage is highly excellent. The flowers are inferior in size and in brilliancy of colour to many of the older sorts, but are distinct in form, being more like some of the natural species, such as fuchsia spendens. The oldest white fuchsia, *Venus victrix*, which was introduced, twixt thirty and forty years ago, has recently, after having been lost for many years, re-appeared, and is hailed as an acquisition. It is a diminutive grower with small flowers and foliage.—*N. B. Agriculturist.*

CLEMATISES—THEIR USE AND CULTURE.

THE immense increase in the varieties of this all-popular climber makes selection difficult. Many of the sorts are too much alike in character to be distinct; yet where a large collection can be grown, it is a most difficult thing to reject any of them, all are so good. The only thing one can do with limited space is to select one or two from the several types, when the leading features of the whole group can be brought together in a comparatively small collection. The several types take their names from the species they have been derived from. The chief of these are .C. Patens, Florida, Lanuginosa, Viticella, Jackmanii. There are a few other types less important from an ornamental point of view, but which may be grown for the sake of distinctness where room can be spared for them. Of the Patens type, which are spring flowers, and best adapted therefore as climbers in the greenhouse or conservatory, two of the best are Stella and Miss Bateman—the latter is pure white, with chocolate coloured anthers; the former is light violet, with a deep red plum-coloured bar down the centre of each petal. The Florida type furnishes some handsome double-flowered sorts, some of which are also highly fragrant. The Duchess of Edinburgh, Lucie Lemoine, and John Gould Veitch are three of the best —the latter is lavender blue, the two former white. These are particularly valuable for cut flowers, especially for filling vases and other free-and-easy arrangements. The Lanuginosa type supplies many splendid varieties. The flowers are usually of enormous size, some, such as Symeiana being as much as 8 or 9 inches from tip to tip of the petals across the centre of the flowers. They are all-summer flowering sorts, extending in favourable seasons into autumn. Henryi, pure white large flowers; William Kennett, deep lavender; Lanuginosa nivea, pure white flowers of great substance, one of the best for out-doors blooming; Duke of Norfolk, dark mauve; and Symeiana, delicate lavender blue, are a few of the most distinct of this type.

The Viticella type is a very elegant one, and flowers in the summer and autumn. Viticella rubra grandiflora, with bright claret flowers, is a beautiful and very profuse blooming sort. Lady Bovill has greyish blue flowers and Hendersonii bluish purple flowers. The Jackmanii type is the most profuse flowering of all, and is the best adapted to out-door culture, particularly in cold districts. They are also summer and autumn bloomers. Jackmanii, the typical sort, is a deep brilliant violet purple, and the most profuse bloomer of all; Rubella has rich claret red flowers, also very profuse, Alexandra has pale redish violet flowers, and Velutina purpurea, with deep black mulberry-coloured flowers, is very effective as a contrast with some of the lighter coloured varieties in the other types.

The Clematis thrives in almost any good garden soil, and does tolerably well even in soils which cannot be described as good; but if the natural soil is not good it will pay to make it so. If it is light and sandy, it should be rendered more retentive by incorporating with it a large proportion of good clay or dense loam. In naturally heavy wet soils it is desirable to drain well; and in all cases where planted out it is desirable to mulch with good cow manure over the roots. As regards pruning, the Patens, Florida, and Lanuginosa types require to be pruned by cutting out all weak straggling shoots, retaining only the strongest one-year old branches, from which the flowering shoots proceed. The pruning of these should be done; any time during the latter part of the winter. The Viticella and Jackmanii types should be pruned back freely as soon as they are done flowering, and every weak shoot should be cut out, so as to encourage the formation of the strongest summer growths, on which the flowers are borne.

The Clematis, in almost any of the above sorts, is adapted to the clothing of rookeries, rooteries, stumps of trees, walls and trellises. Those also of the Jackmanii type may be employed with fine effect as bedding plants, or trained over trellises on beds so as to form flat or undulated masses, according to taste. Any of them may also be used as greenhouse climbers with the best effect where such house is unheated, in which case little else will do so well bearing the name of greenhouse climbers. Nothing can equal them for the clothing of arbours and bowers of lattice-work in wood or iron.—*N. B. Agriculturist.*

THE WOOD APPLE.

WOOD apple (*Feronia elephantum*). Hindi, *Kyath* or *Cavitte*; Telugu, *Yalag-Kai*; and Tamil, *Vellam*. This tree is considered by not a few to be useless perhaps, because it grows wild, and is to be found in almost every place especially in the jungles. Hence, I surmise, it has met with only a cursory notice in our Garden Manuals, and is said to be—"not entitled to a place in the garden." To disabuse the minds of some folks I shall here note some of the many purposes to which this tree (that is prettily clustered with fruit) is applied to. I shall commence with its—

(*a*). *Fruit*, when ripe, and after the globular shell is broken, it has a very strong odour. The tartish pulp is *farinaceous* and granular which is eaten with sugar; some make a hot weather beverage of it like the "*mango fool.*" A most delicious and palatable jelly is made from the juice of the pulp, and which, if properly made, will gratify all *connoisseurs*. The colour of the jelly is of a lovely ruby, and a better kind could hardly be made from any other Indian fruit. Certainly it cannot be excelled. (Wood Apple and Guava mixed also make a good jelly). Although "Firminger" pronounces the jelly "to be such as it is not likely would be approved of by many," but I beg to differ from this opinion. The *unripe fruit* is made into pickle and "*chutney*." The next is the—

(*b*). *Shell* from which humming tops are made. Rockets are also manufactured from it for making Mr. Stripes uncomfortable in his den. Now I come to the—

(*c*). *Foliage.*—The tender leaves which have a sweet *aroma* are much prized by natives; they use it extensively for curing flatulency.

(*d*). *Timber* containing saccharine matter is much relished by "borers," and renders it useless; but it finds a ready place in the kitchen.

(*e*). The *viscous* juice produced from this useful tree is equal to the gum obtained from the *Babool* (*Acacia arabica*) commonly known as "Gum Arabic." Last though not least, I conclude with its—

(*f*). *Medicinal properties.*—The *unripe* fuit when made into *decoction* acts like an *astringent*. The *ripe* fruit is an *antiscorbutic*, its effect being much similar to the *Bael* (*Ægle marmelos*.)

After enumerating the above uses of this generally despised *Wood Apple* tree, I fail to see why it should not be entitled to a place in the Indian Garden Manuals.

* * * * * *

The *Feronia* belongs to the *Aurantiaceæ* or orange tribe, as also does the *Ægle Marmelos* or *Bael* of the Punjab. The young fruit of the wood apple is almost a perfect substitute for the *Bael*, and universally procurable throughout India while the *Bael* is not.—*Asian.*

FORESTRY.

THE *Madras Standard* does not approve of the new rules relating to villagers cutting firewood. We are inclined to think that they constitute a hardship, but it is unavoidable, and if not kept in check by some system, these people would cut down every stick in the forests. Our contemporary says:—

Correspondents writing from the Cuddapah district complain of the operation of the new rules with respect to forest products and the cutting of woop for fuel. Under the recent orders of the Government certain forest tracts not only in that district, but in Kurnool and Bellary have been "reserved" and unless persons are provided with passes they will not be allowed to enter a forest and cut wood for fuel. In the villages and hamlets of the districts, hundreds of poor people, who have no other occupation, cut wood for sale and not timber for that would be opposed to the rules of the Forest Department. Each cooly picks up and cuts as much as he or she can carry and there was hitherto no objection to this. But under the new rules it appears that this system of indiscriminate picking and cutting of wood for sale, is to be put down, and unless passes are granted to wood sellers, they will not be permitted to enter any "reserved" forest. The new rule may have been introduced with the approval of the Government. But we consider it very hard that the poor people in the villages, who can hardly gather more than four annas' worth of wood every day in the forests and by the sale of which they eke out an existence, should not be permitted to enjoy an advantage which they have been allowed from time immemorial. Hundreds of people in the villages get their living by cutting and selling firewood, and the practice prevails in the suburbs of Madras where no forest rules have been introduced and where fuel is collected without let or hindrance. It may be that this rule applies to only certain forests and not to others. But no harm can be done to any Government forest or plantation where people are permitted to carry away only head loads of firewood. A large quantity of this wood is picked up from the forests, and there can be no deterioration or damage done if the old system were continued. It is these new rules and regulations that make the administration unpopular and induce the people—even the poorer classes—to sigh for the good old days.

EFFECTS OF THE WINTER'S FROST ON TREES AND SHRUBS IN THE EAST OF BERWICKSHIRE.

MR. C. STUART, M.D., Hillside Cottage, Chirnside, writes:—Now that the country is beginning to assume the appearance of spring, the blasted appearance of the woods must strike every observer. The Scotch firs, spruces, and silver firs are browned, especially on their sides exposed to the weather, to an extent never remembered by the oldest men; and what with the withered vegetation on the hedge banks, the complete destruction of the hardy whin, and, until within the last few days, the absence of all green to relieve the eye, the country presents a sombre aspect quite unusual at this season. Except in sheltered nooks, the common primrose is not generally in flower; and the king cups are only just opening. In low lying situations, where the temperature was many degrees below zero, the oaks are killed outright. For three years in succession it has been observed that large limbs of these trees were in a dead condition. But it was only last year that a few watery shoots, with enlarged leaves, showed to what an extent some of them had been damaged. The past winter seems to have finished many of these. Last week I visited a place on the Teviot, where the temperature closely resembled our low readings of the thermometer in Berwickshire. Several of the oaks were completely dead; a few whip-like shoots from the trunk constituted all the growth made last year. These shoots are now entirely killed by last winter's frost. Great sheets of bark, completely decayed, were falling from one of these trees on the lawn, plainly indicating that the tree was entirely dead. Two very old Spanish chesnuts were also killed, and all the tenderer shrubs, fruit trees, and conifers. In low-lying situations, especially in the course of the rivers Blackadder and Whitadder in Berwickshire, a similar destruction among trees, shrubs, &c., has taken place. 198 dead or fatally damaged fruit trees were dug up out of one garden, while not a holly remains alive on the same estate. Beautiful specimens of the rarer conifers, planted with great judgment and taste, are either killed outright or fatally damaged; while the fine old ivy that festooned many of the older trees is lifeless. Many years must elapse before the effects of the weather on vegetation for the last three seasons can be rectified. Owing to the wetness of the first of those years, the woods never ripened. In consequence, it was ill prepared to endure the extreme temperatures it was subjected to. When the frost was most severe, the trees were heard to rend both in their trunks and branches from the expansion of the moisture they contained. This was heard both in Northumberland and Berwickshire by credible witnesses, who can point out the trees, principally limes and elms. These persons describe the sounds heard as most peculiar, something like a sharp report. A very painful lesson has been given to all persons engaged in beautifying their policies with the tenderer shrubs, who will, I should suppose, be very chary in future in planting any but the hardiest varieties, especially in low situations, with the prospect of other Arctic winters.—*Scotsman.*

TEA.

THE *Pioneer* noting Mr. Wood-Mason's visit to Assam to investigate the nature of those insect pests which are so destructive to tea, says:—

Mr. Wood-Mason finds that the tea-bug is armed with a serrated ovipositor, in appearance, as in sharpness, resembling a sword, with this the insect pierces the leaves of the plant, and deposits therein the eggs that eventually cause such villainous mischief. But the most important discovery is that the pest appears invariably to choose the blighted portions of bushes for these operations, and thus there is good hope that by vigorous and unremitting plucking of these parts the evil may be mitigated.

Perhaps a more sensible plan would be to remove the cause of those blighted "portions of bushes" by more generous treatment by way of cultivation and manuring.

THE PROPOSED TEA WAREHOUSE.

THE following letter from an Old Planter in this district to the Secretary to the Port Commissioners of Calcutta on the subject of the new Tea Warehouse, which they propose to build on the river bank at Armenian Ghât, seems to shew that in spite of the disfavour with which the Editor of the *Indian Tea Gazette* regards the project, the only real objection to the scheme lies in the extreme probability, amounting in fact almost to a certainty, of its creating a monopoly. Reasonably enough planters will look forward, not without some distrust, to the possibility of circumstances arising in the future, under which even the Port Commissioners, who probably are not quite free from all suspicion of our common human weaknesses, might be led to take undue advantage of the powerful position they would occupy. But if this natural distrust can be properly allayed, it really seems to us that the very low rates for shipping and insuring, as compared with those fearsome "Calcutta Agency charges" we all hear so much about, ought of themselves almost to form a sufficiently strong recommendation to ensure the successful introduction of the scheme and its immediate adoption for shipping and insuring their teas by "*planters who are free to do so.*" This last expression is such a very pregnant and significant one, that it will well bear italicising, though it is not so in our correspondent's letter.

22nd April 1881.

TO THE SECRETARY TO THE PORT COMMISSIONERS, CALCUTTA.

DEAR SIR,—In the last issue of the *Indian Tea Gazette* is published a circular from your office, said to have been addressed to those interested relative to a tea warehouse, which it is proposed to establish in Calcutta —and with it a scale of charges, from which I note that on "teas for direct shipment," the following rates are to be levied, viz:—

Receiving and storing	¼	*anna per chest.*
Shipping	1	"
Rent per week on teas kept in the warehouse ...	⅛	"

no rent being charged on "teas sent direct to jetty shed for shipment."

I would beg the favor of your letting me know whether the 1 anna per chest for shipping will also include taking out the insurance policy, and posting it along with the factory invoice and Bill of Lading to the consignee, or the making over of these papers to a bank or others address in Calcutta, as the case may be. All that has to be done of course, is to send a peon first to the Insurance Office, and afterwards to the Post Office, or address given in Calcutta, but for these trivial services there are agents, who demand a percentage on the amount insured, a heavy imposition of course, but there are also circumstances under which there is no option, and so it has to be borne. Though agents less hard and exacting are sometimes found, who are willing to ship and insure under the more reasonable arrangement of so much per chest, their rates are arbitrary and somewhat unreliable, and they cover a wide range, some charging four, others six, eight, and twelve annas per chest.

If the Port Commissioners are able to undertake the business at 1¼ anna per chest, it will be a great step gained in reducing the charges which press so heavily upon tea, and no doubt the saving will induce most of the planters, who are free to do so, to ship their produce through the new agency, if they can only be made to feel reasonably safe against any abuse in the future of the monopoly, which seems likely to be created, if the proposed arrangements are carried out.

Hoping for the interest of all concerned to be favoured with an early and definite reply to the point of my inquiry,—I remain, Yours faithfully,

Darjeeling News.

THE TRADE WITH CHINA IN SPURIOUS TEA.

SOME correspondence has recently passed between Messrs. Joseph Tetley & Co., a large wholesale firm of tea dealers, and the Commissioners of her Majesty's Customs, with respect to a lot of 400 boxes of so-called Congou tea which had been bought by them from the importers, who had sold it on the assumption that it would be passed by the Customs' inspectors. Unfortunately for both seller and buyer, but fortunately for the consumer, the "tea" was "condemned" as not up to the mark. Messrs. Tetley & Co., complain that "thousands of boxes of identically the same tea had previously been sold and passed"—and affirm that the Act to prevent impure tea being imported is constantly evaded, owing to the system of allowing the inspectors the discretion of saying what teas shall be passed and what be analysed.

The authorities of the Custom-house, in their reply say:—"With reference to your statement that a large quantity of similar tea had been previously passed, I am desired to acquaint you that the Commissioners will cause inquiries to be made as to the diversity of practice stated to exist among the inspectors of tea, with a view, if necessary of adopting measures to ensure greater uniformity."

To this Messrs. Tetley & Co., in another communication says:—"We were not solicitous to have your decision reversed in the case of the condemned boxes ex *Glengyle*, but to point out to you that identically the same tea as was then condemned as unfit for consumption had previously been passed as pure.

"It is this great irregularity of the working of the present system, that we are desirous of seeing altered, as being a cause of loss of time and great uncertainty to the trade, and, what is of more importance, rendering the Act of Parliament designed to prevent the importation of impure teas quite of no effect, for so long as there is any doubt about impure teas being condemned, so long will it be worth importers' while to bring them in.

"We would venture to suggest to you that the object of the Act would be perfectly obtained were a sample of each break of tea drawn when warehoused, and sent under proper safeguard to the tea office at the Custom-house, where such samples would be carefully and systematically considered in the first place by a professed and competent tea-taster, whose duty it would be to send all doubtful samples for analysis.

"We beg to submit, if such a course were adopted and the Customs' standard of purity rigorously enforced, that in a very short time your analyst would have but a minimum of samples to analyse; for directly it was known and felt by tea importers that all teas under a certain line would every one them really be condemned, and not as now a very great proportion of them passed, then they would naturally cease to import such tea.

"We earnestly trust that you will be pleased to adopt some plan by which all tea under the standard may be condemned. We are confident it can be done with ease, and that the trade would be very pleased to see the Act carried out with all strictness."

COFFEE.

ALTHOUGH the coming Ceylon coffee crop may not, says, the *Observer*, be so large as was anticipated in some quarters at the beginning of the year, still there seems no reason to reduce the estimate of the total outturn between 1st October 1881, and 30th September 1882, below 753,000 to 800,000 cwts. (37,500 to 40,000 tons), against not more than 22,000 to 25,000 tons this season, and with a decease in the Brazil reports and reduction in stocks prices should improve by the end of this year.

ACCORDING to the Batavian *Journal of Agriculture*, the production of coffee by the whole world, in 1855, was 330,152 tons, and in

1878, no less than 490,843 tons, showing an increase during the 23 years of 160,675 tons. These quantities were yielded by the following countries :—

	1855.	1878.
Brazil ...	163,400 tons. ...	225,500 tons.
Dutch Indies ...	71,322 „ ...	91,405 „
West Indies ...	29,300 „ ...	41,800 „
British India and Ceylon	28,780 „ ...	53,422 „
South Africa ...	22,315 „ ...	35,890 „
Arabia	6,176 „ ...	2,779 „
Africa	4,000 „ ...	4,000 „
Central America ...	3,500 „ ...	32,500 „
Philippine Islands ...	1,359 „ ...	3,397 „
Oceania	—	150 „
	330,152	490,843

COFFEE.

ALL the species of coffee more or less valuable for economic or commercial purposes appear to be confined to Africa or are of African origin. Of these, one species, *Coffea Arabica* L., the original species of the genus and the one from which all the coffee of the various coffee-growing countries of the world is produced, is believed to be indigenous to the mountainous regions at the extreme south-west point of Abyssinia, the word coffee, it is alleged, being derived from Caffa, the name of one of the provinces of that country.

From Abyssinia the coffee was introduced into Arabia and cultivated in Yemen or Arabia Felix, and for upwards of two centuries Arabia supplied all the coffee then used. Towards the end of the seventeenth century it was distributed eastward by the Dutch, and it is now extensively cultivated in most of the tropical countries of the East.

The credit of introducing the coffee plant into the Western Hemisphere is a disputed point. One story asserts that the French introduced it into Martinique in 1717; while, on the [illegible], the Dutch are said to have previously taken it to Surinam. In either case it is certain that we are indebted to the progeny of a single plant for all the coffee now grown in Brazil and the West Indies.

The writer on the article on coffee in the "Encyclopædia Britannica" gives the following concise summary of the early spread of coffee cultivation :—

"Down to 1690 the only source of coffee supply was Arabia, but in that year, Governor-General Van Hoorne, of the Dutch East Indies, received a few coffee seeds by traders who plied between the Arabian Gulf and Java. These seeds he planted in a garden at Batavia, where they grew and flourished so abundantly that the culture on an extended scale, was immediately commenced in Java. One of the first plants grown in that island was sent to Holland as a present to the Governor of the Dutch East India Company. It was planted in the Botanic Garden at Amsterdam, and young plants grown from its seeds were sent to Surinam, where the cultivation was established in 1718. Ten years later the plant was introduced to the West Indian Islands, and gradually the culture extended throughout the New World, till now the progeny of the single plant sent from Java to Holland produces more coffee than is grown by all the other plants in the world."

Lunan ("Hortus Jamaicensis," vol. I., p. 22?) relates that the first coffee plants were introduced into Jamaica in the year 1728 by Sir Nicholas Lawes, Governor of the island, and that they were planted at Townwell Estate, now Temple Hall Estate, Liguanea (St. Andrew. In a foot note to this Lunan adds, "it has been asserted that seven berries only were brought to this island from St. Domingo, and that the owner of the tree, raised from one of them in Vero, sold its first produce at a bit a berry."

"In the year 1732, coffee was cultivated in this island under the encouragement of an Act. 5th George II., by which the duty was reduced on home consumption from two shillings to eighteen pence per pound. By a further reduction of the duty in 1783 to sixpence, the cultivation was very much extended and produced considerably more to the revenue than the former heavy one."

Bryan Edwards ("History of the West Indies," vol. II., p. 301) states that before 1788 the export of coffee from Jamaica was under 5,000 cwts per annum; after this it soon rose to 27,000 cwts, and a Committee of the House of Assembly in 1792 reported the existence of 607 coffee estates in the Island employing 21,011 negroes.

Coffee cultivation seemed to have reached its maximum in Jamaica in the year 1805-6 when nearly 260,000 cwts were exported. After this, owing to the abolition of the slave trade and slavery, and the consequent abandonment of numerous estates, the exports greatly declined, till in 1866 they reached only 40,400 cwts. Between 1869 and 1874 the total exports have, however, risen from 45,000 cwts to 92,000 cwts, and during the year 1878-79 they were 96,715 cwts.

The ordinary, or Arabian coffee as it is now called, is essentially suitable for cultivation in hilly and mountainous districts, and it is only under the climate conditions combined with suitable soil, aspect, &c., of such districts the most desirable qualities of the "fragrant" bean are produced.

The Liberian coffee, on the other hand, appears to be indigenous to the plains and forests of Western Tropical Africa, and to "grow equally well in the immediate neighbourhood of the sea and at considerable distances from it. It is to this fact that the Liberian coffee owes its importance at the present time as an economic plant of great value, and should its robust habit and prolific character be maintained in other areas its systematic cultivation promises to become one of the most successful of tropical enterprises, "and this, too, it must be remembered, at elevations too low and temperature too high for the profitable growth of the ordinary Arabian coffee."—*Journal of Applied Science.*

CINCHONA.

WE learn that after a lengthened inquiry extending our some years, the Government of Madras has finally come to the conclusion that Indian prepared cinchona, is a really valuable febrifuge, and it will be largely used in the Government hospitals and dispensaries in that presidency, in future, as a substitute for quinine.

THE VALUE OF CINCHONA.

SEVERAL times already we have quoted Mr. Morris' official reports on the growth of cinchona in Jamaica, as affording useful hints to Ceylon planters on the relative merits of the several varieties, and also as to the best means of preparing the bark for shipment, and in his annual report on Government Plantation which by-the-bye has been issued with commendable promptitude, we have some further interesting information on several important points.

In previous notices we have given particulars of four consignments of the produce of these plantations, last year for the London market, but the results have never before been analysed in the form now adopted by Mr. Morris, and they are worthy of careful consideration by all practical men. There were in all 27,299 lbs. of bark, bringing a net return of £5,145. This was obtained from 8,246 trees of all kinds, from 8 to 10 and 12 years old, showing an average yield of 3¼lbs. per tree, or a money value of 12s. 1½d., of the 8,246 trees, 210 were of the hybrid variety, which yielded an average of 4½ lbs of dry bark per tree, or a value for each tree of £1 4s 2d Of the remainder, 3,945 trees were the crown bark, *C. officinalis*, yielding an average of 1¼ lb. of dry bark per tree, and a value of 9s 3½d. Again, 4,091 were red bark trees, *C. succirubra*, yielding an average of 4¾lbs. of dry bark per tree, with an average value of 16s .1d. per tree.

At first sight one is inclined to be rather surprised at the relative returns of the three sorts here shown : but Mr. Morris proceeds to explain away the difficulty as follows :—'Taking the above average values it would appear that tree by tree, the hybrid variety was the most valuable of all, but taking into consideration the small number of trees barked, 210, and the fact that they were exceptionally fine specimens, the comparison of these with the 3,945 trees of crown bark of all sizes, is not quite a fair test —also with the red bark, the average value of these trees at 16s. 1d. compares most favourably with the crown bark trees at 9s. 3½d. Here again it must be remembered that the red bark trees cannot be planted so closely as the crown bark, and they take several years longer—probably twice as long—in arriving at maturity; and on our highest ridges where the crown bark is completely naturalised, it attains maturity in five to seven years, whereas the red bark, suitable only for lower elevations, would require from 10 to 12 years.

Mr. Morris however still maintains, as he has always done that it is most advantageous to grow the crown variety, because as he says the red bark would be certain to feel first, and most severely any fall in the market, as it is not the best for the quinine makers, and is in fact chiefly bought by the druggists amongst whom the demand is of course comparatively limited, Now, however, that the lower alkaloids are finding favour almost equal to quinine, *succirubra* ceases to be a druggist's bark, and will probably be found more profitable in certain localities than the other varieties. The following calculations as to the cost of producing crown bark and the return it would give to the cultivator is interesting, although we are afraid that it is seldom realised in practice :—

"Taking the actual returns of the crown bark as mentioned above, and assuming that they were planted at elevations 5,500 to 6,300 feet, and at distances of 6 feet by 6 feet, or at the rate of 1,210 per acre, an acre of this species would give a gross return of £563. From the working expenses of the Government Cinchona Plantations, it may be safely assumed that an acre of cinchona trees could be established, including purchase of land and all expenses up to the third year, for £30, or up to the sixth or seventh year, when the bark would probably be ripe, about £49 per acre. The cost of barking, curing, shipping, and brokerage has hitherto averaged, about 8d. per lb. This would make a total cost of about £100 to grow and put in the market 1,815lbs.—the produce of an acre—of dry bark realising £563."

The report mentions the yield of a single tree on the Government plantation, which is certainly something extraordinary, and we shall be glad to hear if any of our up-country friends can match it in their experience :—"One of the largest trees on the plantations was up-rooted and barked on the 7th of April last. It yielded 40lbs. of trunk bark, 5lbs. of twig bark, and 9lbs. of root bark, equal in all to 54 lbs. of green bark. This when thoroughly dried was reduced to a total of 16lbs. At the average price obtained for this kind—the hybrid variety—viz [illegible] 1¾d. per lb. the produce of this one tree was worth £1 [illegible]s 4d. It may be added that this tree was growing in a sheltered situation in good soil, and was nearly 12 years old. It measured 40 feet in height and a circumference at the base of about 30 inches."

The obvious tendency of Mr. Morris' report on the [illegible] by the Government of Jamaica, is to stimulate the [illegible] by private enterprise, but he does not overlook the [illegible] naturally suggests itself, will not the increased supply [illegible] affect the commercial value of the article, and thus render production unremunerative. He is decidedly of opinion that planters need not be deterred by apprehension of this kind. He argues that the demand for quinine is so extensive, and the terrible death roll among all nations of the wo[illegible] from fevers, for which quinine is the sole remedy, is so vast that th[illegible] is no prospect whatever, at present of the price of quinine being serious[illegible] reduced.

On the other hand, the prices of good quinine-yielding barks have been steadily rising. Again when we consider the comparatively small areas in which all the conditions necessary to the production of the best qualities of cinchona bark obtain, we shall find that very few tropical countries can enter successfully upon the cultivation; and of these possibly only two or three will possess in so eminent a degree all the favourable conditions enjoyed by Jamaica. What is absolutely necessary is to select suitable sites where the plants will enjoy the requisite climate, shelter and soil; to cultivate only the more valuable and quick growing species, and to establish plantations on systematic and scientific principles, whereby the utmost value is obtained for the outlay, and the conditions of growth carefully studied.—*Ceylon Times.*

GOVERNMENT AND THE CINCHONA INDUSTRY.

From G. King, Esq., M.B., Superintendent, Royal Botanic Garden, Calcutta, and in charge of Cinchona Cultivation in Bengal, to the Secretary to the Government of Bengal, Financial Department, No. 420, dated Howrah, the 30th May 1881.

SOME unfavorable remarks having lately been made in Indian newspapers as to the competition of the Government of India in the London markets with private growers of cinchona bark, I was induced to go into the matter, and it may not be out of place if I lay the results of my inquiry before Government.

2. The tone of the remarks referred to would lead the public to believe [illegible] the quantity of bark sold by the Government of India during [illegible] formed so large a proportion of the total of Indian-grown bark as, [illegible] a perceptible degree, to influence the market to the detriment of private growers. This view is hardly borne out by statistics. From the circulars of two London firms of bark brokers, I find that the total importations of cinchona bark into England during 1880 consisted of 76,074 packages. Of these, 57,560 were from South America, 483 were from Jamaica, and 18,031 were from India and Ceylon. The 18,031 packages from India and Ceylon consisted for the most part of red and crown bark, there being only 207 packages of yellow, and of these 207, all but one came from the Sikkim Plantation, while the odd *one* came from the Government Plantation on the Nilgiris. The yellow bark sent by the Government of India came into competition, therefore, with no yellow bark grown in India or Ceylon, the fact being that in no plantation in India or Ceylon, except in the Government one in Sikkim, do more than a few yellow bark trees exist. Of 17,824 packages of India and Ceylon-grown red and crown barks sold in London, 1,174 were offered by the Government of Madras. The rest belonged to private growers. Madras Government bark, therefore, came into competition with privately grown Indian bark to the extent of 6·6 per cent.; and of the total bark imported into England, Madras, and Sikkim bark together (1,380 packages) formed a proportion of about 1·82 per cent. These calculations are of packages, as I do not know the exact weights in pounds; but bark packages are always pretty much about the same weight, and the results may be taken as substantially reliable. I hardly think these figures bear out the charge, so lightly brought against the Government, of having damaged the interests of private growers by flooding the market with bark grown with public money.

3. For many years prior to 1880, no bark had been sold from the Sikkim Plantation, the policy of that plantation having from the beginning been to grow bark for manufacture into a cheap febrifuge for the people of the country—a policy which has been consistently and successfully carried out. The 206 packages sent to London last year consisted of a kind of bark which could not be manufactured into febrifuge, and of which, except by sale, there was no means of disposing. A further exportation of similar bark has been made during the present year for a similar reason: but changes about to be introduced into the factory make it unlikely that it will be necessary to send any more bark to London for sale. As regards the produce of the Nilgiri Plantation, the policy of the Madras Government has all along been to sell it in the best market.

4. The figures I have just quoted show that it would be hopeless, even if it were good policy for Government to try to lower the price of quinine for the people of India by lowering it in the home market because that really means lowering it for the whole world by flooding the European markets with bark of its own growing. The direct and simple way of carrying out its avowed object in maintaining cinchona plantations is, as it appears to me, for Government to manufacture the produce of these plantations for use exclusively in India. In its plantations, Government has the means of supplying itself with bark, and with the manufactured products of bark, at a greatly cheaper rate than it could buy them in the open market. In proof of this, I need only say that, on the Sikkim Plantation, bark is produced at a cost price of about 2¾ annas per pound, and cinchona febrifuge at 9¼ rupees per pound; while bark of similar quality fetches in London prices varying from two pence (for shavings) to eight shillings and four pence for good quill, and quinetum (which is cinchona febrifuge under another name) cannot at present be bought under forty shillings per pound.

THE PROSPECTS OF CINCHONA PLANTATIONS.

ALTHOUGH the profit of cinchona plantations is said to be from 70 to 80 per cent., cinchona growers in Ceylon and the East Indies will need to look closely into the cost and possible profit of their plantations, since they may soon have to compete, not only with the Government [illegible], but with enterprise in Bolivia. In 1878, a few [illegible] the experiment in that country of cultivating the [illegible] and now according to the report of the Dutch Consul, [illegible] on the banks of the Mapiri at La Paz four or five hundred thousand young trees of two years' growth. In other places also new plantations are springing up, chiefly on the mountain slopes which are cultivated for three-fourths of their height. The cultivation of the cinchona in its original home is, of course, easy, the chief danger [illegible] from drought or ants during the first two years, and the only labour necessary is to keep the young plants free from weeds during the same time. To give shade to the seedling plants, bananas are planted between them. Already excellent yellow bark from Bolivia has been sold in this country and cultivated South American red bark yielding 3 per cent. of sulphate of quinine, has lately appeared in the London market. At the drug sales this month large quantities of the bark known as "China cuprea" have again been offered, and with it some bark closely resembling it in external appearance, but not containing [illegible]. Several other parcels of bark have also been offered which do not appear to contain quinine, and probably do not belong to the cinchona genus at all. The variety of gum which gives a ropy mucilage in appearance like white of egg, is still to be met with in commerce. It may interest those who have it in stock to know that it may be restored from its allotropic to its natural condition by dissolving it in hot water, and allowing it to stand for twelve hours or so in a warm place. In appearance the gum is hardly to be distinguished from the best "Turkey" sort, but is of a greyish, rather than a yellowish-white tint.—*Pharmaceutical Journal.*

CALISAYA LEDGERIANA FLOURISHING IN MASKELIYA.

NOTHING will give us greater pleasure, than to be placed in a position to assure Mr. Moens (and the cinchona planting world generally) that whatever may be the case in Java, "a long dry season" is not required in Ceylon to enable the precious *Ledgerianas* to blossom and seed, any more than to grow luxuriantly. And a few more facts added to those furnished in the interesting statement made by Mr. Christie of Maskeliya, ought to convince even Mr. Moens of the fitness of certain portions of our younger districts between Adam's Peak and Great Western for the cultivation of this valuable species. After all, although blossom is an important matter, it is not *the most* important in respect of cinchona. If the *Ledgeriana* trees grow vigorously and put on bark after the fashion of the *succirubra*, species (as stated by Mr. Christie) certainly the cultivation should be pronounced a decided success. His comparisons speak for themselves, and we trust these will be followed by others made by the possessors of *Ledgeriana calisayas* of an appreciable age in Boltumbe or West Haputale, in Madulsima, Maturata, and other districts. The piece of bark sent to us by Mr. Christie, requires no microscope to discover its quality; to break it and taste it is almost sufficient! The analysis shews that Ceylon *Ledgerianas* of the true type are not likely to be a bit behind those of Java in their value to the manufacturers of quinine. Mr. Howard will be greatly interested in the experience of Mr. Christie (whom we heartily congratulate), and we shall forward to the veteran Quinologist the piece of bark sent to us, to enable him to judge of the result even at this early stage.—*Ceylon Observer.*

STATISTICS.

STATISTICAL PROGRESS.

IN due time we shall know the results of the census. The Board of Trade returns show us what change has been effected in other matters of national importance and consideration during ten years. We find that public wealth has increased 30 per cent., commerce 13 per cent., textile manufactures 16 per cent., minerals 45 per cent. The deposits in the Bank of England increased from 23 millions to 39½ millions. The Savings Bank deposits of the working classes rose from 51 to 76 millions. Income-tax returns showed an average increase of £4 per head of the population and even Ireland showed an increase of £2 a head. We heard much about commercial depression during 1879, and yet during that year the minerals raised in this country amounted to 64 millions, as against 41 millions in 1869. As a natural result of these figures, railway traffic grew in very similar ratio, *viz.*, from 41 millions to 59½ millions. The Post Office showed the greatest growth of all *viz.*, from 847 million letters in 1869 to 1,239 millions in 1879. Again, pauper statistics showed a reduction of pauperism by 19 per cent. (*viz.*, from 1,281,000 to 1,037,000), an almost natural corollary of the above recorded increase in national prosperity. Turning from commerce to morals and minds, we find that crime had diminished during the decade referred to. The number of convictions fell from 14,340 to 12,526. On the other hand, intellectual attainments showed development—the natural result of the Education Act. The average attendance of children at school had risen from 1,333,000 to 2,980,000—an increase far in excess of the ratio of increase of juvenile population. Agricultural returns for the same dates were highly significant as showing the gradual tendency for grazing and dairy farming to take the place of cereal production—the inevitable result of the competition of the foreign grain market. The arable land had fallen from seventeen million acres to a trifle over 15½ millions; and in Ireland the diminution in this respect was nearly double in proportion to the arable acreage. As set-off against this, live stock has increased in number, with the exception of sheep. Cows had gone up 8 per cent., horses 12 per cent.; pigs 6 per cent., sheep had gone down 6 per cent.—*Ladies' Journal.*

SERICULTURE.

SILK.

AMONG the wares which farmers in the south of Europe bring to market are bunches of mulberryleaves. They are purchased by people who keep silkworms, and who have not the means on their own ground for feeding them. The leaves are sold by weight in the market, and to select what will nourish the worms best is a task of some difficulty. The farmer wants to sell the heaviest, but the purchaser knows that as the trees grow older the leaf gets smaller, and that it is the small leaf which contains most food. Those who do not buy in the markets, hire mulberry trees in nurseries and plantations for the season—a good tree giving from thirty to sixty pounds of leaves. The price of a tree varies according to the local demand for it, but eight francs would not be considered too much for one yielding thirty pounds of leaves.

When the leaves are carried home from market the rearing of the silk-worm commences. It is a work requiring the greatest care and delicacy, and there are various ways of setting about it. In spite of improved methods, many of the silk cultivators of the south still maintain the most primitive. They have the eggs of last year's grey moths preserved in phials hermetically sealed. Those have been immured in earthen pots, kept at a low temperature, so as to avoid premature hatching. To hatch the eggs, they are taken out, and one or two ounces of them being poured into a silk bag, it is worn on the chest for some days. At night it is put under a pillow, or wrapped in fine linen, and the eggs are placed on a bed kept at the average heat of the human body. After the worms are hatched, they are lifted into flat baskets and covered with mulberry leaves, which they devour greedily. The feeding goes on for a week, or it may be a fortnight, the worms not seeking to escape from the baskets where they are supplied. At the end of that time they stop feeding, crawl uneasily among the chopped leaves, and the cultivator knows that they are preparing to spin. At that stage small bushes are given to them—broom bushes, heath, or clean bean-stalks. These are arranged in rows, with air and space between, each, and look like so many miniature hedges. Inside and around them the cocoon is spun. By and by, with the worms inside, the cocoons are carried out to a cauldron in the cultivator's garden and thrown into hot water. The silk then loosens itself, and may be ree'ed off, and the dead bodies of the worms are given to the birds, who appreciate them as if they were seed. The silk-thread may then go to market and from that to the factory.

The silk-worm is not, however, a native of Southern Europe, though in Spain, France, Italy, Greece, and Turkey its cultivation is pursued with different degree of success. China is the true home of the worm; and it was at Constantinople that two Persian monks, coming from the country of the Seres, first introduced it during the reign of Justinian. It is to this first progeny, carried from the East in a hollow cane that all the later silkworms of Europe must be referred. It was soon discoverd that, with the introduction of the mulberry, Europe could be made as productive as China. Becoming independent of Oriental supplies, silk was sent out from the Greek Empire, by way of Venice for 6,000 years. The Chinese, however, still maintain their ancient cunning in the cultivation of the insect. They allow no stranger into the secret of their trade, and to England alone they send in a good year as much as £4,600,000 worth of silk. The hanks or "books," as they are called, come into the markets covered with caps made of a single cocoon: and it is one of many processes in connection with the culture and exportation of silk by the Chinese which in Europe is neither practised nor understood.

The industry was carried in the eleventh century to Sicily by Roger I.; and, as he had seized some Athenian weavers, silk was not only grown but manufactured with all the art of the period. From Sicily the industry readily passed into Italy, France, and Spain, though the Venetians and the Genoese had already been importing worms and mulberries on their own account. A curious circumstance in connection with it was that the noblest Venetian families thought they might engage in the trade without loss of dignity. Glass and drugs shared the distinction with silk. Louis XI. probably deserves the credit of introducing silk into France. Tours became a rising town under his patronage. Francis I. promoted the industry in the neighbourhood of Lyons and Avignon. Henry IV. personally interested himself in the subject, and the naturalisation of the insect as far north as Orleans. He was anxious to have it introduced at Paris; and at Fontainebleau mulberry trees were planted in great numbers. At the same time he offered titles of nobility to such Parisians as had sufficient enterprize to establish silk factories. Later on, Louis XIV. is found offering a reward of three livres to the cultivator of every mulberry-tree which should be in a thriving condition three years after it had been planted. The consequence was that Provence, Languedoc, Dauphine, Lyonnais, Gascony, and Saintonge became mulberry plantations.

A bold attempt was made by James I. to render silk culture popular in England. It had long been known that silkworms fed in English houses had gone through the work of spinning and breeding as if they were in a southern climate. It seemed, therefore, to King James that nothing was required but mulberry-trees, so he sent out circular letters to the county authorities of England, inviting those who could to buy sprigs in London at three-farthings a piece, and to plant them without delay. For a time there was much excitement at the prospect of silk being made indigenous. Not very long before, a sumptuary law had been passed for the benefit of a too luxurious middle-class, providing "that whosoever shall wear silk in or upon his or her hat, bonnet, or girdle, scabbard, hose, shoes, or spur-leather, shall be imprisoned during three months, and forfeit ten pounds;" magistrates of corporations and all who ranked above them, being excepted from the operation of the statute. But the failure of the effort made the King turn his attention to Virginia as a more suitable field than England. In 1718 when every scheme on which joint-stock subscriptions could be raised was made the most of, one for the cultivation of silk was put forth. A company leased Chelsea Park for 122 years, and planted 2,000 mulberry trees. Nothing came of it. Seven years later, a scheme which promised to be more remunerative was set on foot for the cultivation of silk in the south of Ireland. The climate of county Cork, it was thought would suit both the plant and the worm, and the cheapness of labour would put the cultivators on terms of equality with competitors in the south of France. The undertaking was supported by many who hoped to improve the condition of a peasantry even then understood to be very badly off. Eighty acres were selected near Michelstown, and 400,000 white mulberry trees were planted. They grew admirably; and nothing, at first, seemed wanting to the success of the experiment. But it was soon found that if labour was cheap and the climate suitable, incurable awkwardness of the Irish labourers unfitted them for the task of rearing the worms and reeling the silk. The company had to transfer its capital and appliances to Malta, where there was some hereditary taste for the work among the poorest classes. If the silkworm cannot be cultivated in England, it has been proved that at least in some of the colonies the conditions are favourable to its growth. Colonial Governments have not been blind to the fact. To encourage the industry the Government of New Zealand offered a percentage on all cocoons prepared for export, but as yet the offer has been attended by no result. Victoria, in its vine district, has already begun to cultivate the silkworm, and its cocoons are favourably known. That there is room for competition may be judged from the value of the silk imports into England for any recent year. Taking 1877 as on the whole, a fair average year, it appears that there were imports in "knubs" and waste to the amount of £827,166; of thrown silk, £108,598; of raw silk, £1,452,045; while silks in various stages of manufacture were valued at £12,681,844. In some seasons these imports are of higher value by several millions. In its raw state, the silk is divided at present among 706 factories, having 842,528 spindles, 12,546 power-looms, employing 40,985 workers.—*St. James's Gazette.*

TOBACCO.

Tobacco in France.—The following table from a recent report shows that the consumption of tobacco in France has been steadily increasing:—

	Population.	Amount consumed. Kilogrammes.	Amount per head. Grammes.	Equal to lbs.
1815	29,250,000	8,981,403	307	·67
1826	31,673,853	11,595,084	366	·80
1831	32,731,256	11,071,088	338	·74
1841	34,018,715	16,461,934	484	[illegible]
1851	35,546,919	19,718 030	555	[illegible]
1864	37,133,424	28,019,803	755	[illegible]
1866	37,807,203	30,627,663	810	1·78
1872	35,844,414	27,031,000	754	1·66
1876	36,643,087	31,188,846	851	1·87

It is estimated that there are 5,500 acres under cacao cultivation in Ceylon at the present time, valued at £300,000. From the quantity of seed sold it is probable that over 25,000 acres will be planted.

TOBACCO CULTIVATION.

THE following report upon the tobacco fields at Wangaratta has been forwarded to the Commissioner of Customs by the Chief Inspector of Excise:—

Custom-house, Melbourne,
20th April 1881.

The Hon'ble Commissioner, Trade and Customs.

SIR,—I have the honor to report that I left Melbourne for Wangaratta at 10 minutes past 6 A.M., on the 15th instant. Immediately on arrival I visited the tobacco plantations in the immediate vicinity of the town. There are 85 acres under crop, in the hands of one European and 13 Chinese. They have not yet commenced to cut the tobacco. On the 16th I inspected the plantations on the western side of the King River, and found the greater part of the crops drying in the sheds. The acreage under cultivation had been 123 acres, owned by six Europeans and two Chinese. On the 17th I went five miles further up the King River, being then 50 miles from Wangaratta, and saw six plantations, comprising in all 121 acres, and cultivated by two Europeans and four Chinese. On the 18th I returned to Wangaratta, the eastern side of King River, and found that 183 acres had been under cultivation, worked by seven Europeans and four Chinese. The tobacco is in various stages of treatment, some of the leaf having been removed to the drying-sheds some three or four weeks since, whilst in other plantations the tobacco plants have not been touched. All agree, however, in the opinion that the yield this season will be of fair average quality. The total quantity of land cultivated this year in this district is about 511 acres, and is expected to produce 230 tons. There are 25 Europeans and 160 Chinese employed in this industry. From all sides I gather that complete satisfaction would be given to the tobacco growers if the Government would add an additional 6*d.* per lb. on the imported leaf, for, without doubt, the quality of the colonial tobacco is such that the present imported article would be completely shut out of the market, as all, or nearly all, the land on both sides of the Upper King River would be devoted to the culture of tobacco. Drought appears to be the greatest enemy the growers have to contend with, but they say that if sufficiently protected, they could irrigate the land by artificial means, at no considerable cost, as the land borders either upon the river or on creeks running from it. Naturally, if the tobacco could obtain a fair paying price, the grower would exercise more care and attention on the plants as they mature, both under crop and after housing. I may here state that the Chinese, many of whom I found to speak English fluently, and who are exceedingly intelligent, have advantages over the European in their constant supervision and untiring efforts to keep the plants free from insects, &c. From careful observation, I am satisfied that in this district there is no improper manufacture of tobacco, the people are simply growers. I also visited the two breweries and tobacco factory in Wangaratta. Attached is a list of tobacco planters, with the acreage under cultivation.—I have the honour to be Sir, your obedient servant.—*Australasian.*

H. T. HAMMOND,
Chief Inspector of Excise.

CHINESE TOBACCO.

IT will no doubt be news to a good many people that Chinese tobacco is being consumed in this country, and probably to a considerable extent. In his last report from Hankow her Majesty's Consul tells us that tobacco has for some years been a favourite speculation in that important trade-mart, and that investment therein is at length becoming profitable now that the uses for which it is best adapted have been recognised by Home manufacturers. The supply is so large from the provinces, of which the mighty Yangtsekiang forms the market-road, and the leaf so fine in colour, texture, and fragrance, that merchant after merchant [illegible] convinced that it ought to form a profitable export; but, though [illegible] it was sent to America to aid in the manufacture of Havana [illegible] to England for similar purposes, it has not until quite lately proved a remunerative investment. It is now Mr. Alabaster believes, used for the manufacture of cigarettes, under the name of Turkish tobacco, and for mixing with various cut tobaccos in this country; but he goes so far as to express his conviction that, when better known, it will be smoked on its own merits. Mr. Alabaster, of course, only refers to the unprepared leaf-tobacco, the prepared article from the nature of the process it goes through having a taste somewhat nauseous to the foreign palate. It will be interesting to note, in conclusion, from the last available trade-returns, that in twelve months close upon eight million pounds of this leaf tobacco were exported from Hankow in foreign bottoms alone, without taking into consideration the amount shipped in native junks; the estimated value being given at about 120,000lbs. We have no means of knowing how much of this event beyond Shanghai and the Chinese coast-ports, but we imagine that the bulk of it was not intended for foreign consumption.—*The Colonies and India.*

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NOTICE.

SUBSCRIBERS to the STATESMAN, FRIEND OF INDIA, *and* INDIAN AGRICULTURIST *are informed that arrangements have now been made by which these journals will for the future be published under the general superintendence of the undersigned.*

All communications regarding literary matter should be addressed to the Editor of the paper for which it is intended.

All communications concerning the general business of the STATESMAN AND FRIEND OF INDIA *Office, Advertisements, and Subscriptions to the* daily STATESMAN AND FRIEND OF INDIA, weekly FRIEND OF INDIA AND STATESMAN, *and* INDIAN AGRICULTURIST, *should be addressed to the MANAGER,*

WILLIAM RIACH.

13*th June* 1881.

CONTENTS.

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

ACKNOWLEDGMENTS.

RECORDS of the Geological Survey of India.—Vol. XIV., Part 2, Calcutta: 1881.

REPORT on Revenue Administration of the Punjab for 1879-80. Lahore: Central Jail Press, 1881.

SEABORNE TRADE and Navigation of the Madras Presidency for 1879-80. Madras Lawrence Asylum Press, 1881.

REPORT on the Administration of the Department of Agriculture and Commerce. North-West Provinces and Oudh, for 1880-81. Allahabad; North-West Provinces and Oudh, Government Press, 1881.

THE Indian Forester for July 1881. Calcutta: Central Press-Co., Ld., 1881.

CORRESPONDENCE.

DUAL SAP.

TO THE EDITOR.

SIR,—While expressing my thanks for your allowing my article on the "two saps" to appear in your paper, I must admit I was much disappointed at your remarks, for I had hoped to have been shown by yourself where my theory was faulty, or that some of your numerous subscribers would have taken up the subject. To me it appears one of great interest which would revolutionize many existing practices which appear utterly opposed to Nature. I trust you will pardon my writing again, and that you will venture some comments and not treat the subject as you did on previous occasions, it being one that cannot be passed over by alluding to what has and is being done, but what is necessary; and to show clearly the manner in which Nature can be helped, for I conclude man in his pride will allow that this is all that our feeble efforts can bring about. But to my subject.

The treatment of coffee is what I will first take up.

While accompanying a friend in charge of a coffee estate on the Neilgherries, I observed him plucking up the young shoots on which there were no flowers; and was told by him that, by so doing the sap which went to their nourishment would tend to increase the size of the berries. This first led me to draw the distinction between the fruit and leaf-sap. It appears to me that as with the human being and animals so with plants; Nature changes its condition at the time for propagating its specie. The same nourishment tends to support blood and milk; yet no one would I suppose be so bold as to say they were synonymous. Good milch cattle will never be found to carry much flesh, hence the inference that the greater portion of nourishment taken is converted into milk instead of blood. Now I hold that with the change of seasons plants always take their turn, and that this period to them is like the seasons for propagation to human life, the same sustenance undergoes a different process by which fruit-sap is created, and so long as it exists, it performs its functions towards supporting the fruit; but so soon as no longer required, ceases to flow as in the case of milk, and changes its nature into leaf-sap as milk does to blood. There could not be a better illustration than the mango tree, of a year when the pollen is destroyed. On examination, the leaves will be found, covered with a coating of sugar-sap ejected from the flower. If Nature could utilize this sap in the support of leaf, is it likely that it would exhaust itself in the manner it does? You remarked that if this theory were correct, what would be the advantage to tea-planters, in their removing the flower of the tea plant? This can easily be shown, the flower being removed which to the plant is like the young to the animal, the necessity for its nourishment ceases, thus the space occupied by the fruit sap is taken up by that of the leaf, and a considerable portion of the time which would be spent in the fruit is devoted to producing leaf.

I have a theory of my own with regard to the cultivation of vine, which I should like much to have discussed.

E. A. C.

Hardoi, 26th June 1881.

ARTIFICIAL INDIGO.

I.

(To the Editor of the Times.)

SIR,—As one interested in the indigo trade, permit me to refer to your report of Professor Roscoe's lecture under the above heading. In acknowledging the great learning and well-known skill which Professor Roscoe is enabled to bring to bear upon any subject in connexion with chemistry, I must, nevertheless, take exception to one or two statements made by him in his lecture as reported by you. My principal objection, and it may as well be stated at once, is that the invention referred to is called the discovery of "artificial indigo," whereas the discovery does not go beyond an attempt to produce indigo blue. Indigo commonly so called contains, besides indigo blue, indigo red, and indigo brown. True indigo blue is considered chemically as the pure article, but the natural dye contains, in addition, the other two substances, the former of which, at least, is certainly a[illegible]t influence in the dyeing processes. What effect, if any, the la[illegible]y have, has, I believe, never been definitely settled ; b[illegible]gestion that indigo red modifies this process considerabl[illegible]refore, as the discovery goes no further than the artifi[illegible]f indigo blue, I think it can hardly be considered that the [illegible] which chemists have set themselves for the past 40 yea[illegible]solved ; the most that can be said is that another among t[illegible]mpted substitutes for indigo has been brought out. This poi[illegible]eing fully admitted—*viz.*, that the discovery is that of indigo blue alone, I am prepared to allow that the "propiolic" acid, if sold at a moderate price, may be used for many purposes for which indigo is not suitable. Hence the two may well work side by side.

To show that the artificial product is not the same as natural indigo, I may state that I am given to understand on the very best practical authority that the shades of blue produced by indigo cannot be attained by the use of the "propiolic" acid, and further that the great desideratum of natural indigo, perfect fastness, is in a great measure wanting in this artificial production. This alone would condemn its use for many purposes, as "indigo dyed" is almost a synonym for fastness of colour—*i.e.*, inability to fade or wash out. While on this point, I may deplore the present taste or fashion for bright, but fugitive shades. We hear on every hand complaints as to the fading of articles of dress, carpets, &c., and the statements continually made that 20 years ago carpets lasted longer and looked far better after years of wear than they do now after as many months. The reason is obvious. Coal-tar dyes are now used to a surprising extent, and, even where they are supposed not to exist, with the result as given above. The remedy is, however, wholly in the hands of the publice. Beyond this, even the use of some of these coal-tar dyes is positively poisonous. Many instances have appeared in the public prints as to their baneful, nay, even fatal, results. An instance of this came before my own notice but a short time since. The groom of a neighbour having cut his foot, found shortly afterwards that the foot was poisoned. It was only with the greatest difficulty and after many weeks of illness that amputation was found unnecessary. The cause was found in the colour of the red sock he wore. Scarlet, till within the last two years was rightly considered one of our fastest and safest dyes, and so it is still when the natural dyes, cochineal and lac dye, are either used, but recently an aniline scarlet, more easy of application, has been discovered ; and if the public find that their scarlet flannels no longer stand, they will know where the blame lies.

This invention of artificial indigo blue is derived from coal-tar. That the discovery of artificial indigo will never be accomplished, it would be folly to assert, but at present I think we are some long distance removed from it. I have already shown that the article now produced forms only one component of the natural dye, and according to Professor Roscoe is very costly. Taking his figures of 6*s.* per pound for 25 per cent. of the acid, and that the acid contains only 68·58 of indigo blue, in theory, in every 100 parts of acid, we arrive at a cost of 35*s.* per pound within the merest fraction for pure indigo blue, in theory. Now, as theory usually tells against the theorist, we may take it that in practice the cost would be much greater ; but even at 35*s.* per pound, the cost as against the natural dye stuff at present market rates would be about four times as great and not "twice that of the pure natural colour" only, as given by the lecturer. Again, the planters in India could, if necessary, sell their produce at a very considerable reduction on present quotations, so that unless the artificial dye stuff could be produced at a cost not exceeding 5*s.* or 6*s.* per pound pure, it would be unable to displace so long tried a servant as the natural dye, provided always, even at this low figure, the results turn out in practice in every way as good.

I hope that the scare we experienced about this time last year in the London indigo market through the, to say the least, somewhat exaggerated reports which were then made current with regard to the artificial product, may have one salutary effect—namely, that the indigo growers may see that their position is one not entirely free from danger, and that while they have the time and opportunity, they may endeavour to improve their manufacture and lessen the cost of production ; so that should the unhappy event of the discovery of artificial indigo at a paying price ever be accomplished, they may still be able to beat the artificial product by manufacturing at a lesser cost. That the destruction of indigo planting would be a positive calamity, may be seen from the fact that the annual average production of indigo in India alone exceeds, perhaps, three millions sterling, a loss which to India would be serious, both on account of the destruction of so large a proportion of her exports and the vast interests, both European and native, which it would affect.

I am, Sir, yours faithfully,

E. B. BROOMHALL.

9, Mincing-lane, E. C., June, 4

II.

(To the Editor of the Times.)

SIR,—Mr. Broomhall is incorrect in stating that the discovery of artificial indigo "does not go beyond an attempt to produce indigo blue," for this body has actually been obtained in a chemically pure state from coal-tar. He is also wrong in concluding that indigo red has not been artificially produced, for this product has likewise been prepared from coal-tar. The object of my lecture was to bring forward these facts.

I am, yours faithfully,

HENRY E. ROSCOE.

Owens College, Manchester, June 7.

BAMBOO IN CEYLON.

(To the Editor of the Society of Arts Journal.)

SIR,—In the discussion that took place after the reading of Sir Arthur Phayre's paper on British Burmah, on the 13th May, I see that a quotation I read, bearing on the growth of bamboo, from the *Gardener's Chronicle*, of the 30th of April, is (inadvertently) omitted, referring to the Royal Botanical Gardens at Peradenya, Ceylon. H.J.E., a keen observer, writes :—

"Perhaps the most striking objects in these gardens are the extraordinary clumps of giant bamboo, which exceed anything I have ever seen or heard of. In some of them not less, and probably many more, than 200 *culms* of over 100 feet high are growing, as tightly packed together as possible. Some of the stems must be very nearly, if not quite, a foot in diameter, and the average, eight or nine inches. This splendid bamboo is, I believe, a native of the Malay Peninsula, and is the most remarkable instance of rapid growth I know of, each of these immense stems being formed in a few months."

To lovers of botany, a fine specimen of this bamboo may be seen at the Duke of Northumberland's garden at Sion-house, Chiswicke. I have a stem here from that clump, nearly 70 feet high, the top of which pushed its head through the roof of the conservatory.

THOMAS ROUTLEDGE.

Claxheugh, Sunderland, 30th May 1881.

The Indian Agriculturist.

CALCUTTA, AUGUST 1, 1881.

THE AGRICULTURAL DEPARTMENT.

LORD LYTTON gave us the Afghan war and abolished the Agricultural Department. Lord Ripon has closed the war and reconstituted the Agricultural Department. We use Lord Ripon's name in a representative sense. We do not need to consider how much of the credit of the changes of policy belong to him personally. It does not matter that the withdrawal of our armies from Afghanistan and the revival of the sacrificed department may have been ordered by the Home Government; it is enough to know that the policy thus embodied is in perfect harmony with the policy indicated by the Viceroy in the speeches which he delivered last year, during the too brief period when India was permitted to hear his voice and to know that the Viceroy was a living soul. He said it was his desire to put an end to wars, and to improve agriculture and the condition of the people. The former has been accomplished ; an important

step is now being taken in the direction of the latter. Peace and agricultural improvement must go hand-in-hand, or peace, in India, becomes a doubtful blessing. If both should be linked in history with Lord Ripon's name, he will be fortunate among Viceroys. Under his predecessor, we had a costly and not an honourable war; agricultural improvement was formally declared a visionary idea, by the abolition of the department, which had, it must be confessed, failed to fulfil the chief end of its existence; the development of our system of internal communications was checked, because all available funds were required for the war; new and exasperating taxation and legislation filled up the cup of bitterness which was put to the lips of the people; and while all those evils flowed directly from the Government, nature, as if to mark the period as the blackest in our annals, added to the sufferings of the people the desolating scourge of famine. Lord Lytton's coming to India might well be cursed by the people as bitterly as Job cursed the day of his birth. It is good fortune in itself merely to succeed such a reign. Difficulties and perplexities are, indeed, a necessary inheritance, but, on the other hand, it is hardly possible for a well-meaning ruler not to act the part of a redresser of grievances, a bringer of relief to the people, a social and political benefactor. The time has not yet come to weigh Lord Ripon's claim to be regarded personally as a benefactor to India; but, as contrasted with those of his predecessor, the policy and the measures which it is his good fortune to be identified with, will certainly be remembered as beneficent. And if he cannot claim the full credit to himself of resuscitating the Agricultural Department—a measure recommended by the Famine Commission and approved by the Home Government—it may at least be assumed that it is a task entirely to his liking, for it belongs, as we have said, to the kind of work which he announced last year that it was his wish to perform.

There could be no better time than the present for re-establishing the Agricultural Department and for organising it in a sufficiently liberal and efficient manner. The abnormal drain on the exchequer has been staunched; we have peace all around us and the promise of peace; generally good harvests have somewhat lightened the perennial pressure of poverty and hunger on the people; the main sources of revenue are yielding normally, if not copiously; and, in short, the present condition of India wears an aspect as like prosperity as can reasonably be looked for with its present population and undeveloped resources. We may look upon the present as a day of grace given us to provide against such threatening evils as over-population, exhaustion of the soil, hopeless indebtedness of the cultivators, and failure of the rains of heaven. In order to do this there can be no doubt that a special agency is desirable and even necessary, and a strong, well-organised, and well-supported Agricultural Department is the agency that is required. Is the Government fully alive to the necessity of making the new Department really efficient? Or, which is the same, or nearly the same thing, has it faced the necessity of making the department an agency for spending State funds freely, while for a number of years its labours must be unremunerative? If organised on niggardly principles, it must be a failure, as was the too much ridiculed Etcetera Department. That Department, it may be said, was never allowed to commence its proper duties. It did much miscellaneous and, no doubt, useful work, but the gigantic task of improving the general condition of agriculture and of the cultivating classes was one with which it was never able to cope. In order that the new Department may undertake the work with a reasonable hope of achieving substantial results, the first essential is, of course, that it must be well manned and organised. It may not be necessary that it should spring at once into existence with a fully equipped establishment and complete ramifications all over the country. Financial considerations may compel the Government to go to work gradually, contenting itself at first, as it seems disposed to do, with the establishment of an imperial office, with subordinate agencies in one or two provinces. But a complete scheme should be at once formulated, and a persistent endeavour made to carry it out in its completeness as speedily as possible. The present Government may only be able to begin the work, but it may at [illegible] leave to its successor the inheritance of an intelligent and comprehensive plan by which the central Department shall be the heart of an organisation co-extensive with the Indian empire, to it would flow a constant stream of facts from every district in the country, bearing upon the condition of the agricultural community and the work being done by the provincial agencies for its improvement. The Secretary would thus be at all times aware of the peculiar condition and needs of every tract, and would issue instructions or advice to the local officials as to measures suitable for the time and place. He would know what districts it was desirable for him to visit personally from time to time, to see with his own eyes what measures could be wisely adopted, and what results were produced by measures introduced. With such an organisation, and such an official personally responsible, there could be no possibility in the future such a thing as a famine taking the country by surprise. The Agricultural Secretary would have his attention immediately directed to any tract where there seemed to be the least danger of a scarcity. From that moment, he would have his eye upon that tract daily; he would be kept regularly informed regarding the progress of crops, and the probable extent of the failure; he would be also able to find out what was the general condition of the cultivators as to poverty or indebtedness, and what stocks of food the district held in reserve. He would know exactly what facilities existed for importing food into the district; he would be able to calculate the extent of the relief—if any—that would be necessary, and would have schemes of relief-works and plans for facilitating transport of food ready for the issue of orders at the moment when they became necessary. The horrors of real famine can only be mitigated; but if we were always fully prepared to battle with them in the way we have indicated, we have no doubt but that in most cases we should be able to avert utter starvation from the general mass.

It is to be wished, however, that the department may not for a long time to come have to concentrate its energies on the relief of actual famine, and that it may be enabled to work so efficiently on measures for famine prevention as steadily to lessen at once the chances of recurring famines and the difficulties of dealing with them. We have not left ourselves space to discuss in this article the means of preventing famine, and indeed the subject has been so much discussed during the past five years, that we can now do little but reiterate. But one thing which should be constantly urged, and never lost sight of, is that *the* way above all others to ensure us against famine, and to stimulate the people to improve their methods of agriculture, is to cover the country as rapidly as possible with a complete network of intercommunication. We do not gather clearly from the Government Resolution what the functions of the new department are to be in regard to the construction of roads and railways. It must, at any rate, be its duty to advise the construction of roads and light railways wherever those are urgently needed to connect producing districts, and districts especially liable to the failure of crops, with main lines of communication. Model farms are doubtless good, if prudently conducted; experiments for the improvement of seeds, of cattle, and of methods of cultivating are highly desirable; but if these are to be of real and widespread benefit to the people, the means of communication must be extensively increased and improved. No measure will go so far to stimulate the people of a district to improve their methods of agriculture and the quality of their stock and crops, as the running of a good road or a railway through the district. Roads and railways are the most effective educators. Apathy and indolence and blind conservatism disappear before them. Give cheap and easy means of communication and transport, and thus ready access to convenient markets, and the peasantry will soon begin to develop both energy and intelligence in increasing and improving the yield of their soil.

Of vast importance also, and of unequalled importance in some parts of the country, is the introduction of a sufficiently elastic system of collecting the land revenue. There is much to be said in favour of a fixed assessment, paid regularly in money at stated times; but, without some relaxation of the system, it is doubtful if ever the condition of the cultivato

in some parts of the country can be materially improved. Where the peasantry are steeped in poverty and indebtedness, it may be necessary to have recourse, as a remedial measure, to an assessment fluctuating with the value of their crops, and at the same time to collect the proportion of the value payable to Government or the landlord, at the time when the tenant can bring his crop into the market. This would tend to relieve him from the necessity of borrowing from the *bunnia* at heavy interest, but it may be impossible to deliver those already largely involved without adopting a system of Government advances. We should like to see the Agricultural Department empowered to advance money at reasonable interest to cultivators so as to deliver them from the hands of private money-lenders. Government can borrow money at 4 per cent., and if the department would make advances to cultivators at 5 per cent. simple interest, it would be sufficiently remunerated, and would in time emancipate the ryots of India. Roads, railways, an elastic system of collecting the land revenue, and agricultural banks—these, it seems to us, are the grand remedies for the evils that weigh down the agricultural masses of India.

COTTON IN OOMRAWUTTEE.

AN age ago when Britain was scarce known in the East its factories unestablished—when the Portuguese having converted their forts into bartering houses, their renowned heroic qualities into the traders' and the sensualists' keen lust of avarice, had almost run their race, when the Mahrattas, rising like young lions, were casting off the thraldom of the Mogul Emperors and becoming aggressive in their turn, driving before them lawless bands of Pindaries, Arabs, and Rohillas—the machinery of Mogul conquests and their bane. Forcing these to take refuge in the impregnable strongholds of the Satpuras, and other Central Indian ranges, wonderfully built by a god-like race of herdsmen. Whence it was the wont of these predatory bands to issue, increasing and becoming all-powerful in their triumphant progress of rapine and blood. Devastating cities and plains on all sides, and whole countries of unmatched fertility in the Central Provinces and Independent States, now in wilderness and jungle the paradise of sportsmen; attest to the zeal and completeness with which their work was carried out. The supreme element of terror and depopulation in these hordes, were murderous gangs of thugs and slave-dealers; the former satisfied their own requirements by plunder, and appeased the blood-thirst of their god by wholesale strangulation with the gaily coloured silk handkerchief—remorseless, ruthless, unsparing alike of sex, of age, or of youth—the latter regardless of the male, but very careful of the olive-tinted, round limbed, Brahimin damsel, the little beautiful Mussulman girl; carrying them far away into captivity for concubinage, to perpetuate the lordly Rajput race; careful also of the strong limbed Mahratta Kunbi girl for mineral purposes. These raids, very prevalent in the rich valley of the Berars (bounded on the north by the Satpuras) against which the ruling Mussulman power was at times unable to cope efficiently, and at others in league, caused the population to wall in and fortify each considerable town substantially, while the villages girded themselves in with citadels of earth and sun-dried bricks too strong and high for the scaling ladders and offensive implements of the period.

All through this turbulent time, and before the black soil of the Berars was, as it is now, famous for its cotton, and the Moguli town of Oomrawutty, owing to its strength and central position celebrated as its principal mart. Fortified and embattled loopholed walls of great thickness, 25 to 30ft. in height, rising to 40 and 50 about the gates; bastioned and ramped for cannon at points of vantage or weakness, encompassed without a break a city of from 40 to 50 thousand inhabitants, to whom seven gates of enormous strength gave exit and entrance; the folds of whose doors 30ft. in height and 16 in breadth, of solid teak iron-plated studded in iron spikes, a foot in length, supported and arched in by carved Saracenic stone-work of unequalled architecture—remain all but intact to this day, mementoes of the capabilities of the constructors. Over these in the palmy days, no perishing flag in lazy flaps now hid and now displayed the emblem of the conquerors; but high above the arch crest of each then impregnable entrance, supported on iron tridents, hung as in the heavens, in solid gold, silver-plated, the crescents of the true believers. In front of one of these gates called Bhosari, on a wide open plain, overlooked and commanded by the fortification, was brought—from every nook and corner of the Berars, in thousands of carts, in hundreds of thousands of net-work receptacles—its chief produce for sale. And here congregated merchants from all parts, who transported the staple in unwieldly guarded caravans of pack-bulls and camels, men's backs, and country carts, to weavers who clad the dwellers about Bombay, Poona, and Sattara, the country of Hyderabad and a great part of the Central Provinces. But *Si nous avous* change *tout cela*, with regard to the mode of barter, pressing and transit, although the use of the hand-loom is almost a told tale; yet the descendants of the same people are clad by those of the same weavers, from the same produce through the iron looms of Bombay and Hyderabad, Sholapur, and Nagpur. While Bengal and Manchester, Chinese and Australian, Italian and Japanese mill owners are apt bidders for Oomrawuttys. The soil in which this cotton revels consist of disintegrated unformed rock and clay of a dark brown, almost black colour, adhesive to so great a degree as to afford mortar for most of the houses built of stone and brick in the Berars. The varieties of cotton, processes of cultivation, with the implements in use of ginning and carriage remain in *statu quo*, unchanged as in the days of centuries back. The soil is annually superficially manipulated, and only once in every six or eight years is it deeply turned up, not by an ordinary plough, but with a thick pointed or chisel-shaped iron crowbar. When the rains have slightly saturated the soil, the husbandman looks up his team and his *bukkhur*. The former generally after the pattern of the devoured in *Pharaoh's* dream, and the latter, the instrument he uses in place of a plough. It is formed of a blade of rather stout hoop iron two to three inches wide, a foot and-a-half in length and sharp on one side, this is fixed into a block of wood, so as to leave a space between, with the edge downwards; and by means of a slight pole attached both to the block and the yoke, the bulls drag this over the ground at as leisurely a pace as possible. There is a plough handle at the back of the block for the *bukkhur* boy, used more to ease the bulls, and to unruffle the surface of the field as little as possible, than to press on and so perform the legitimate action prior to sowing. This primitive operation concluded, the soil is ready for the seed. Furrows are now created a foot and-a-half apart and say 2 inches deep, with an iron tipped wooden ploughlet; and the seed, carried in an open bag hanging from the operator's neck, is at the same time dropped by him to the ground through a pierced bamboo tube vertically attached to the contrivance. It only remains now to smoothe over the ground with a toothless harrow, and vegetate for a time in "masterly inactivity." Rain is not much required till after the plants have well germinated, and then good showers two days in the week are necessary till the pods are nearly matured and no rain at all after. The land is kept free of weeds altogether, and the outturn depends second to rain solely on this. The weeding is generally performed by running a miniature *bukkhur* between the rows drawn either by men or a single bull. About the roots of the plants the earth is hand-weeded by boys and women. It is a pretty sight to view a field of growing cotton in the rising sunlight; the even hedges of green a foot in height stretch far away to the horizon, the pearly rain drops glittering like diamonds, pendent to the rich sheen of emerald, and how livid the contrast to the dusky earth on which herds of deer search in vain for their accustomed sustenance. But it is a far more pleasant sight to view the same field two or three months after the hedges have not apparently very much increased in height, they are wider and have attianed a deeper hue, it may be that they are bent with the multitude of yellow convolvulus-like flowers, and the wealth of silver grey, the bursting "bols" disclose. The earth is freely dotted with the snowy fibre, and covered with the tender shoots the deer loves, and these are grazing close to the cotton picker's women and children, gaily clad, whose wild Mahratta choruses enliven their light toil, and only cause the deer to raise their heads and listen. But this harmony is too perfect for man not to disturb; he must create discord and slaughter, and to this end is that cart freighted with implements of death and destruction drawing near the band of pickers, and while a mock loading of cotton proceeds, hark a rifle's crack and

the lordliest stag of all lies kicking itself into frigidity! Two others fall, and the rest would easily be deceived were they not does.

Picking is commenced in the latter part of November and continued into January if the season is an early one; if late, to the end of February. All about this country the cotton is allowed to fall on the ground, thus attaching to itself grass, weeds, and leaves, consequently it does not command the enhanced rates of the produce of the Surat, Broach, and Dhollera districts where the cotton is picked off the plants. The cotton pickers do not use baskets, but a fold of their wide *sarees* forms quite a sufficient receptacle. From morning to noon is the work incessant, when a short respite is allowed for meals, then on till evening, when, after having carried the result of the day's labour to the house of the owner; each picker receives the startling remuneration of two annas in full of all demands. The ginning is accomplished with the most primitive appliance and in the simplest manner. Cotton owners do not supply ginning machines, the ginners have to bring those with them. Two old women save up together and purchase one at a cost of from Rs. 2-8 to Rs. 3. It consists of a flat piece of wood about 18 inches long and 6 wide, to the sides of which are nailed erect, two pieces of wood tapering upwards. A thin spindle of iron is bored through and through the top of the sides, underneath which, and almost touching it, is fixed horizontally a stick of wild plum wood about 2 inches in diameter and of the same length. There is a handle on one side attached to the iron spindle, and on the other to the plum wood, which being revolved in opposite directions causes an outward rotation. The women turns the handles with the right, and feed the machines with the left hand; their daily task is 21lbs. of fibre, and they are paid by the weight of seed, one pice for each seer. A portion of the seed is reserved for planting, and the remainder used as food for cattle. When a sufficient quantity of cotton is ginned, it is filled by manual pressure into ginning sacks, 5 feet in height and 2½ in diameter, called *dokras* or *ukkhas*, containing 70 seers or so. The village carts convey four to five of these to the market, and the town bundies ten. Cotton is grown in the Berars in the proportion of two fields of the staple to one of food grains and seeds, and this excess of cultivation in a year of ordinary rainfall of 25 to 30 inches does in no way affect the price of edible grains, which are cheap enough, ranging from 20 to 25 seers of common wheat, and 30 to 40 seers of *jawari* per rupee. From within a radius of 20 to 50 miles on the one side, and 30 to 60 on the other, all cotton grown, except what is retained by the local weavers, is brought to the Oomrawutty mart and finds a ready sale. Many firms in Bombay send up agents in the season, and innumerable natives purchase and press for distant local markets. In former times no regular impost was levied on cotton; but there existed from long custom a lien on it, rigidly exacted on the part of the Temple priests and mendicants. The beggars each day in the season lined the different approaches to the mart, and the priests had their raised dais in the centre. The loud cries of the former were rewarded with minute handsful of cotton from the passing carts; and no sooner were these ranged at site of sale, than offerings of fibre were conscientiously conveyed to the lordly *gurus*. The petty mendicants, of course, carried the proceeds of the charity to their own profit and loss account; but it was far otherwise with the dole to the temple. Eleemosynary corporations were constituted by the rules of which the whole sums of money thus accruing were distributed in alms. Each traveller who presented himself had to be supplied with a regulated subsistence allowance for the day. This primitive and unsophisticated method of levying black-mail passed, however, into a different phase on the establishment of the cotton yard, where all cotton disposed of, is subject to a small municipal tax. A moiety of the sum collected, ranging from Rs. 2,000 to Rs. 3,000, and termed the Dhurrum Fund, is annually divided among priests and mendicants who allot its distribution according to immemorial custom. The other half of the tax is expended by the Municipality on improvements to the cotton yard and its approaches. No first transactions in seed, cotton, or fibre are permitted till the same has been registered in the yard, and the duty paid. This yard is a spacious walled enclosure, out of which four gates lead to the principal factories. It was instituted years ago on the introduction of the Cotton Frauds Act to transactions in cotton in the Berars. In the yard, lengthy and handsome Mangalore tiled sheds have lately been erected for the shelter of buyers and their brokers. There are offices for taxing and registration, and places of business for both European and native merchants, and a large fire-proof godown has been erected for storing purposes. Cotton fibre in the gunny parcels called *ukkhas* of 140lbs. or thereabouts, pays one anna duty, and seed cotton pays two annas the cartload. The latter since the ginning factory of the Mofussil Company was found too strong in the working, taking in large portions of seed—is alone purchased by professional native ginners called *gujars*, each of whom employ from 40 to 60 gins daily. The arrangements connected with this work are faulty in the extreme. Except the wealthy ginners, who possess walled in yards to their houses where ginning is carried on, the Municipality let out open pieces of ground for this purpose outside the city for the season. The lessees encircle these with a bamboo matting, where both storage and ginning are carried on. The seed cotton is piled in huge heaps high above the matwork, quite open to any person having malicious designs, and fires are frequent. Brokers are licensed by the Municipality beyond whom and the owners, none are allowed under a penalty to transact this business. Those dealing in the fibre, pay Rs. 20, those in seed cotton, Rs. 12 for the season. Cotton arrives in the yard generally during the evening and night, and the carts are ranged in rows from end to end of the yard, with the high *ukkhas* of cotton loaded on them, forming long avenues on each side, down which the merchants and brokers promenade to test the samples with the bulk on the carts. In the morning, as the press agents and merchants arrive, they are met by their brokers with samples; and the price is determined in a most unique manner. For instance, the broker says "Jurrie Ellichpur ka Souda," and clasping the merchant's right hand with his—he covers it with a fancy handkerchief or a piece of his waist cloth, when by some mysterious intercommunication of palms and finger, the secret is out and the cat killed. There is generally very little bargaining, as Reuter has already intimated to all concerned, the day's rate at Bombay and other places; and by about 10 o'clock each morning a pretty general clearance has been effected, though throughout a good season from 400 to 500 cartloads are daily attended to.

The cotton is now taken to the compound of the press for weighment. The office of weigher is hereditary and monopolised by one family, the head of which pays a rather heavy municipal tax. He supplies the different factories and merchants with weighmen and receives all sums paid to this account. In the weighment there is always a large margin left in favour of the buyers to the no small chagrin of the kunbis. The *ukkhas* are then stacked prior to manipulation near the press in flimsy open enclosures of bamboo matwork on pebble packed floors. Considering that at the commencement of the season when the full tide of cotton has not yet set in, and at the latter part when it is on the wane, these lie for days exposed to the weather and other contingencies, it cannot be regarded as a perfect arrangement and stone store houses should be erected. By lifts the bundles are then carried to the upper floor of the press building and opened out in front of the agent or assistant. Each bundle is then beaten with long cane rods to loosen its sides and open it out, and then thrown into a wooden receptacle called the "cradle," which when full, holds the necessary amount that presses into a bale. It is afterwards filled into a long cylindrical shaft with the necessary gunny packing laid out underneath, and after being stamped on by men, receives from above the pressure of a heavy iron column acted on by hydraulic power. This is all that is required to compress it into the desired proportions and is done in a minute. A prong-sided socket now lifts the package and fits it into another open iron press, having apertures above and below, so that the hoop iron may be passed round and round the bale. It is then rolled out, the sides sown on with gunny, weight marked and ready for transit to any part of the world. Of course the different qualities of cotton are dealt with separately. The standard nett weight of a bale is 392lbs; and this quantity presses into a package, and it is a great object to have all the parcels approaching this weight as near as practicable.

In a good season the presses of Oomrawutty turn out from 40,000,000lbs. to 50,000,000lbs. of cotton in 120,000

to 140,000 bales; and the ordinary day's work for one of Hodgart's double hydraulic presses, is 400 bales or 150,000lbs. to 160,000lbs. The charge for pressing a bale and supplying the necessary packing is from Rs. 3-4 to Rs. 3-12. Wood is used as fuel, babul or tamarind, and is purchased at the rate of Rs. 6 per ton for green and Rs. 12 for dry. The colliery at Worora is unable to supply the coal required by the presses. A railway constructed by the State connects Oomrawutty with the G. I. P. line at Budzara where there is a spinning and weaving mill erected under the auspices of Messrs. Gaddum & Co., now fast falling into decay. Why this should be so when it stands in the centre of a cotton yielding district, is difficult even to conjecture; surely it would be cheaper to work the raw material at its place of growth, than to send the same to Bombay or Nagpur, weave it and bring it back again. But the ways of cotton are mysterious, and we have Manchester as a precedent. There are in the Berars four other marts where presses are established, Khamgaon, Akola, Moortizapur, and Akote; but the cotton turned out is all sold as Oomrawuttys.

WILD SILK IN THE PUNJAB.

We would wish to draw the attention of European capitalists and commercial firms in the silk trade, to the great value of the wild silkworms (and of the silk produced from such cocoons) to be found in the valley of the Sutledge River, and also in the various valleys whose drainage passes into that river. The grand valley which divides the military sanitarium of Kussowlee from the military station of Subathoo, terminates in the valley of the Sutledge. The hot and lower parts of this valley are well supplied with "Bair," (*Zisyphus Jujuba*) and *Jher-baeree*, (*Zispyhus Lotus*) jungle, and the grand tusser silkworm is freely met with. The mulberry is common all over the higher parts of the hill sides from below Subathoo and north-west of Hurreepore dâk bungalow. On these mulberries the genuine wild silkworms of the Himalayas (*Bombyx Huttoni*) is always to be found. In October 1862 I sent some of these cocoons to Calcutta, and the silk was most favourably reported on, being declared by competent authority to be "fully as good in quality as the best Bengal." The colour of the silk was white.

These wild silkworms will not feed if removed from the trees, and the only way of turning them to account would be to have a dwarfed mulberry plantation made, the trees or mulberry bushes being closely planted, so as to make a running hedge and kept down by cutting to the height of seven or eight feet. The hedge to be protected by common twine netting properly tanned to withstand the rain. A dozen or more of these hedge plantations being formed, the Paharees should be paid so much per hundred for half-grown wild silkworms brought by them to the farm and these should at once be placed on the mulberry hedges and removed as soon as they arrive at the spinning stage. To secure a good supply of eggs, selected cocoons should be tied on to twigs, so that the moths in due course would lay their eggs where it suited their convenience. The eggs laid in October would be hatched in April-May next spring, and the eggs laid in July-August, would produce the second set of cocoons and moths whose eggs would hatch in the following spring. Thus it will be seen that this wild silkworm produces two silk harvests within the year, the first being the spring, and the second the autumn crop of cocoons. The whole of the operations would be outdoor work, and the principal outlay after the mulberry hedge plantations were formed, would be the cost of the nets, *mesh* one inch, and as the Paharees understand knitting, the art of netting would soon be acquired, and with Bengal twine to hand, the nets could be made at a very moderate cost. The removal of the worms in doors when arrived at the spinning stage, is an easy matter, and they might be allowed to spin on the hedge and the cocoon be removed in due course.

The locality we would recommend is the land near "Kukree Huttee," on the old road to Simla. The buildings of the hotel there are sufficiently extensive, and the property could be purchased for a moderate sum. The next locality would be in the neighbourhood of the Hurreepore dâk bungalow, but as the land belongs to the Puttiala Rajah, objections might be raised by the Durbar. However from below Subathoo to "Kukree Huttee," hotel there is ample room for half-a-dozen large silk farms, and these once established, the paharree zemindars would soon form mulberry plantations and sell the cocoons at the factory.

The formation of "Bair" and bush "Bair" (*Jher-baeree*) plantations in the same locality is easy of accomplishment, in fact if land be available, transplantations of bushes from the jungle could be carried on at any time as water is freely and always available. To stock such plantations with tusser cocoons, would not require much trouble or outlay, and after the first supply of eggs had been laid, the extensions of tusser silk raising would depend on the increase of bush "Bair" culture.

The paharees would take to this pursuit as soon as the value of the "Bair" was known, and raising tusser worms thereon, understood. The collection of tusser cocoons in the jungles growing "Bair" would become a regular occupation and wild silk gathered in the jungles on both sides of the Sutledge would soon be brought to Subathoo and "Kukree Huttee." To show how freely the bush "Bair" grows in these hills we would wish to mention that from Kaepu on the right bank of the Sutledge, and within the boundaries of Kotguih to twelve miles higher up the river's course, the bush "Bair" is the principle plant of the jungle. Now if a tusser farm was established at Kaepu, and steps taken to introduce a good supply of unhatched tusser cocoons, the cultivation of the bush "Bair" being carried on, the locality would in two years swarm with tusser silk worms and tusser cocoons in abundance.

The power to sow bush "Bair" seeds in the jungle would we presume be granted by the Punjab Government, and once in fruit, the foxes and jackals who feed thereon would extend the growth in the usual manner, for the voided seeds speedily germinate, the plants bear fruit, and further extension follows. From Kaepu down stream to the bridge over the Sutledge the bush "Bair" is common, and no doubt the opposite bank of the Sutledge is as well supplied. Hence it only requires a little management and some capital to convert miles and miles of unprofitable hill side into vast breeding grounds for the tussor silkworm. The opposite or Kulu bank of the Sutledge is British territory, but how many miles down the river it extends before meeting foreign territory we do not know.

We are convinced that if the subject of tusser silkworm breeding, and the planting of *Jher-baeree* and "Bair," seed-stone were lucidly explained to the various hill chiefs owning territory from Roopur up to Rampore in Busahir that one and all would take the matter in hand in order to increase their annual income by this most simple, inexpensive, and highly profitable measure. It should further be explained that the lac insect, *Coccus lacca* breeds freely on all kinds of "Bair," trees and bushes, and that once introduced from the plains, propagation and extension will go on year by year till the valley of the Sutledge becomes a regular mart for the sale of seed lac, and its easiest made product "shell lac."

These hill chiefs are perfectly alive to their own interest but at present they know very little about the tusser silkworm and less about the lac insect, and we fear that this ignorance will continue until Subathoo has its silk farm, and a Government nursery is established at Kaepu for raising the common "Bair" tree of the plains preparatory to placing tusser cocoons thereon, and in due time removing young but well grown silkworms from these trees to the bush "Bair" jungle extension on both banks of the Sutledge river.

From this nursery various hill chiefs down to Belaspore could be supplied with "Bair" tree seedlings, and subsequently with tussor cocoons, a trained native being sent to show how to place them on the trees and transfer the young worms to the wild bush "Bair" In four or five years from date of commencing work, the Kaepu property would have become valuable, and then European capitalists would we think be forthcoming to purchase the same, and so recoup Government for its outlay, and relieve it of its duties as pioneer of tusser sik farming operations.

CULTIVATION ON VILLAGE-SITES.

One of the most unsatisfactory features about the annual settlement of the revenue in Madras, is the cultivation of waste land situated within the village-site (Nattam.)

The Board and Government insist on all such cultivation in excess of the extent allowed by the rules for house-site, &c., back-yard being absolutely prohibited on the ground, that it may be wanted for building purposes, and the result is that villages are free of unsightly waste grounds covered with prickly-pear and filth of all sorts. This looks very like killing the present generation for the sake of prosterity, and we cannot help thinking the policy is entirely wrong on every ground, financial, sanitary, and agricultural. It is wrong financially because some of this cultivation having been surveyed, it depends almost entirely on the Curnam, how much of it is brought to account, and who is made to pay for it. Moreover the uncertainty as to the assistant is a direct incentive to evasion by collusion between the Curnam and the cultivator. That it is bad from the sanitary point of view, it requires no argument to prove, the backyards of houses in villages are often filthy enough, but the very filthiest *foci* of disease are to be found in the waste uncultivated patches covered with prickly-pear and abounding in snakes and offal. Such pieces of ground if regularly cultivated, would produce considerable supplies of these vegetables which are so much required in this country, and the filth that formerly produced nothing but disease would, in the form of manure, become the chief means of producing them.

Then from the standpoint of the scientific agriculturist, what can be more discouraging than to find an agricultural population living away from their land? Think of the waste of manure and the waste of time that are involved in the present system, why endeavour to extend it? Why not rather *compel* the people to live on their land? The practice of living in villages was only an advantage when they were walled and offered some protection, however slight, against the attacks of marauders or even invading armies. Now walls are no longer required, and in the interests of sanitation and agriculture the practice of trading together simply because it is the custom, and no longer because it is necessary, should be discouraged in every possible way. Land within the village-site should therefore be freely given for cultivation, and given on puttah, so that if people will insist on living in a crowded unwholesome village to the great detriment of their neighbours as well as themselves, they should be obliged to pay for the land. Why should land so invaluable for the production of vegetables be kept out of cultivation for the sake of a posterity which it may be hoped will have more sense than to live on it?

It is argued indeed that if such land is allowed to be cultivated, the remainder of the village-site will be more crowded than ever, but that is almost impossible. A native family never breaks up and occupies fresh ground, until the house has been split up into infinitesimal portions, and its inmates crowded to the verge of suffocation.

EDITORIAL NOTES.

IN our issue for May, we had an article on Sugar-cane, in which from the carelessness of our printers the word Beheea was used throughout for Belna. We made a short correction in a later issue. Considering, however, the harm that such a mistake was calculated to do the patentees of the Beheea mill, Messrs. Thomson and Mylne, we have pleasure in inserting the following letter from those gentlemen. "The short mention made in your issue of June 1st, regarding the misprint in the article on 'Sugar-cane,' which appeared in your May number, should, we think, be supplemented in justice to our cane mill and in order to counteract as far as possible the misleading effect of the printer's error: we would be obliged therefore by your finding room in your next issue for the following in the form you may consider best:—

"The Belna, not the Beheea mill, is worked by eight bullocks, and requires sixteen for a working day of eight hours; the Beheea mill is usually, and ought always to be, *worked by a single bullock*, but in some districts of the N.-W. P. where the cultivators have as yet no bullocks trained to work singly they at present, for that reason, insist on yoking a pair instead of a single bullock; this, however, is an utter waste of power and money, and worse, as it brings a considerable amount of useless strain on the machine: this, Mr. Campbell, Superintendent of the Government Engineering Works at Roorkee and other experienced officers of Government can testify. The mill is by many cultivators worked day and night so as to get a large area of cane squeezed by the one mill within a limited time, and where this is done, of course a relay of cattle is needed, as the one bullock cannot go on working day and night without rest or food. In this case the two or more cultivators who have agreed to use the one mill, club together and all their cattle work in turn for two hours or so. If properly set and managed, the mill is quite easily and efficiently worked by a small bullock such as the Behar farmers use in their ploughs. In Shahabad, Gya, and other districts of Behar there are thousands of cultivators with small holdings who do all their ploughing well-irrigation and the squeezing of their Sugar-cane with the one pair of well trained, well fed bullocks. The Beheea mill in place of being a "rude heavy machine" weighs only five Calcutta maunds (4½ cwt) and is the lightest as well as most efficient machine ever constructed for such work as it is equal to. Its lightness and compactness are two of its great recommendations, and these good qualities combined with its efficiency, portability, and cheapness for the work it can do are so manifest to the cultivators of Bengal and the N.-W. P., that no less than 15,000 of them have been taken by them since 1874, when after many trials and by patient persevering endeavour, continued through several years, what was begun to aid our own tenants on the Jugdespore estate was brought into such efficient form that cultivators from villages around and at a distance began to come in yearly increasing numbers, wanting us to supply them with mills. The number supplied last year was very nearly 4,000, while through we have no guarantee and have to venture a large amount of capital, we are preparing for a demand considerably in excess of this during the coming season. The cane has to be passed through these native mills several times before the whole of the juice is expressed, but by the Beheea mill, if properly used, this is effected by once passing through, so saving a large amount of time and expense, and securing a better cleaner juice. Thousands of mills can be seen at work doing this in the Shahabad, Gya, and other districts any day during the sugar-cane harvest."

DR. BIDIE furnishes to the Madras Government, a memorandum on the various grains indigenous to the Southern Presidency. These number forty-three. In each case he gives local names in several languages, and this cannot fail to be exceedingly useful for purposes of identification. He also forwards samples accompanied by descriptive remarks. The Government have directed the entire collection to be forwarded to the Secretary of State; with a view to have them valued and reported on generally.

MR. W. R. Robson, M.R.A.C., has been experimenting with Madagascar paddy. The result was an average outturn of 1,164lbs. grain, and 2,616lbs. straw per acre, which are not particularly good. If he is right in supposing the Madagascar grain to be same as has now developed into the Carolina rice, we fear it is not adapted to India. The Carolina rice has a tap-root more or less developed, and hence seeks its sustenance lower down in the soil than does the ordinary country grain. Our mode of cultivation—which consists in scratching the extreme surface—offers no help to this new variety. It is wise, however, to continue the experiments in this direction, and with this end in view Mr. Robertson notifies that he has 1,979lbs. available for seed, and he says in this connection "I shall be glad to receive indents for small supplies to be experimentally sown on land watered by the south-west monsoon."

THE preservation of insectivorous birds has been pressed on the attention of the Madras Government by Dr. Bidie. His counsel is that birds that feed on insects should be protected by law from being destroyed for the sake of their feathers, as they afford an effectual help against the visitations of borers, locusts, and a host of insatiable grubs. The doctor, in alluding to some of the Australian colonies, says:—"In Victoria, there is issued to all

State schools a diagram exhibiting 36 colored figures of birds which eat insects, and are therefore protected by law as friends of the farmer and colonists generally." He refers to the injuries inflicted on crops by insects in Southern India, and remarks that "there is iminent risk of such pests increasing largely, if measures be not adopted to protect their natural enemies the insectivorous birds." The Madras Government has recommended to the Supreme Government the passing of a general Act to regulate netting and other means of capture or destruction of birds. The best methods of impressing on children in schools the value of birds to agriculture are without delay to be considered. In Bangalore and throughout Mysore a like measure of prevention is needful. Numerous stuffed birds hawked about by natives are to be had for a mere trifle, owing to the absence of anything like a check against the wholesale destruction of the feathered-tribes.

THE Irrigation Report of the North-West Provinces for the *rabi* season of 1880-81 shows that the total area irrigated was 1,032,010 acres, or over 188,000 acres more than the irrigated area of the previous *rabi*, but less by 43,942 acres than the area of 1878-79 which was the largest on record. The increase since last year was due to the deficiency of the monsoon rainfall.

"LAST year during July and August I was conducting a series "of experiment on aloe fibre and used your mill to crush the "stalks. Nothing could have been more satisfactory than the "manner in which the machine did its work. The machine I "calculated would enable me to put the dressed fibre into the "Calcutta market at a cost of about Rs. 6-8 per maund, leaving a "clear profit of Rs. 1 per maund."

IN an article on "The future Wheat Supply," the *New York Tribune* takes exception to the estimates of Messrs. Read and Pell in respect of the cost of producing wheat in America and sending it here. The *Tribune* says it is not improbable that this year may bring the competition between American and European farmers to a crisis. The United States will likely have more than 200,000,000 bushels of wheat to sell, while the deficiency in Europe may be much less than that quantity. In that event the weakest will go to the wall. The cost of producing wheat in America, the *Tribune* declares, is less than that stated by the Assistant Commissioners. The British farmer, it says, will have to sell wheat at 38*s*. per qr. in order to keep the home market to himself.

THE agricultural statistics for Australia for the year ending March 31, 1881, were published in the *Government Gazette* about a week ago. According to them it appears that there was a serious decrease in the average yield per acre of our principal agricultural products. On wheat, however, which is now the chief grain crop of the colony, there was an increase in the total amount, as compared with the previous year, of 320,191 bushels, owing so much larger amount of land having been sown with wheat than was sown in the year ending March 31, 1880. In 1871, 284,167 acres were placed under wheat cultivation, and 1881, 976,416 acres. The acreage under oats decreased from 149,309 acres in 1871 to 133,910 acres in 1881, while the area under potatoes increased from 39,026 acres to 44,733 acres, and under hay from 163,181 acres to 249,424 acres within the same 10 years. The average returns per acre of our four principal crops in the year ending March 31, 1881, were as follows:—Wheat, 9 9 bushels; oats, 17·6 bushels; potatoes, 2·7 tons; hay, 1·2 tons. The corresponding averages per acre of the same crops in the year ended March 31, 1880, was:—Wheat, 13·3 bushels; oats, 24 bushels; potatoes, 4 tons; hay, 1·5 tons. In 1871 the colony produced 2,870,409 bushels of wheat, 2,237,010 bushels of oats, 127,579 tons of potatoes, 183,708 tons of hay; and in 1881, 9,719,049 bushels of wheat, 2,358,459 bushels of oats, 124,706 tons of potatoes, and 300,184 tons of hay.

IN a recent letter the Acting Commissioner of the Nilgiris requested the sanction of Government to sell the jalap tubers grown at Ootacamund at a moderate price, to be determined in communication with the Superintendent of the Gardens. "There is a large demand for the plant, and up to the end of March last, 4,201 tubers were supplied to applicants from various parts. In one case, Mr. Jameison inadverently charged for 1,000 tubers at Rs. 5 per 100, and received the amount Rs. 50. It is impossible to meet the large demand out of the very limited cultivation of jalap now carried on in the gardens, while to extend it for gratuitous supply would partly absorb the small revenue derived from other sources." The Government have approved of the sale of the tubers at a very moderate price.

THE following interesting sketch of the Persian opium industry is by a correspondent of the *Pioneer* who dates from Yazd. "Any information about India is gladly received by them, as relating to a great trading country, and the grand rival of Yazd in its staple product—opium. Rival, indeed, is hardly the right word, for the opium export of India is more than ten times that of Persia; still the advances made in opium cultivation and manufacture in Persia within the last few years are well worthy of notice, and under a more active Government might bode interference with a main source of Indian revenue. Within ten years, the weight of exported opium has doubled. It was 4,000 chests in 1871-72; it will, reach 8,000 this year. Each chest contains 10½ shaki mans, each man being 512 tolas, or 6⅖ seers, thus the chest weighs 67⅕ seers and the total export this year amounts to some 13,440 Indian maunds. It goes direct to Hong-Kong, where the principal Yazd merchants have representatives. Why Yazd should be the great opium emporium of Persia, appears to be explained by two reasons? In the first place it is in the centre of the opium-growing country. Wherever one halts, between Karman and Yazd, the wide fields of poppy challenge attention, and it is the same towards Ispahan and around Ispahan itself, where even more poppy is grown than about Yazd."

AMONG local products which are worthy of attention is the wild lavender. It grows luxuriantly all over the hills, and flourishes at Ootacamund. The dried flower stem, we believe, commands an excellent price in the home market, and is quoted at £60 per ton. This is almost as good as coffee at present. The plant thrives without attention, and the stem requires no preparations. We are unable to tell the yield per acre, but this must be considerable, as the flower stems rise in great profusion, and the cultivation may be indefinitely extended. The records of the Government gardens ought to contain information regarding the late Mr. McIvor's cultivation of the plant, which if given to the public might be useful just now.

THE keeping of bees has never been common in this country, and it is a little strange that this should be so. The expense attendant on this industry is practically *nil*, and the profits considerable. A market can usually be had for good honey, and even if this were not the case, the produce cannot fail to be a grateful addition to the villagers' food supplies.

THE following sentence is from the Indian Famine Commission Report, and points to the want of enterprise in India. "The obstacles that stand in the way of the investment of English capital in India, such as the climate, the distance and the want of exact knowledge of the country, are still very great, and it may be feared that the disinclination to risk such investments has been rather increased than diminished by the system of giving a guarantee of interest at a high rate on the large capital of the great railways. So long as the opportunity was afforded to capitalists to make advantageous investments on a large scale on the security of the State, the inducement to attempt any enterprize without such security must have been greatly diminished."

THERE is no doubt a considerable amount of truth in this, and the idea of guaranteeing various classes of industries is of course out of the question, we would, however, make an exception in favour of railways, and principally for the reason that they are practically public works, conferring many advantages on the public service. We also think that Government might help forward many struggling industries, not by way of guarantee, but by offering premiums and prizes for improved methods of manufactures, &c., a little help in this direction would do much to foster new, and help on old industries.

A CORRESPONDENT of the *Bendigo Independent* thus testifies to the curative properties of gum leaves:—"I will relate something

respecting the curative properties of the gum leaves. I am acquainted with three persons who have been thoroughly cured of rheumatism by sleeping on beds made entirely of those leaves. Those used were of a round shape, and of a sticky nature growing on young plants, and the nearest to the ground. It is also well known that a dozen of these leaves made into a decoction of tea are good for a cold or for inflamed eyes. Further if a few of the leaves are rubbed smartly betw een the palms of the hands and immediately held to the nostrils, taking a lengthy hard sniff, a most refreshing sensation will bo the result."

Our up-country contemporaries speak of a very rich fruit harvest as being ripening in Kumaon this year.

The Japan Government have also instituted an Agricultural Department, and a following list of subjects to which the attention of the department is directed, would do for the consideration of our own new department. "The matters submitted for consideration by the assembly of local officials charged with development of agriculture in their respective provinces are reported to be: (1) Revision of the methods enployed in preparing agricultural statistics. (2) Exchange of seeds (between the different prefectures) and their transport. (3) Supply of manure. (4) Establishment of a Society for investigating fishery affairs; and the protection of marine production (*e.g.*, fish, sea weeds, &c). (5) Subject of rewards granted for meritorious services calcutated to promote agriculture."

The experiments now being carried on at the Saidapet Farm, Madras, with cattle breeding with stock imported from Aden, seem to be succeeding. The satisfactory results that have attended the importation of Aden cattle into Madras, have induced the Board of Revenue to sanction a further outlay of Rs. 1,200 for the purchase of fresh stock for the Saidapet Farm. The bulls that are now to be ordered "should," the Superintendent of Government Farms says, "not be over five years of age, should be docile, and of a good shape; the cows should be young and by preference, rearing their *first* calves; and that they should undoubtedly be good milkers and docile; the whole of the stock to be in perfect health."

The revenue from opium is very much above the estimate and this is all the more remarkable, when we reflect on the fact that Persian opium is coming to the front with rapid study. The latest reports we have from China quote the following prices, in dollars per chest:—

Malwa from ...	... 680	to	740
Patna " ...	... 577½	to	595
Persia " ...	... 535	to	577½

It is therefore fast overtaking Patna opium in Chinese estimation, and a very few years ago it was quoted at less than half the price of the Indian drug.

The largest purchase of land ever made by a single person was effected last month. Mr. Hamilton Dosson, a manufacturer of Philadelphia, concluded a contract by which he secured 4,000,000 acres from the State of Florida. The land formed part of the public domains of the State of Florida, and was under the control of the Board of Internal Improvement for the State. Mr. Desson's intention is to work out a great emigration scheme with offices in England, Germany, and France. If some of our wealthy native magnates would invest their capital in purchasing or renting large stretches of land, and would encourage cultivators to work under them, much good might be done to India. They would require to make certain advances to ensure good crops, and could make those advances under an arrangement to receive a certain percentage of the crops in return. By this means many young men might be more usefully employed than in hanging about the residences of their relatives doing nothing but indulging in laziness—and worse, and would, besides making fortunes for themselves, be the instruments of conferring lasting blessings on their poorer countrymen.

A Bombay contemporary is inclined to indulge in pœans of joy over the prospect of a large portion of our native business being transferred to the western capital. He says "In the memorial of the Calcutta shroffs, mahajans, and dealers to the Agent of the East India Railway, it is stated as a matter of painful regret to the memorialists, that several firms of good repute have lately, in consequence of the opening of the Rajputana line, established agencies in, and sent representatives to Bombay. The matter is not felt to be one of painful regret here, and if the memorialists should be obliged, as they hint, to give up their business in Calcutta, and proceed to Bombay they will be cordially welcomed." This is quite legitimate, and it will be the fault of our railway authorities if such a change takes place.

Reuter announced recently that tropical weather is being experienced in England. "When the last mail left the subject of the weather was attracting more than ordinary attention, which is saying a good deal. The hay crop was a failure in consequence of the dry and ungenial weather which distinguished the once merrie month of May, but the grain and root crops taking them altogether, promised well. Wheat, though thin and rather backwards (says one authority), looks strong and healthy, and has advanced rapidly since the rains of a fortnight ago. In Devonshire it is said not only to be of a very fine colour, but to be thick on the ground, and fast bursting into ear. From some of the chief corn-growing districts however, the report is not quite so good as this. In Lincolnshire we hear of a good many light crops, and in the eastern counties the crops are not reported to be heavy, though they look remarkably well. In Sussex wheat is not "promising," though a fair crop may be expected. Oats and barley and beans are favourably spoken of, but on some soils the former will be rather scanty, as much of the seed sown never appeared above the ground, in consequence of the parching weather. Of root crops the accounts vary greatly. In many districts they have been attacked by the fly, and the rain has come too late to save them; but there is plenty of time still to sow the fields over again, and to have a good plant on the ground by the beginning of September. Potatoes, though late, are reported to be vigorous and healthy both in England and Scotland. And from both North and South alike we hear of "abundance of summer food," that is to say, on the grass lands there will probably be a rich aftermath, while hedgerows, ditches, &c., show abundant signs that the season has been in some respects one of luxuriant vegetation. In Lancashire the enormous numbers of buttercups and the abundance of May-blossom are noticed by agricultural correspondents. If from grass and corn we turn to fruit prospects, we find that here too, the reports are of a mixed character. From the cyder counties excellent accounts are given in the home papers of the apple crop and gooseberries, currants, and strawberries are all said to promise very fairly." What strikes one, in reading this, is the prominence given to crops intended solely for cattle-food, as hay and root crops. In India such a thing is unknown. Cattle are fed on what may be called the "waste products" of agriculture, and no ryot ever thinks it necessary or even advisable to grow anything wherewith to feed his cattle.

Several native princes have nominated students to attend the Sydapet School of Agriculture. These students are supported while attending school. Such a system is calculated to make the school popular, and if a proper selection be made, cannot fail to repay those States in results. There are at present thirteen of such students supportted by nine States, and the Superintendent having intimated that he has accommodation for as many more, it is to be hoped that others will follow the good example.

An interesting article on the paper manufacturing industry from the *Madras Standard* will be found among our selections. We insert it because it opens up the subject of growing plants for paper-making. There are really hundreds of different plants in India admirablyadapted for paper-making, and the largest number of these can be cultivated at a nominal cost. This subject is coming to the front, and the doubt recently expressed by Lord Hartington, as to India's ability to furnish paper ought to lend additional force to the movement.

THE latest official report from the Central Provinces tell of steadily improving prospects. Public health, which has suffered much recently from cholera and small-pox; of the latter complaint the report is silent, the epidemic having disappeared, and cholera, in a mitigated form, is reported only from the districts of Raepore, Damoh, Nursingpore, Seonee, Jubbulpore, and Saugor. Rain is falling in fair quantities, and the agricultural prospects are good. Trade continues brisk and the material condition of the people is satisfactory. The *kharif* sowings are over in many districts, and are proceeding fast in others. Food-grains are now quoted as follows, in seers per rupee.

	Rice.	*Wheat.*	*Jowar.*
Sumbulpore	45½	...	...
Raepore	35	41	...
Chanda	15	23	33
Mundla	21	31	35
Khandwa	...	20	40
Hoshungabad	9	18	36

MR. ST. GEORGE TUCKER'S note on cattle disease is the most important contribution to the subject which has been made for some time. We can remember in one of the earliest visitations of Asiatic cholera, it was discovered that the district of Hungary in which extensive salt mines are situated, was entirely passed over by the plague. This gave rise to inquiries which we remember led to the opinion being generally held that a free use of salt was a preventive, and from our own experience we can recall a circumstance which adds weight to Mr. Tucker's suggestion. We remember a gentleman who had charge of a large estate in Upper India, telling us that during all the years in which he had charge of the property, on which there were several hundred head of cattle, he never had any disease among them, although all around cattle disease might periodically have been raging. He attributed his freedom from these complaints to his habit of allowing the cattle a certain quantity of salt daily. The total cost of this was scarcely appreciable, and the result was satisfactory. We observe one or two of our contemporaries inveighing against the salt tax, as the cause of this inability on the part of the people of India to supply this necessary article to their cattle. This is absolute nonsense. We should like to see the rate of the duty considerably reduced, but even at its present rate it is very far from being oppressive. The total gross revenue from the salt duty, as recorded in the last budget was £7,266,413, which sum, divided among the two hundred millions of India, is equal to 8·72*d.* per head per annum, and when it is considered that this is practically all the taxation borne by the great mass of the people, the cry against the salt-tax is meaningless. The reason why the farmers do not, as a rule, give their cattle salt, is because they are utterly callous as to the comforts of their cattle. A visit to an ordinary *bustee*, will convince any reasonable man that the Indian ryot does not possess a spark of feeling for his cattle. He does not care how they are housed, so long as they are sufficiently covered in, to prevent them catching cold, and being unable to work. Did any one ever see a villager scattering grain to fowls in this country. No, all animals are allowed to live, they are not helped to live, and if they somehow contrive to exist at all, it is not because of any care bestowed on them by their owners. We hear of animals in good condition obtaining prizes at home. This is a sort of thing which the ordinary ryot utterly fails to appreciate.

THE quantity of wheat exported from Bombay is assuming vast proportions, and during 1880 no less than 195,000 tons were despatched from that port alone. This matter is being pretty fully discussed at present, and this it is which doubtless has led to the reduction in carrying charges on the East India Railway to which we have already referred to. These reductions, however, do not refer to stations above Patna, and if this line is desirous of intercepting a large share of this traffic, the rates from stations in Upper India must also be overhauled. That this traffic is worth striving after, will be clearly seen when we are told that this quantity is equal to about 800 trains carrying 250 tons each or about 30 trains a week. Grain carried as wheat is, gives less trouble than general goods; as a rule it comes in whole wagon loads, and gives comparatively little trouble. Another great advantage is that, as a rule, it is all "through" traffic; trucks are picked up at several stations, and once the requisite number of wagons are secured to form a train, there need be no further stoppage till Howrah is reached, other than may be demanded by the traffic rules of the road, and for the necessary changes of engines and guards. There can be no doubt that if the East Indian line were doubled all the way to Delhi, a very large share of this traffic would find its way to Calcutta, in spite of the shorter route now existing by the Rajputana, and Bombay, Baroda, and Central India lines. The break of gauge on that route necessitating a double breaking of bulk makes that route unpopular, as, in spite of the utmost care, bags of grain sustain much damage by this transhipping,—if the phrase be admissible as applied, to trains.

UPON the whole we do not think that Calcutta has much to fear on account of the opposition lines to Bombay, at least so far as Upper India is concerned, but the line at present in course of construction, eastwards into the Central Provinces from Nagpore, will perhaps prove a great help to Bombay. At present it does not pay to send the cheap Central Provinces' grain to any seaport; the want of roads being an insurmountable difficulty. As an illustration of this, it is affirmed that it takes more to carry wheat from the Central Provinces to Bombay than it does to convey it from Chicago to Liverpool. This of course handicaps India, at least that portion of it, and the same remark may almost be made regarding the other districts in which wheat is available for export. This subject derives extra importance from the latest news from America telling us of the failure of the American wheat crop. As matters connected with inland transport are at present managed by us, India can never be said to compete with America in supplying the English market. Barring this difficulty, there is no reason why India should not be an active competitor for a share of this traffic, instead of standing comparatively idle in the contest, sending home a large supply only when certain special conditions of the market transpire. She ought to be in a position to send all our surplus stock, with a reasonable hope of profit any more, she ought to grow wheat for the express purpose of supplying the English market. The quantity of wheat sent to Europe last year for Bombay was 195,000 tons, equal, commercial men tell us, to three hundred thousand steamer tons. In other words, sufficient to load 150 steamers of 2,000 tons each.

THE Liverpool *Journal of Commerce* says that "at the Liverpool Corn Exchange a sample of wheat transmitted by the Hudson's Bay Company to Mr. Drake, Canadian Government agent in Liverpool, was carefully examined by several of the leading importers and millers present. These gentlemen pronounced it to be the finest sample of wheat in the market, and as a consequence offers of 3*d.* per bushel were made more than for the finest samples of Californian."

THE recent returns published by the Registrar-General respecting our recent harvest are of unusual interest. They relate only to the production of wheat, but even with this limitation they tell a surprising tale. Wheat is now of importance to this country almost equal to gold or wool. If our wool is worth three millions and-a-half, and our gold is worth three millions, our wheat crop of this year would be worth, if delivered at an English port, upwards of two millions and-a-half. Within the last six years the acreage under wheat has been nearly trebled. It is, therefore impossible to deny to this industry a front place in our occupations. Consequently every change in its productiveness becomes a matter of national concern. It is thus a subject of deep regret that the results of the harvest have been by no means such as we could desire. The yield per acre has been less than that obtained in any year for last ten years, with the exception of the unfortunate harvest of 1879. Although the area under wheat has, as compared with last year, increased by nearly 221,000 acres, this increased area gives an absolute decrease of about 265,000 bushels. The average of last year was 13·29 bushels to the acre. The average of the present year is only 9·84 bushels.

ON the subject of producing fruit in Upper India, a correspondent from Simla writes to a contemporary, tells what is being done at Simla. He says:—"We have not had any rain

for two or three days, and the weather is perfect. I went down to the Annandale gardens on Thursday, and was astonished at the fine show of flowers, vegetables, and fruit ; the latter is not ripe, but promises to give a fine crop, the apples particularly being in splendid condition. When I say that the apples, which are almost all of a good English sort, are sold towards the end of the season by auction at from Re. 1-8 to Rs. 2 per seer, you will see what a good thing can be made out of a well managed fruit garden. One or two private persons in Simla have already followed the lead of the Annandale gardens, and even at this early date a few good English apples can be obtained, though they fetch exorbitant prices.

In South Western Russia, between the Baltic and the Black Seas, the sunflower is universally cultivated in fields, gardens, and borders, and every part of the plant is turned to practical account. A hundred pounds of the seeds yield forty pounds of oil, and the pressed residue forms a wholesome food for cattle, as also do the leaves and the green stalks cut up small all being eagerly eaten. The fresh flowers, when a little short of full bloom, furnish a dish for the table which bears favorable comparison with the artichoke. They contain a large quantity of honey and so prove an attraction to bees. The seeds are valuable food for poultry ; ground into flour, pastry, and cakes can be made from them ; and boiled in alum-water, they yield a blue coloring matter. The seed receptacles are made into blotting paper ; the woody portions are consumed as fuel, and from the resulting ash valuable potash is obtained. Large plantations of them in swampy places are a protection against intermittent fever.

The boring of the now famous artesian well at Vittoria (Spain) has reached the immense depth of more than nine hundred and seven metres (2,975 English feet) without the nature of the rock bored through changing in the slightest degree since the works began. Geologists are astonished at the thickness of the rock, for there is scarcely a well in the world which reaches the depth of the Vittorian one."

A Wisconsin farmer has sold for $27,000 black walnut trees from 10 to 20 inches in diameter, which he planted 23 years ago on a piece of waste land unfit for cultivation.

It is estimated that the United States is capable of maintaining an area of 200,000,000 acres of corn-land, which, with the average yield of the past ten years, would yield upwards of 5,250,000,000 bushels of corn.

The profits derived from ostrich farming are so great and the returns are so quick, that it has led to the majority of the farmers in South Africa, investing their all in this new industry (to the neglect, in too many instances of their legitimate calling), which from its nature, depending in a great measure, as it does, on the caprices of fashion, must necessarily be a transitory one. Valuable land is left untilled, sheep-farming is dying out, the natural resources of the country remain undeveloped, and when the day comes, which it assuredly will not many years hence, when ostrich feathers will be a drug in the market, and unsaleable, the agriculturist will find to his sorrow that, in his "haste to be rich," he has been pursuing a shadow, and is landed in poverty.

We understand that the Royal Commission on Agriculture have resolved to obtain a supplementary report on American agriculture. The intention is to have the state of American agriculture down to the present day recorded and laid before British readers. The responsibility of furnishing the supplementary report could not, perhaps, have been entrusted to a more competent pen than that of Mr. John Clay, jun., whose reports to the Commission on American stock raising and Californian wheat growing have been perused with so much interest.

The New Zealand Government has taken in hand the fostering of new industries, and if only our Government would exhibit half the zeal shewn by the Colonial Government referred to, we should soon see a change in our industrial and manufacturing concerns. "During the present year alone it has announced its readiness to give a premium of £1,000 for sugar made from beet grown in the colony ; £500 for linseed-oil, and £100 for oil-cake from seed grown locally ; £300 for starch ; fifty per cent. on the value of silk cocoons, up to a limit of £1,000 ; £500 per annum, for three years, for sulphuric acid ; £250 for hardware ; £500 for the first fifty tons of cheese of fair quality produced in a factory worked on the American principle ; £500 for the first hundred tons of fresh meat exported to England in a refrigerating chamber and landed in marketable condition ; £500 per annum, for three years, for refining a hundred tons per annum of cane sugar, and a bonus for starting a factory for sporting and blasting powder." At our exhibitions and agricultural shows prizes of 10 rupees or so are offered. This has very little effect, but if we had the chance of obtaining £1,000 as the reward of our enterprise, much more might be effected.

The following remarks on the American wheat crop of the current year, from the Chicago paper will be read with interest, although they tend to mystify us still further :- "The *Chicago Tribune* declares that careful investigations of heavy capitalists as to the present position and future prospects of the wheat crop have resulted in proving (1) that the winter wheat crop of the States will only equal two-thirds of last year's yield ; (2) that the acreage sown to spring wheat is only four-fifths that of 1880 ; and (3) that at the present time only 7½ million bushels of wheat remain in the hands of millers and in elevators in the country. The *Chicago Times* remarks that if these estimates be correct, America has only wheat enough on hand to supply her own wants till harvest time, and that her wheat crop of this year will merely supply the demand of the home market without yielding a single bushel for export abroad." However much this may affect the purses of the American exporters, there can be no doubt that it opens up a bright prospect for the Indian merchant, and, as a natural consequence, for the cultivator as well. This information is not credited in London. The *Pall Mall Gazette* say—"Surely news of such importance—portending, if it be authentic, the failure of the chief source of our bread supply—should reach us through other channels than the columns of our Chicago contemporaries." We shall look for further information with interest.

A telegram from Reuter tells us to-day that the American wheat harvest, which has been in-gathered, is 25 per cent. under the average, and that the French have an average harvest; this cannot fail to mean high prices for wheat in England, and opens out a fair prospect for the Indian exporter. The information we gave yesterday from the Chicago papers was correct, and it now largely depends on the various Indian railways—notably the Great Indian Peninsula and East Indian lines—whether we shall be able to avail ourselves of this opening or not.

The subject of opening out a land route between India and China crops up periodically. It is now being discussed again, and the favorite route would seem to be that starting from Bhamo. This was doubtless the ancient route, but it has a disadvantage which does not seem to have been observed. The objection to this route is one which does not apply to the road itself, but to the position of its Western terminus, Bhamo. This town is in Burmah, and with a terminus under the government of a country inimical to us, we could not calculate on using this route with any degree of certainty. It may be said that whichever route is chosen, it must run through a foreign country. True, but we should avoid having the terminus outside of our own land. By starting from Sudiya, on the Brahmapootra, we might avoid Burmah altogether, by keeping within the Tibetan boundary. Doubtless some arrangements as to right of way could be made with the Tibetan Government for that portion of the road between Sudiya and the Chinese province of Yunnan, a distance of about 300 miles, and as the Chinese would be equally interested in keeping the route open, we might place some dependance on their securing the safety of the Eastern section. Once the railway is constructed up to Sudiya—which ought not to be much longer delayed—this would be a much

quicker route than by Bhamo, which necessitates a long voyage by water from Calcutta.

We observe with much satisfaction that the East Indian Railway is meeting the grain traffic in a liberal spirit. From an advertisement we observe that the Agency have reduced the rate for grain to Howrah from Rs. 20 per 100 maunds from Rajmehal, to Rs. 29 per 100 maunds from Patna. These rates are equal to ·647*d.* and ·570*d.* per ton per mile respectively, and may be considered very reasonable, considering the comparative nearness of the two stations to Calcutta. This is the way to meet the difficulty raised by the opening out of the Rajputana line to Bombay.

OFFICIAL PAPERS.

THE REVENUE AND AGRICULTURAL DEPARTMENT.

EXTRACT from the proceedings of the Government of India, in the Home, Revenue and Agricultural Department (Public),—under date Simla, the July 1881.

READ the undermentioned papers :—

Home Department Resolution No. 31—1104-1119, dated 14th June 1879.

Home Department Resolution No. 53—2046-2061, dated 29th October 1879.

Report of the Indian Famine Commission, Part I, paragraphs 118 to 125, and Part II, Chapter IV, sections 1 and 11.

Despatch to her Majesty's Secretary of State for India, No. 19, dated the 14th March 1881.

Telegram to her Majesty's Secretary of State, dated 10th June 1881.

Telegram from her Majesty's Secretary of State, dated 11th June 1881.

RESOLUTION.

In 1879 under the pressure of financial exigencies, it was determined that the work of two departments, the Home Department and the Revenue, Agriculture and Commerce Department should be amalgamated (some of the duties of the latter being at the same time transferred to the Finance and Military Departments) and that the office of Secretary in the Revenue, Agriculture and Commerce Department should be abolished. This measure was not adopted without reluctance as it was admitted that the system which had been in force since 1870 possessed many advantages.

2. The Famine Commission has now proposed the institution of an Agricultural Department in India. It lays stress upon the importance of rendering *readily* available the accumulated experience of past famines in different parts of India, and has urged that greater attention should be bestowed on the investigation of vital, economic and agricultural facts. Any effectual measures of agricultural and industrial development must, in the opinion of the Commission tend at least to the mitigation of famines, both by promoting the increase of the food-supply amongst a growing population, and by directing industry into new and productive channels. Moreover, it is represented that the Government would obviously be strengthened, in its future dealings with scarcity, by a systematic classification of the experience gained in past calamities.

3. After careful consideration of the views put forward by the Famine Commission, the Governor-General in Council came to the conclusion that full justice could not be done to the important interests which they advocate, and more particularly to the protection of the people from the effects of uncertain season, without some enlargement and reconstitution of the department now charged with those duties. The experience of the last two years, had shown that new additional work could be undertaken by the amalgamated Home, Revenue and Agricultural Department without imposing upon it an undue burden; and it therefore became necessary to devise some additional means for the conduct of business more immediately affecting agricultural improvements, the social and economical condition of the people, and the material resources of the country. It was accordingly determined to recommend to the Secretary of State the appointment of a new Secretary to the Government of India, to have direct and special charge of these branches of the administration; and his Lordship has now sanctioned this proposal.

4. It remains to decide what portions of the work at present performed by the amalgamated department shall be entrusted for the future to the new department, and what portions shall continue to be under the control of the Home Secretary. One of the most important objects of the new arrangements is to enable the Government of India to devote increased attention to the important subjects above mentioned; and it would, therefore, be inexpedient to make the new department responsible for all the general and miscellaneous business which, for reasons of administrative convenience, was *formerly* conducted by the Revenue, Agriculture and Commerce Department. The new department will, as a matter of course, control all operations for the relief of famine; but that part of its functions will be necessarily intermittent, and its main work will lie in the branches of the public administration which most closely affect agricultural development and the interests of the agricultural population. In making the following distribution of work, the Governor-General in Council has therefore, been influenced by the desire to free the new department as much as possible from unnecessary calls upon its energies, in order to direct its efforts, so far as present circumstances admit, to the fulfilment of its most really essential duties.

5. Having regard to these considerations, the Governor-General in Council is pleased to direct that all matters connected with the subject noted below so far as they affect the provinces of British India, shall come under the cognizance of the new Department, *viz* :—

1. Land Revenue including Settlement and Takavi advances.
2. Surveys including Geological Surveys, but ex-cluding Archæological and Marine Surveys.
3. Agriculture and Horticulture, including Fibres and Silk Fisheries, Cattle-breeding and Cattle-disease.
4. Minerals.
5. Meteorology.
6. Famine.

All matters relating to the undermentioned subjects shall be administered by the Home Department :—

1. Law and Justice.
2. Jails and the Penal Settlements in the Andaman and Nicobar Islands.
3. Escheats, and the administration of Estates of Intestates.
4. Police.
5. Education.
6. Examination.
7. Industrial *Arts*, Museums and Exhibitions.
8. Sanitation.
9. The (Civil) Medical Service.
10. The Ecclesiastical Service.
11. Civil Service questions.
12. Registration of Assurances.
13. Patents.
14. The working of the Vagrancy Act.
15. The working of the Arms Act.
16. Copyright.
17. Archæological Surveys and Conservation of Ancient Monuments.
18. Municipalities and Local Funds!
19. Census
20. Gazetteers.

6. As a temporary arrangement, the Home Department will also be charged with the superintendence of the Forest Department; and, subject to consideration, the Revenue and Agricultural Department, will temporarily conduct the whole of the business of the Government of India connected with Emigration.

7. The Military and Finance Departments will continue to administer all matters connected with the branches allotted to them by the Home Department Resolutions, Nos. 311—1104-119, dated 14th June 1879, and Nos. 53—2041 2061, dated the 29th October 1879.

8. The new Department will be styled "The Revenue and Agricultural Department," and will be constituted with effect from the 6th July 1881. The officer to be placed in charge of it will have the position, and will exercise the duties of a Secretary to the Government of India.

ORDER.—Ordered, that a copy of the foregoing Resolution be communicated to the several Departments of the Government of India, the local Governments and Administrations, and the Officers named in the margin, for information and guidance.

Foreign, Military Finance, Public Works and Legislative Departments! Governments of Madras, Bombay, Bengal, the North Western Provinces and Oudh and the Punjab, Chief Commissioners of the Central Provinces, British Burmah, Coorg and Assam, and Resident at Hyderabad, Surveyor General of India, Superintendent of the Geological Survey of Indi; Director General of Post Offices in India; Superintendent of Port Blair and the Nicobars, Sanitary Commissioner with the Government of India, Surgeon General with the Government of India, Registrar, High Court, Calcutta, Secretary, Board of Examiners. Registrar, of Calcutta University Bishop's Chaplain, Curator of Ancient Monuments, Director-General, Archæological Survey of India, and Meteorological Reporter to the Government of India.

Ordered also, that the Department of Finance be requested by a separate Office Memorandum to issue the necessary orders regarding the salary to be drawn by the Secretary in the new department.

(True Extract)

C. GRANT,

Offg Secretary to the Government of India.

TEA AND COFFEE IN BENGAL.

A REPORT on the tea and coffee cultivation in Bengal for the year 1880 shows that the number of gardens under tea cultivation during the year was 274, against 257 in 1879, and the area under plant was, so far as could be ascertained, 38,805 acres against 38,668.

In the Darjeeling district there was an increase of three gardens over the number reported in the previous year, and of 33,854 lbs. in the approximate gross outturn of tea. The year was, on the whole, a favorable one, though the red spider is said to have made its appearance in some of the gardens. The complaints from blight were few, compared with those made in the three previous years. Mosquito-blight, though it did some damage in March and April, was hardly noticeable in the later months of the year when it is generally most active. Labour, which is almost exclusively derived from Nepal, was more plentiful than in the previous year in the hills, but in the Terai it was scarce. The reason of the scarcity of labour in that tract is explained by the manager of a tea garden in the following words:—

"In former times when tea was more remunerative, larger labour forces were kept on the gardens during the cold season; now more economy is evinced in this point in all the gardens. The coolies, who have been long in a garden, have in most cases become well off, and when the weather is bad and the work was heavy, can better afford to sit idle. The large number of estates opened out in the Terai and Dooars lately, of course, much tend to drain labour."

In the Jalpigoree district there was also an increase of 10 gardens over the number returned in 1879. The gross yield of tea amounted to 817,765lbs. against 411,580lbs. in the previous year, thus showing an increase of 406,185lbs. or 98 per cent. during the year under report. As stated in the previous year's report, the gardens in the district

are chiefly stocked with the hybrid plant. Manure is used to a very limited extent, the soil being rich with vegetable deposit. Leaf-rolling machines have for some time past been introduced into the district. The use of a tea-drying machine in one of the gardens is said to have effected a considerable improvement on the results obtained under the old system of drying over charcoal fire, while in another garden, machinery for seiving and equalising tea worked with success. Labour is chiefly imported from Nepal and Chota Nagpore, the indigenous labourers numbering between 700 and 800 only. The labourers are reported to be well-housed and properly treated. One application for lease of lands was under enquiry at the close of 1879, and four applications were filed during 1880. There were thus altogether five applications for disposal. Of these two were granted, one was withdrawn, one was negatived, while one was under inquiry at the close of the year.

There was an increase of two gardens in the Chittagong district over the number reported in the previous year, but the figures are again incomplete, 18 gardens having failed to supply the information sought. The gardens in the Chittagong Hill Tracts have all furnished the returns for 1880, but no figures regarding the yield of tea were supplied in the previous year. A comparison of the results of the year under review with those of the previous year is, therefore, not possible. The weather was not very favourable for tea, and the flushes were below the average. The outturn per acre showed a decrease, but this is attributed to the plucking having been finer than it used to be, the common class of tea hardly paying the cost of manufacture. The soil and climate are well adapted to tea cultivation, very little manure being used. There is an abundance of local labour except at the rice harvest, and the number of labourers imported into Chittagong is small. Improvements in firing and other operations have gradually been introduced, and machinery has been brought into use in several in tea estates the district.

No new gardens were started in the Dacca district, but the average yield per acre shows an increase from 92lbs to 132lbs.

The number of tea plantations in Hazaribagh in 1880 was the same as in the preceding year, but there was an increase of two gardens in the Lohardugga district. One garden in Hazareebagh and three gardens in Lohardugga furnished no returns for the year ; but on those gardens from which returns were received both in 1879 and 1880, the aggregate outturn is said to have shown an increase in the year under report. Early rains in the spring and seasonable weather during the monsoon materially helped to improve the prospects of the industry. The prices, however, showed very little signs of improvement, except for the better qualities which are not yet grown in large quantities.

Coffee is only grown experimentally in the Chittagong district, and those who have cultivated a few plants speak favorably of the growth, especially of the Liberian coffee. No returns have been received from the Chittagong Hill Tracts, but the crop of the Ceylon or common coffee is said to have been a "fair average one" ; the planters have prepared nurseries sufficient to provide plants, of Liberian coffee for 100 acres during the current year. No increase is shown in the number of gardens in the Lohardugga district, and there was a decrease of 320lbs. or 50 per cent. in the total yield as compared with 1879.

ARTIFICIAL COFFEE DRYING.

From the Daily Times, 6th June.
(Translated from the Dutch.)

Report on Van Maanen's method of coffee drying, by the Commission appointed for the purpose by the Commercial Association at Samarang.

We, the undersigned, having formed ourselves into a commission, at the request of Mr. Van Maanen and of the Commercial Association at Samarang, to be present at a trial to be made with a method invented by the said gentleman of artificial drying of coffee, and to give an opinion thereon, have the honour to report the following thereupon .—

The drying apparatus fitted up on the estate belonging to Messrs. F. and A. M. Engelken, named Pendem, in the residency of Surakarta, excels in great simplicity together with inexpensiveness of construction. The trial was made with a quantity of coffee equivalent to about 36 piculs dried and prepared, which had previously been lying 24 hours in the drying receptacles. The operation in the apparatus lasted 22 hours, after which the coffee appeared to be dry enough oto be stored. The operation required little supervision, is extremely simple and inexpensive, about 5½ cubic metres of fuel (jungle wood of all sorts) being used for the drying of the aforesaid quantity. Although we willingly affirm that the drying takes place very equally, and that the coffee is exposed neither to unusual heat nor to injurious vapours, we must, for the present, forbear from passing any judgment regarding the influence which the artificial drying might have on the taste and colour of the coffee, as it is not till after arrival in Europe, it can be ascertained whether the quality has suffered or not. In order, to ensure certainty thereon, the Messrs. Engelken intend to forward a consignment of coffee to the Netherlands, assorted in the following manner :—

25 Piculs dried in the usual way in bricked receptacles.
25 Piculs first partially dried artificially and then in the usual way.
25 Piculs first partially dried in the receptacles and then completelyo so artificially.
25 Piculs wholly artificially dried.

This consignment, shipped to the Netherlands and brought to market, will enable brokers to pass satisfactory judgment regarding the influence of the drying method of Mr. Van Maanen on the colour and taste of the coffee. Upon this must depend the final decision on the practicability of this method. Should the result of this trial be satisfactory, we do not hesitate to recommend strongly this method for all coffee estates, and, chiefly, for those which, from high situation, raise difficulties in the common mode of drying. Although all the advantages enumerated by Mr. Van Maanen in his pamphlet (the expense, for instance, will in some cases, be higher than set forth by him, but nevertheless be far below what the present mode of drying or one of Guardiola's apparatus costs), yet it is beyond doubt that Van Maanen's method presents great advantages which will soon recoup both the expense of fitting up and the cost of buying the invention. In conclusion we note the fact that the trial was witnessed by Mr. D Ples, Head Inspector of the Government Coffee Culture, who seemed greatly pleased with the drying apparatus of Mr. Van Maanen.

Samarang, May 1881.

(Signed) F J Knoops,
K Van Gessel,
A. Bauer,
J. A. DeZentje.

KAURI GUM OF NEW ZEALAND.

CONSUL GRIFFIN, of Auckland, has written a full report on the production of kauri gum, which is largely used for the manufacture of varnish, of which the following is an abstract :—

It consists of the dried and solidified sap of the kauri tree, a species of pine known to botanists as the *Dammara australis*. It is found only in the province of Auckland, in that part of the colony lying to the northward of the thirty-ninth degree of south latitude, and does not exist in any other part of the world. The largest quantity of marketable kauri gum is dug out of the ground. It is found at various depths, from just above the surface of the soil to many feet below the surface. It is found on bare hillsides, on flat clay lands, in swamps, and even in some places that are covered with a more or less thick coating of volcanic *débris*. Sometimes the gum is found in small detached lumps, and at other times large deposits will be found in one hole. On cultivated land it is not unfrequently turned up by the plough, and in many places the cutting of large drains in swamps has revealed large deposits of this vegetable product. In the forks of the large branches deposits varying from a few pounds to nearly a hundredweight are sometimes met with. When a kauri tree is cut in the bark, even one of the largest and oldest, varying in diameter from six to ten or twelve feet, if the weather be dry, a large mass of half-dried gum will have oozed from the wound, not unfrequently appearing in the form of a great thick band, reaching from the wound to the surface of the soil around the tree. When a tree is felled, the stump bleed in a like manner until large masses of gum can be broken off from the stump. This "young" gum is white in colour, and has not the rich amber colour which age imparts to it when stored beneath the surface of the soil away from the action of sun and weather.

The gum is not soluble in water. It ignites freely, and burns with a lively sooty flame. It froths and bubbles, and produces a pleasant aromatic odour. The perfume it exhales when burning in the open air is not unlike that of frankincense and myrrh.

Some of the finer specimens of kauri gum are used in the manufacture of jewellery, but, while it is very clear and beautiful, it is not so desirable for this purpose as amber. It is not nearly so hard as the latter, and it is much more brittle, and insects and plants are not so frequently found imbedded in it.

Kauri gum was known to the native race long before the island were settled by Europeans. They used it for the purpose of kindling their fires, and it is also said to have been employed by them in their religious rites, but there does not appear to be any ground for the statement Kauri gum became an article of commerce immediately after New Zealand became a British colony. At first the exports were small, amounting to about 100 tons per annum. The price of gum at that time ranged from £5 2s. to £5 19s. per ton The natives then were the only persons engaged in searching for it and bringing it to market.

The implements used in digging for the gum consists of a spade and a spear. The spear is a long steel rod, about half an inch in diameter with a wooden handle with a cross on the top, like that of a spade or a shovel. The rod is brought to a point, and the gum digger pieces it into the ground. Practice and experience enable him to tell whether he is touching a stone or a piece of gum When he touches the gum he digs around it until it is extricated, and then renews the search as before. The number of persons regularly engaged in digging gum varies from 1,800 to 8,000, the greater part of whom are Maories, but even they do not show any special fondness for the work. They resort to it when they become pressed for food and clothing on account of the failure of their crops, or other causes. Many Europeans have resorted to this kind of work, but they belong generally to a class who are unruly and impatient of the restraints which a civilised life imposes upon them, and who prefer to camp out after the fashion of gipsies, and live in tents and raupo huts rather than in houses fitted for civilised beings It is generally supposed that a European who resorts to gum-digging is unfitted for any other occupation He leads a reckless, dare-devil sort of life, away from friends and kindred, and from the restraints of civilisation.

When the gum is taken out of the ground, it is covered with earth, and its surface is found to be in a partial state of decay. When the digger is tired of work, he puts his gum into a bag and carries it to his tent or hut, and in the evening or upon rainy days he, with the assistance of his wife and children, scrapes off the decayed surface until the clear solid gum beneath is reached. When a sufficient quantity of it has been

scraped, it is put into a box or bag and taken to the nearest store or public house, where it is sold for what it will bring. Sometimes the purchaser will assort it, but it is not generally sorted till it reaches the city buyer, who employs a large number of skilled hands for that purpose. The gum, after it is scraped and assorted, is packed carefully in boxes, so as to prevent the lumps from breaking. It is then ready for export. The dust and scrapings are also exported.

Some of the gum is used in New Zealand for the manufacture of varnish, but in no great quantity. The export of kauri gum for the year 1880 is larger than that of any other year. The total export for 1878 was 3,410 tons, and 3,247 tons was the total export for 1879. The invoices thus far received indicate that the total shipment for the year 1880 will be 5,500 tons. The price of gum ranges, according to the *Scientific American*, from 144 dols. to 720 dols per ton. The greater part of it, however, is bought at the former price. The average price may be safely set down at 216 dols. per ton. At this rate the total value of the estimated shipment for the year 1880, *viz*., 5,000 tons, would be 1,188,000 dols. More than two-thirds of the gum goes to the United States It is either shipped to New York and Boston in sailing vessels, or to London for trans-shipment to the American cities.

It is a matter of regret, adds Mr. Griffin, that the kauri forests are disappearing. The trees are being so rapidly cut down that they will soon cease to exist. The Government has not taken any steps to protect them, either by conserving those that remain, or by planting new ones. At the present rate of consumption, fifty or eighty years will see the bulk of the kauri trees cut down. Of course, when the trees are destroyed there can be no deposits, and kauri gum will become a thing of the past The amount of gum taken out of the soil up to the present time has been so great, Mr. Griffin concludes, that it would probably require a forest growth of ten thousand years to replace it.

SELECTIONS.

A VISIT TO THE MOACH SALT WORKS.

A REFERRED has furnished us with the following interesting communication as to the Sind salt works at the Moach.

Above two years have elapsed since Government took up the monopoly of salt manufacture and started an establishment at the Moach, a place of little importance at one time when natives worked on their own account, but now well worth a visit. It would repay the trouble of the trip which is not expensive and is much more instructive than a visit to that "Old Lion of Sind Mugger pier— a place more distant with worse roads to get over and only horrible sights to see when there, while a trip to the salt works may be heartily enjoyed even at this season with boating, oystering, fishing, &c. &c., and I added on a recent visit at least 2 species of Crustacea to those already on record as occurring in Sind and last and not the least the going over the salt works was time not unprofitably spent.

The Acting Superintendent very kindly conducted me over the entire ground, and great credit is due for the extreme cleanliness of the place and the admirable order in which everything appears to be kept.

The ride to the works from Kurrachee is very pleasant, especially in the early morning, or at about 5 in the afternoon. There is not much to be seen, it is true, by the ordinary observer, who would probably discern no more than a great blank in the features of the land but their are many points of interest nevertheless particularly when *nolens volens* carried out of the usual track by a restive camel, by no means a "respector of persons," which has the greatest aversion to wheeled vehicles, gibbing at all he meets, and only to be forced to the object at the risk of his nose, and probably your legs Those who would care to see the Moach Salt works would do well also to make a wide detour to windward of the Municipal sweeping heaps and the Hindoo burning ground, if they have any respect for their old factory system Over beyond the latter the road leads straight to the works which can be seen from a great distance, the hillocks of snowy white salt being very visible. A good cart road also runs up.

The nature of the country adjoining which the manufacture of salt is carried on, may be described as being an extensive plain of saline soil lying near the sea, and running along a stretch of a large marshy creek, with here and there slight undulations, and beyond this bounded by rough stony ground on which the only vegetation to be seen is the euphorbia, commonly called cactus in Sind, and some saline shrubs as *Salsola Sindæ*, &c., &c. Animal life occurs just now in the unpleasant shape of locusts (*Gryllus migratorius*) in their third stage with wings now ¼ of an inch long, and which should now be destroyed, the Rock Lizard (*Uromastix Hardwickii*), and a *Stellio*, hitherto only known in S Afghanistan In some places in the immediate neighbourhood, however, where the soil is less impregnated with salt, small cornfields may be seen which relieve the eye somewhat by their welcome verdure. At different parts where the spring tides flood the low lying land, pretty extensive salt swamps are formed; which, after the tide has receded produce large quantities of what is known as "spontaneous salt." It is on soil of similar kind bordering the "back water," or creek which supplies water indirectly to the pans, that the manufacture by solar evaporation is carried on. The soil is a description of black clayey earth, with an admixture of sand, and is impregnated with salt. There are in all I am informed 51 pans, each divided into from 12 to 18 beds, and having as a source of supply a shallow well 12 to 14 feet deep in its midst, the water being supplied in the most primitive fashion, *viz*., by a long bamboo lever with a bucket attached at the end, like the *dinrah* of the *fellahs* in Egypt. The extent of land taken up by the pans I have not ascertained; but it is possible to increase it almost indefinitely, as the land stretching along this black water appears particularly suited for the production of salt; in fact, it could produce nothing else, except mangroves.

The process of manufacture, although simple, is not uninteresting. Prior to forming the pans, much preliminary labour is necessary in the way of raising embankments, damming beds and making foundations by treading down the first 2 or 3 yields of salt to make the soil of a proper consistency. This accomplished, the yield continues, and may be worked, for some time, with such slight repairs as become necessary from the action of "raking." The first charge of water usually requires from a week to ten days or more to evaporate, and subsequent ones about one half the time; but the usual run at the Moach is 8 days—much however depending on the season of the year The strength of the brine is tested by the hydrometer; but a more simple means of judging is the reddish tint given to the water by a minute infusoria a species of volvox, which makes its appearance in myriads just as the salt is ready to crystallize This creature is present even in rock—salt, which it tints of a fine pinkish hue, and also in the waters of our sea shore; and is especially abundant in some parts of the Red Sea. This is however a digression. The process of manufacture is the time-honoured one followed nearly throughout India wherever salt is made The 51 pans are, as I said before, divided into beds of greater or less extent to the number of from 12 to 18. These divisions are made by raised ledges about 8 inches high. The salt water is bucketed into the pan from the wells, and the openings closed as soon as all are filled Behind each pan is a second store of water undergoing concentration, which is admitted as occasion requires, into the beds. Here the brine remains till the salt crystals form, but is never allowed to evaporate to dryness. While still moist the salt which has crystalized into the pans to the depth of an inch or two is raked up in little heaps in each bed and previous to being placed in larger heaps for examination, is washed beautifully white. Each heap when completed is stamped all over to prevent fraud, till ready to be taken over by Government—the manufacturers being paid by the outturn—when it is pierced in different places to ascertain the uniformness of quality throughout, the heap weighed, and finally finds its place in some one of the hillocks of salt, standing on raised platforms. Here all the salt manufactured is stored, and here purchasers are served.

There are no roads near the pans passable for carts. Camels only are employed for carriage. The situation of the Superintendent's quarters is good, and there are effective measures adopted for the prevention of smuggling. All spontaneous salt in the neighbourhood is destroyed in the interest of Government.

Of the quality of the Salt manufactured at the Moach, there can be no question as to its being of the best. It is pure and medium grained, and contains a large preponderance of chloride of sodium. From 3 samples obtained in the Bazaar of Moach manufactured salt, the following has been deduced as the average composition:—

Moisture.	6 2900
Insoluble matter	1·6000
Chloride of sodium (salt proper) ...	90 0750
Of magnesium (Epsom salts) ...	1 11,4
, of Calcium	·0985
Sulphate of lime	2682
	99·4771

If moisture be excluded, the percentage of chloride of sodium equals 96 82

It is evident the Government are alive to the importance of the manufacture at the Moach, as I see *pucca* buildings for the establishment are being erected; but how long they will be in course of completion is a question, as the P. W. D. I believe have them in hand.—*C. & M. Gazette, Sinde Issue.*

INDIAN AGRICULTURAL REFORM.

THERE probably never was a time since our first occupation of Indian soil when an exhaustive inquiry into and consideration of the economical condition of the country were so much needed as now. The deficiencies in the last budget viewed in conjunction with a financial position of almost normal precariousness, the uneasiness caused by forebodings of increasing national destitution, which, even if we discredit them, we are unable to disprove suggest the need for inquiry and action. On the other hand, if the situation is critical, the opportunities are favourable. The cyclic period of famine or scarcity is past, the empire is at peace, and a party whose especial traditions are those of economical government is in power. Only it is to creation rather than to destruction that we must look for help; to an enlargement of our resources rather than to a curtailment of our expenses. Few attempts at thorough agricultural reform have been made in India. The first genuine effort dates from 1871, when India had the advantage of being ruled by a Governor-General who had farmed for his own livelihood, and who was conversant with the theory and practice of modern agriculture. Lord Mayo's endeavours were directed towards the establishment of a real working agricultural department presided over by a Director-General who, with the aid of provincial directors and experts, was to move about generally, while the crops were on the ground, watch closely all local schemes and experiments, furnish suggestions, information and advice, procure through the agricultural societies of Europe and America, seeds, cattle, sheep, models of implements, and keep all fully informed, through the medium of an agricultural journal, of what the rest were doing.

It is not our object to trace the history of this department, though under the invaluable direction of its first and only Secretary, Mr. A. O. Hume,

C.B., it did a vast amount of useful work which has been briefly described in a pamphlet recently issued by that gentleman entitled, "Agricultural Reform in India." We would rather draw attention to a few of the more pressing needs of Indian agriculture, which are dwelt upon in that work, and consider their practicability at the present time. And in treating of these matters it is necessary to award full credit to the natives for the results achieved under their, so to speak, rule-of-thumb system. Considering their ignorance of scientific methods and want of capital, Mr. Hume remarks that the crops they do produce are on the whole surprising. They know to a day when it is best (if only meteorological conditions permit) to sow each staple and each variety that is grown in their neighbourhood; they know the evils of banks and hedges, dwarfing the crops on either side and harbouring vermin; they accurately distinguish every variety of soil, and so far as the crops they grow are concerned, the varying properties and capacities of each, they fully realize the value, though they can command but little of ordinary manure, ashes, and the like. They know the advantages of ploughing in most cases as deep as their imperfect implements and feeble teams will permit, and of thoroughly pulverizing the soil, and they also recognize where, with a scanty or no supply of manure, it would be folly to break the shallow-lying pan; while as for weeds, their wheat fields would in Mr. Hume's opinion shame ninety-nine hundredths of those in Europe. As far as circumstances and poverty will permit, they know the benefit of and practise, rotation of crops, and they are great adepts in storing grain, which they will turn out of rough earthen pits, after 20 years lapse, absolutely uninjured.

But excellent as this non-scientific agriculture is, as far as it goes it must not be overrated. It is wholly empirical; and imperfect appliances, money troubles, the usurer's impatience, and above all, superstition and reverence for omens often prevent the Indian cultivators from practising what they do know. And though the British Government are sole or part proprietors of the major part of the land, they have neglected to carry out any substantial improvements in this primitive system of agriculture which was stereotyped two thousand years ago, when the conditions and requirements of the country were utterly unlike what they are now. With proper manuring and proper tillage, Mr. Hume points out, speaking broadly that every acre of land in the country can be made to yield from 30 to 70 per cent. more of every kind of crops than it at present produces—a fact satisfactorily proved by his own experiments with almost every common North-West Provinces crop, and by Mr. Robertson with most of the Southern Indian staples. But notwithstanding this, and the enormous additional areas brought under cultivation, vast irrigation schemes, and improved and really excellent systems of settlement, the land revenue of the chief provinces of India has actually decreased. A remarkable proof of this will be found in Mr. Clements Markham's "introductory Life of Akbar," recently published by Allen & Co. In the reign of that monarch, the land revenue of India (less Cabul, which now belongs to Afghanistan, and Madras and half Bombay, which were outside Akbar's dominion) amounted, under an admirable system of settlement, to £15,775,838, while the amount of land revenue derived by our Government in 1877 from the same provinces was only £18,356,248. When we reflect on this and on the fact that the agricultural masses are, to say the least neither wealthier nor better fed, taking the country as a whole, than they were 70 years ago, we need seek for no more convincing proof of the fact that if good government consists in doing the best one can for the land and its inhabitants, ours amounts to a very serious failure.

The sole explanation of this state of things is that the older-tilled lands as a body yield now lighter crops than they formerly did. This is the reason confidently assigned by Mr Hume, and he adds that it is what almost, every experienced and intelligent cultivator in Upper India will say is the fact in regard to all but that little circle of fields skirting each inhabited site which gets the great bulk of what little manure is available. And what is it that has brought about this disastrous condition of affairs? Speaking broadly, it may be said to be due to a system of quasi-spoliation, the continually taking a great deal from the soil and putting very little back. But the disease may be subjected to a closer diagnosis. Only 50 years ago, when jungles and grazing grounds abounded, when cattle were more numerous, when much wood was available as fuel, there was actually a much greater amount of manure available, and a very much smaller number of fields on which to spread it. But of late years the stock of cattle has sustained incredible losses from starvation and different forms of cattle disease, and the consumption of their droppings as fuel is due to the impossibility in some places, or expense in others, of procuring wood. For six weeks every year the cattle are practically starved over a greater part of India. Mr. Hume's description of the hot season is so graphic that we cannot forbear reproducing it:—

"The hot winds roar, every green thing has disappeared, no hot-weather forage is grown, the last year's fodder has generally been consumed in keeping the well bullocks on their legs during the irrigation of the spring crops, and all the husbandman can do is just to keep his poor brutes alive on the chopped leaves of the few trees and shrubs he has access to, the roots of grass and herbs that he digs out of the hedges of the fields and the like. In good years he just succeeds; in bad years the weakly ones die of starvation. But then come the rains. Within the week, as though by magic, the burning sands are carpeted with rank, luscious herbage, the cattle will eat and over-eat, and millions die of one form or other of cattle disease, springing out of this starvation, followed by sudden repletion with rank, juicy, immature herbage."

The enormous annual loss of cattle in India was a matter which received Mr. Hume's attention in connexion with a scheme of Lord Mayo's to establish veterinary colleges in the Bengal Presidency. Diseases of the most virulent character, plagues, and murrains had raged unchecked amid agricultural stock, and devastated whole districts, depriving millions of their savings and means of subsistence, and seriously endangering the food-supply of the country. But a few years ago more than half the cattle in Oudo were lost during two successive bad seasons. The average annual value of the cattle lost in India by preventible cattle disease of one form or another is estimated by Mr. Hume at £7,500,000, and this in climates where, if the beasts are moderately fed, given plenty of work, and kept away from contagion, they never seem to be sick or sorry, but are very prolific, and work on from youth to extreme old age.

Besides the loss of cattle, another source of ruin is to be found in the occurrence of *reh*, or saline efflorescence, *in irrigated lands*. This evil, though still imperfectly understood, is one of increasing magnitude. Along the Western Jumna Canal thousands of fields are to be seen lying barren and glittering as though hoar-frost were overspreading the land, an efflorescence due to the excess of soluble salts, which, as the water which has sought them out works upwards by capillary attraction and dissolves in vapour, is left as a sterlising deposit on the face of the earth. The general remedy for this serious evil, it is now beginning to be admitted, is subsoil drainage, by which the excess of saline matters may be passed away. But, inasmuch as the efflorescence is one of complex origin and constitution, very different additions to the soil, organic or mineral, may be necessary to enable it to seize the *maximum* share of the utilizable portions of the *reh* as it is filtered downwards. Herein is another important practical investigation which scientific agriculture alone can satisfactorily undertake.

A very important matter which might with advantage occupy the attention of a department of Agriculture is the provision of some general growth of hot-weather forage, which will not require much good land, irrigation, or capital, for all these are difficult to get. This is not so impracticable a matter as it sounds. In India, wherever you have a closed grove of trees, there you have a spontaneous and luxuriant growth of herbage, and at the end of April, even in the hottest and driest parts of Upper India, while the whole country round is as bare as any desert, there will be found in preserved groves (such as the more wealthy zemindars often keep) a mass of hay above and green grass below that is perfectly surprising. This is due partly to the rich deposit of decayed twigs and leaves and partly to the diminished evaporation from the soil, protected by the trees. By planting communal groves of this character throughout the country a most important benefit would be conferred on the inhabitants. Together with a valuable provision of fodder would be obtained an improved supply of fuel, and an immediate great diminution in the consumption of manure for such purpose. The resulting good would thus act and re-act in many ways. To achieve this object it would be necessary to select a tract of land in each village which would be good enough for planting with hardy trees, but yet too poor to be worth cultivating, obtain legal enactment for its being set apart for the communal purpose referred to and impound the services of the villagers for breaking up the ground, planting it and surrounding with a good stout mud fence, the enclosure after a few years being thrown open to the cattle in the hot season. Such an undertaking would, as Mr. Hume remarks, undoubtedly be vast, but there could be no possible objection to an experimental and partial trial of it in any selected localities, and its beneficial outcome would be manifold and permanent.

The list of subjects which would fall to the notice of an Agricultural Department is, from the circumstances of the case, a long one. One feels tempted to dwell on the improvement of which the rude native mechanical appliances are susceptible, the utilization of undeveloped products (such, for instance, as the numerous fibres indigenous to India and adapted for a supply of paper-making stock), the improvement in the breeds of cattle, and a score of other important and pressing needs. We have, however, cited enough to indicate that the reforms which await attention in India, have the closest and most vital bearing on the economic condition and wealth of the country, and that some agency for their due discharge is imperatively called for. The Indian Agricultural Department suffered a practical abolition when the late Viceroy amalgamated it with the Home Department, and discharged its exceptionally gifted chief. All prospects of achieving any great agricultural reform was thus, for a time, effectually shut out. It may, however, be not too much now to hope that the present Governor-General may see his way to carry into practice tentatively some such project as Lord Mayo planned. Its results and teaching could not but be valuable and instructive, and under competent direction they might be successful enough to earn him the thanks of all posterity.—*Times.*

THE CULTIVATION OF BEET.

THE cultivation of beet occupies a large amount of public attention. France produces about one-fifth of the total European yield. About 5 per cent. of sugar is obtained from roots grown in this country, while in Germany and Austria, the return varies from 8¼ to 8¾ per cent. The reason of this difference is due to the French farmer aiming at once to secure roots that will simultaneously repay the sugar manufacturer, the distiller, and the stock fattener. Large roots are the terror of fabricants, which growers complain that the factories do not offer prices

to encourage the raising of smaller-sized ones. In Belgium, agriculturists assert they are ruined by accepting the seed supplied by the factory proprietors; however, there can be a serious difference in the richness of a variety of beet as much even as 6½ per cent. The aim in sugar beet culture is to plant in narrow lines, moderately manure, secure a root about 2lbs. weight, globular, not growing much above ground, with few roots, and hence easy to lift and subsequently manipulate. Of the prospects of this season's crop sowings are late, and vegetation three weeks in arrears. The advantage, however, is clearly in favor of early sowings so far. Another moot point, now occupying prominent attention, is what is the best base for determining the commercial richness of beet? The majority advocate selling according to density; but Professor Petermann of Belgium leans to the system of saccharine richness. In the former plan, the better theoretically for all interested, the chief difficulty lies in its application. M. Pagnoul, an authority in the dispute, lays down a juice density scale, commencing at 4·5 degrees, and rising by one-tenths to 7. A density of five degrees, would represent a saccharine richness of 9·5 per cent., and a yield per acre of 20 tons, at the price of fr. 16 per ton.: A density of 7 degrees, 15 per cent. of sugar, a return of 18 tons per acre at a price of fr. 38 per ton, being a monetary difference in favor of the latter, of fr. 94 per acre. A juice of a density below 5 degrees becomes unremunerative, not only containing less sugar, but more foreign matter detrimental to the extraction of the sugar. The density could be estimated by having an independent official at the factories, who would determine it from half-a-dozen of average sized roots, three to be selected by the fabricant, and three by the farmer. Some agriculturists, in order to increase the density of the juice, have recourse to the fraudulent plan of applying nitrates to the beet during the last stage of its growth. This induces fresh vegetation, the root augments and also the leaves, but at the expense of the sugar in the tissue of the roots, so that the density which was 5 degrees falls to four, and the fabricants quickly discover the fraud. M. Pagnoul advocates the raising of eleven beet roots to the square yard, each root to weigh about 14 ounces, and the yield per acre to be 16 tons. A ton of beet carries off from the soil 18lbs. of alkaline salts. Manures for beet ought to be of a nature to be rapidly assimilated, capable of acting at the commencement and middle state of the plant's growth, during the period when light is strongest and longest, and so more favorable for the production of sugar. A slowly acting manure, produces the same effect on the roots as the fraudulent application of nitrates just described. To avoid such a result, German farmers apply farm-yard manure to the preceding crop, employing a limited dose of nitrate of soda and superphosphate, following the wants of the soil, before sowing. All that tends to produce a rapidly developing root can only be favorable to its saccharine qualities.—*Madras Mail.*

THE DATE PALM.

THE wild original of the Date Palm is not known with certainty. Some writers regard *Phœnix spinosa* as the wild form from which it has descended, whilst others would trace it to *P. sylvestris*. Fischer does not mention the latter species, which inhabits the warmer parts of India; but he combats the view that the former can be the parent of the cultivated date, because its distribution affords proof of a totally different constitution. It inhabits tropical Africa, and is restricted to regions enjoying copious rain. Our author agrees with Cosson that it is far more probable that the progenitor of the Date Palm was a native of the extra-tropical desert region, the strongest evidence in favor of this being a record that it existed in a wild state in the Canary Islands anterior to their settlement. This record has been in a measure confirmed by Bourgeau's explorations. Nevertheless, it is noteworthy that both of the species of *Phœnix* mentioned closely resemble the date, especially when the latter has run wild, yet they do not overlap the date in their distribution. *P. sylvestris* is one of the commonest plants in India, but it ceases growing where *P. dactylifera* is cultivated or has run wild. A peculiarity of the latter is to produce suckers in abundance, both under cultivation and in a wild condition; and left to itself it forms impenetrable thickets. The lofty columnar trunk surmounted by an ample crown of feathery leaves with pendent heavy golden or red clusters of dates, is a product of art, not of Nature, for the leaves naturally persist and conceal the grace and elegance of the tree. The true date exists in a wild state in many places throughout its cultivated area. Roughly this area may be described as the extra tropical rainless and slightly rainy region of North Africa, from the Atlantic to Egypt, and through Arabia, Persia, and Afghanistan, to the Punjab in India. This zone lies between the 15th and 35th parallels of latitude. It is also cultivated in some situations in Southern Europe, where the climatal conditions are similar. We have not sufficient space to enter into the history of the cultivation of the date, and the impress it has left on the works of the ancients; but we may recall the massive pillars in the ruins of Edfoo (Apollinopolis Magna) surmounted by gigantic capitals, about 7 yards in circumference, faithfully representing the crown of foliage.

OASIS.—The date palm alone preserves, and to a great extent constitutes these small isolated spots of vegetation characteristic of the wide, wide Sahara. In their figurative language, the Arabs say "this King of the Oasis plunges its feet into water, and its head into the fire of heaven." This pretty accurately describes the conditions under which it flourishes best. Where the atmosphere is humid or the rainfall considerable, there the date palm will not ripen its fruit. Cosson (*Le Regne Végétal en Algérie*, p. 58) states that if there is such a thing as an oasis in Europe, it is at Elche in Valencia, where there is a plantation of 60,000 date palms ripening their fruit. Under the shade of the date, cereals and many other plants are cultivated.

CULTIVATION.—Abundant moisture at the roots, great heat at least during the summer, much sunshine and the little rainfall, are the most essential conditions in the cultivation of the date. Neither the fiercest heat of the sun nor the strongest winds injure its foliage. The wind may bend the crown to the earth, or even uproot the tree, but it is incapable of breaking its trunk, and it will bear without injury 10 deg. or 12 deg. of frost, as well as very low night temperatures succeeding very high day temperatures. The nature of the soil is of little importance, provided always there is plenty of water, which may be either fresh or brackish. Like most of our fruit trees that have been long under cultivation, the date palm has given birth to innumerable varieties, and these increase in number as we recede from either the Polar or Equatorial limit of its cultivation, whereas only two are distinguished at Elche in Spain, and Thebes in Persia. Cosson enumerates seventy-five for the Oasis of Zibau. These varieties differ in the consistence, shape, colour, and ripening season of the fruit, and they bear such names as the beauty of Mimon, the Gazelle's Horn, Dove's Egg, Bird's Brain, Bitter-sweet, Sweetness Itself, &c. Propagation is usually effected by means of suckers as they not only perpetuate the variety pure, but come into bearing much younger, and the cultivator runs no risk of over-production of the male plants. In five years they produce fruit, though they do not come into full bearing until they are about thirty years old. After they attain eighty or ninety years, the crop begins to diminish, yet they sometimes continue bearing until they are 200 years old. The trunk is of very slow growth, and eventually reaches a height of 70 or 80 feet. An old tree that produces fruit of a superior quality is sometimes rejuvenated by banking up the trunk with mud to a depth of two yards. In about a year's time it is rooted in the mud; it is then cut off above the old roots and transplanted.

DESTRUCTION OF DATE GROVES.—Generally speaking the destruction of a tree is regarded as a sinful act, and the most deplorable results have followed the cutting down of the enemy's date palms in warfare. Extensive areas have been thereby rendered permanently desolate.

IMPORTANCE OF THE FRUIT.—Although the inhabitants of the desert subsist for long periods almost or quite upon dates, yet these do not replace every other article of diet as the cocoa-nut does in some regions. They may replace milk, fish, and meat, but grain is regarded as a necessary concomitant. Dates are prepared for eating in a variety of ways. An Arabian proverb says that a good housewife knows how to dish her husband up dates differently every day for a month. Animals as well as human beings draw a great part of their nourishment from dates—the seeds are given to animals. Fresh fruit is very largely consumed, and may be had for several months in the year in the most favourable situations, but immense quantities are dried and stored, and if properly done will keep good for years. It is estimated that many millions of persons derive the greater part of their nourishment from the date palm, and by far the greater part are inhabitants of extratropical regions.

INDIAN HONEY.

IN England the cultivation of bees has attained extraordinary perfection, and every year we have a Honey Show, where the latest improvements in hives, and the largest specimens of combs are exhibited, and rewards given according to merit. The poorer class are in this way encouraged to exercise thrift by cultivating the remunerative and easily kept bee. Even in busy London, with its superabundance of lime and brick, and its scant allowance of shrubs and flowers, high up on fifth and sixth storeys bee-hives are kept, and while busy men are hurrying along the street to collect their money, the busy bee is speeding along high in mid-air to collect its honey. Perhaps the reason why in India so little is known of the subject, is that our first acquaintance with the indigenous article is derived from the purchase of a bottle of that noxious liquid sold in beer and brandy bottles as Mahableshwur honey. It looks like castor-oil in the crude state and tastes, partly like it, and partly, perhaps, like jaggree or molasses flavoured with onion. I eschew "Mahableshwur honey."

The bee has in all ages carried off the palm as an example to man. Its praises have been sung by poets and philosphers for its industry, intelligence, thrift, forethought, &c., and Dr. Watts has made us familiar with its habit of improving each shining hour. Solomon has referred the sluggard to the ant if he wishes to mend his ways, but I think he might almost as well have referred him to the bee, unless it be for this reason that the bee is altogether dependent on "shining hours." Wet and cold put a complete stop to his operations. I must not, however, dwell longer on these commonplaces, except to say that I believe the government of a hive is not a commonwealth but a monarchy. The queen is a sovereign in every sense of the word. She is continually followed by her bodyguard, and the deference shown her by the other bees shows that they at least do not think one bee as good as another. The citizens, it is true, [illegible] work for the good of the State, as it was in the palmy days of Rome, [illegible]

the queen is the dictator. There is no republic in Nature. Neither shall I go over such points in bee economy as are the same among English and Indian bees. If any one wishes to be informed on these points, any book on bees will enlighten him. I shall only refer to "things not generally known" about the three common kinds of honey bees to be found in that ubiquitous portion of India known as Dustypore. Two of these kinds are in some parts of the country not uncommon, and may be called the big and small honey bee. The big bee very closely resembles its English contemporary in colour and appearance, but he is nearly half as large again, and his disposition is totally different. He is active and fierce, and his sting is far more formidable, so that no one can any approach his hive with impunity. He is not to be meddled, with—no, not for a moment. Fortunately for us men, his hive is usually "situate" aloft on the underside of some high rock, or public building like the Rajabhai tower, or if it be a woody country, on the branch of some large tree so that there is little danger of disturbing a swarm, and nothing is to be feared from a solitary bee. Woe betide the man, however, who unwittingly lights a fire under such a tree, for the smoke, as it "gracefully curls" upwards, will soon bring down the whole army, and they will execute terrible vengeance. I once saw a swarm of, I suppose 20,000, seeking for suitable spot to settle on, and as they buzzed round and inspected the head of my ghorawalla, he angrily struck one to the ground. In a moment news of the outrage was communicated to the others, and half-a-dozen stings were buried deep in his face and arms. This premonition saved him, for he fled howling to his tent, and managed to close the doors just in time to keep out the whole swarm which came hotly pursuing after him. On the principle of "love me love my dog," the infuriated bees then fell upon his innocent horses and though the beasts rooled on heir backs, killing hundreds every minute, the dark cloud which hung over them never seemed to diminish. It was not till they got rid of their ropes that they were able to escape from their persecutors by galloping over the plains. I do not see why the honey of these bees should not be obtainable by carefully protecting all one's vulnerable parts, and then climbing boldly up to the hive and cutting it down; and if the hive be in an accessible place, the bees may easily be driven off with fire and smoke at night. The natives, however, in most parts of the country, much as they love sweets, scarcely seem to be aware that the hives cont in honey, but avoid them with a kind of horror. It is only where honey is sufficiently common to make trade in the article profitable, that a class of men springs up whose "business" it is to collect it. The ordinary Hindoo will not be tempted into trying dangerous experiments. Who knows what might become of him! I must not forget to mention that it is a merciful provision of Nature to compensate poor distressed bee-stung humanity, that whenever a bee stings a man, the sting comes off, and as the bee cannot live without its sting, it soon dies. We may therefore whenever a bee stings us, always soothe ourselves with the thought that we have killed the bee.

The comb of this bee, when finished, is about three feet in length and about two and-a-half in depth, and the cells are back to back, as in English hives. Only the honey is always storted in the cells at the top round the branch, and the lower cells beneath the branch are devoted to the larvæ, so that it is an easy matter to separate the honey. This is the form adopted by all the three kinds of bees I have referred to. The bees never use the same cells for different purposes. The big bees make a prodigious quantity of honey, but owing to the dangerous character of the insect my information is limited, and I have never measured the produce in quarts.

I have a much greater affection for the little bee than for the big savage monster. He is an inoffensive little thing, scarcely larger than a table fly, and those who have gardens must have seen him often murmuring among the flowers and collecting his treasure with his little woolly feet. Moreover, his sting will not penetrate the human skin, and he is always drowsy, and never seems to have his wits about him. In fact, on a cold weather morning, he cannot be got to move at all. I think if experiments in keeping bees will succeed in India at all, this is the kind that would prove most practicable. The hive is generally in a thick bush or hedgerow near the garden. Not, however, because the bees like our flowers. On the contrary, showy flowers, and above all double flowers, are their abhorrence. The bee may patronise some of our flowers, but it is the little, highly-spiced aromatic, pollen-producing wild flower that is his favourite. He seeks the haunts of men only because in a well-watered region he can get his supplies within a limited area, and that is what he wants. He cannot, like the big bee, secure miles of country. The comb of this bee is at its largest only eight or nine inches in length, and the greatest quantity of honey I have ever found in one was three-quarters of a pound.

The third variety of bee which I mean to describe is not to be distinguished from the last in appearance; nevertheless, there is one important difference, namely, that it is possessed of rather a formidab'e sting. It is possible that the sting is only a development which the honey-eating propensities of Englishmen have rendered necessary to prevent the race being exterminated; but as Englishmen know nothing about these bees, I am inclined to think this one is a distinct species, and its close resemblance to the other species is only intended to create an occasional pleasant surprise among honey-eaters in general. I once had such a pleasant surprise. One fine morning, while out walking, I spied, some yards from the ground, in the overhanging branches of a [illegible] tree, a small bee-hive. I quickly scrambled up the trunk of the tree, and crept along the branches to the hive. Then taking out my knife, I pushed aside the bees to see what was the amount of honey. Before I could cry 'Jack Robinson," several bees shot out from the hive, and made "remarks" on my face which made me retreat precipitately among the leaves. Luckily, leaves afford a complete protection from bees, and while the wretches were thinking they had routed me with great slaughter, I was already meditating fresh schemes for revenge. I left as I had come, and next morning returned again better prepared. First of all I ascended the tree, and with a small saw quietly cut through the branch at some distance from the hive. The branch was borne up by several others around it, so I did not disturb the bees. I then tied a string to the branch, and threw one end to the ground. I then descended, and put on my armour, which consisted of a muslin bag put over my head and tied at the neck, and a pair of gloves. I also tied my sleeves at the wrists and my pants at the feet, lest perchance the bees might travel down them and turn the corner. All being ready, I took hold of my string, and with one ferocious pull brought down branch and hive. In an instant, the bees guessing that my face was the most vulnerable part, came down like a cloud on the muslin. Had the onslaught been as persistent as it was fierce, I have little doubt they would have discovered joints in my harness, but fortunately for me, as soon as they found their stings ineffective, they beat a retreat. When I felt assured of my safety, I removed my gear, and found the comb uninjured, with scarcely a bee left. I bore it home in triumph to discuss at my leisure, and the honey was almost the best I have ever tasted. The honey of the big bee is no doubt stronger and more worth having than that of the others, but what affects the quality of the article more than anything else is the flowers from which it is gathered, and wild flowers are the best. The honey of the little bee varies so much, that it is sometimes, like sugar and water, and at others almost equal to the best English honey.

Just one point more before I close, which may interest naturalists. All these kinds of bees first make their appearance about the beginning of October, and continue their work till May. This honey is not stored up for the use of the old bees in winter, but is a sort of "pick-me-up" for the young ones, and as each young bee breaks the covering of its cell and issues forth, its first act is to climb to the cells at the top of the hive and take a long draught of honey. After taking this draught it is soon ready to commence business itself, but without it it soon dies. The young bees come out in regular order as the cells have been built, beginning with those nearest the branch, and extending in a semi-circle to the edge of the comb. Whenever a sufficient number of bees has been hatched to form a swarm, they leave the hive on their own account, and the amount of honey is exactly suited to the wants of young bees, so that when the last of the bees is hatched and has taken its initial draught, there is no more honey left. I do not know if one swarm will make two combs during the same season, but by the end of May all the honey is done, and the combs are deserted. What becomes of the bees after that I do not know. It seems not improbable that they pass the wet months in the hollows of trees, but I have never seen this authentically stated.—*Journal of Applied Science.*

AGRICULTURISTS IN CAP AND GOWN.

A SHORT time ago the students of the Madras Agricultural College presented a petition to the Senate of the University of Madras with a prayer that it "would patronise the institution, and take under its fostering wings, a science, the study of which your petitioners submitted was no less important than that of Civil Engineering and Medicine." In other words those who signed the petition wished to be placed on the same footing as other University students. They say :—"That seeing the primary importance which the profession of the husbandman occupies, and must occupy in this country in the face of a rapidly increasing population with the arable area already pushed almost to its extreme limits, your petitioners feel sure that you will think it necessary and desirable that the intellect of the country should be directed to the study of Scientific Agriculture, which *alone* can prevent the results which such a condition must bring about if unchecked. That from the improvement of agriculture, as great benefits will accrue to the people of this country as from the study of Civil Engineering and Medicine which have been patronized by the University. That your petitioners hope that, if the University affiliates to it this institution and grants Degrees in Agriculture, the art now so degraded will rise in the eyes of the people and its true importance as "the most useful, the most noble employment of man" will come to be better recognized. That agriculture is a recognized part of the University curriculum of many American Scotch and German Universities, and that distinct Degrees in agriculture are now granted in some of them."

It must be admitted that there is great truth in what is here said; that agriculture ought to be treated scientifically there can be no doubt, and that it ought to be improved is evident to those who have been any time in the country. It would be better that youths should take a degree in farming than in arts, for in the former case they would help to develop the resources of the country, while in the latter they would only settle down to Government employ. But we question whether the scheme put forward by the students is the best calculated to forward the interests of agriculture; we think that the country is not sufficiently advanced to allow of degrees

being given for this subject. It is true that in American, Scotch, and German Universities such degrees are given, but it must be borne in mind that agriculture is in a very different state in the countries of the west from what it is in India. For many years past Europe and America have been doing their best to make the most of the land and everything has been done to get the greatest amount of possible good out of it. But the case is very different in India, and the farmer here is not able to carry out the suggestions of the scientist. There they do not think that the proper plan is to follow the footsteps of their ancestors; they do not believe that everything is right simply because those before them did it.

Looking at the course of instruction laid down in the Madras Agricultural College, we cannot help thinking that it is far too ambitious in its character; far beyond what is required. We do not say that agriculture should not have a high standing; that it should not eventually be ranked with engineering and medicine, but at the present time something of a simple nature would be sufficient. The education that the youths receive will place them far above the most intelligent ryots, and the result will most probably be that these young men will look down upon the men whom they will be expected to instruct; the ryots will look upon their knowledge as new fangled and unsuited to their wants, and consequently they will reject the instruction that will be given to them. The cultivators will be likely to ask these young men whether they have come to teach their grandmothers to suck eggs, or a similar question in the vernacular. The fact is, to give men a thoroughly scientific—or rather we should say, collegiate—education, and then to send them out among ignorant ryots is something like using razors to cut blocks of granite. It would be better to give the students a less ambitious education in the first place, and then after they had taken their place on the land and taught the ryots the benefit of a superior system of cultivation, the curriculum of instruction might be raised. At the present time it is not so much scientific knowledge that is required as practical improvement, and it is to be feared that the youths who are trained in the College will pay more attention to the former than to the latter; we fancy that they will consider everything that is worth learning is to be obtained in the lecture room, and should the Senate of the University grant the payers of the students and confer degrees in agriculture, we feel sure that the out-door work, by far the most important will be looked upon with great disfavour, and will as far as possible, be neglected.

The petition before us, shows what a hold the University has upon the minds of Indian youths; they seem to imagine that everything that does not lead up to this is worthless; that knowledge that has not the superscription of the University upon it ought to be rejected. This feeling exists to a most unwholesome degree, and the petition before us is a proof of it. The knowledge which the youths who signed the document value most is that which would make them stand the highest in the University list, and in all probability this is the knowledge that would be of the least use to them as agriculturists. We think, after perusing the petition before us, that the Senate of the University instead of granting the prayer of those who signed it would do well to put that institution on a better basis in other respects.—*Bangalore Spectator.*

EFFORTS TO IMPROVE NATIVE HUSBANDRY IN SOUTH INDIA.

(By Wm. Robertson.)

In May 1880, I had the honour to read before the Society of Arts, a paper on "The State of Agriculture in South India." Since then the Indian Famine Commission Report has been issued, and several important papers, embracing many of the subjects dealt with in my paper, have been read before this and other societies. Of course, on such questions some differences of opinion must exist, but, on the whole, the opinions expressed agree generally, with those I ventured to place before you. My conclusions may be summarised regarding South India as follows:—

(a.) The good land is already under tillage: any addition made to the tillage area must therefore consist of inferior soils.

(b.) Additions made to the tillage area must be at the expense of the area that produces scrub-jungle and grass, which afford the ryot—free of cost—fuel for domestic use, and grazing for his stock, which resources thereby become lessened.

(c.) The addition of large areas of poor soils to the area under tillage, increases the necessity for applying manure, while the corresponding decrease in the area yielding fuel and grazing, diminishes the ryot's means of supplying this manure.

(d.) The proportion of the occupied area, cropped annually, is considerably greater now than at any previous period, thus the benefiting influences of "fallowing" are less exercised.

(e.) Half-tilled, unmanured, arable land, bare for six months in the year, is much less able to retain and store the rainfall than the land when under scrub-jungle; the rain-water flows more quickly off the land into the beds of streams, and the irrigation sources dry up sooner in the season.

(f.) There is, generally, a great waste of irrigation water; were the water used with care, the irrigable area might be largely increased.

(g.) Famines occur during long periods of drought, when the crops cannot obtain the water they require.

(h.) The half million persons added yearly to the population of the presidency, rely for food chiefly on crops raised on inferior soils, farmed without the aid of irrigation water, and almost without manure.

(i.) Under present conditions, famines are likely to become more frequent and more severe.

(j.) Under good husbandry—by deeper tillage, and by the use of organic manures—the soils might be made much more fertile, and the crops rendered less liable to suffer injury during a moderate drought.

(k.) The welfare of the State depends upon the condition of agriculture even to a greater extent now than formerly, seeing that it has guaranteed to protect the people against the effects of famine.

(l.) A primitive system of husbandry, which sufficed to meet the wants of a scanty population, when there was plenty of good land available, no longer suffices, now that the demand for human food has become so great, and such a large area of poor soil has to be tilled.

Early in the present century, attention was given by the State to the improvement of indigenous varieties of cotton, but nothing on an extensive scale was attempted until about 40 years ago, when the Marquis of Tweeddale was Governor of Madras. A Cotton Department was then organised, and cotton farms were established in various parts of the presidency. These so-called farms, I should explain, were mere tracks of land, frequently unfenced, and generally without any buildings. The land was devoted exclusively to the culture of cotton. On these farms, crops of Bourbon, Egyptian, and New Orleans cotton were grown from imported seed, and the seed produced was distributed over the presidency; but the land was devoted chiefly to the culture of the better kinds of indigenous cotton, which, it was thought, might be improved by better culture, the liberal use of suitable manures, the careful selection of the best seed for sowing, &c. These farms were under the direct charge of men who had been brought from America, and who were supposed to possess a thorough knowledge of the cultivation of cotton, and its treatment when undergoing preparation for the market. In connection with these farms, experiments were carried on in ginning and packing cotton for export. These cotton farms were carried on for a short time in the face of many difficulties. Some valuable experiments were carried out, and much important information was collected. But a new Governor having been appointed, who had no interest in agriculture, the partially dormant opposition, which had existed for some time, assumed an active form, and the Cotton Department was eventually suppressed. There can be no doubt whatever that the administration of the department was defective in some important respects. But taking into account the state of agricultural knowledge at that period, the many difficulties to be overcome, and the hostility of the class from whom aid and support might have been hoped for, the experiment was quite as successful as in reason could be expected. It was certainly a mistake to confine the operations of the farms exclusively to cotton culture. Had efforts been made on a similar scale, and with the same persistency, to improve agriculture generally, any improvement secured would have acted for good on cotton culture, and such results thus obtained would have been more lasting in their influence. It was also a decided mistake to improve largely seed of superior varieties of cotton from countries where cotton is grown on fertile, almost virgin soils, or cultivated with skill by intelligent planters, and to attempt to introduce these kinds of cotton at once into general cultivation in South India, on impoverished shallow tilled, unmanured soils. Before superior sorts of cotton can be grown in South India with success, there must be a very great improvement in the character of the husbandry generally practised. In a few favoured localities, in various parts of the country, the conditions necessary for the successful culture of the higher races of the cotton plant can undoubtedly be secured; but the land thus favourably circumstanced is already usually fully utilised.

However, as I have already stated, the Cotton Department effected much good. We have, even now, in certain districts in South India, a variety of cotton introduced and acclimatised by the department, which, though much deteriorated, is still superior to any indigenous cotton; while there can be no doubt that the immense quantity of superior cotton seed distributed over the country has effected much good in indigenous cotton, by inter-breeding with it.

The plea under which the Cotton Department was suppressed, was that the department was not a financial success—that its income did not meet its expenses, as if this was the standard by which the results of the operations conducted were to be judged. I never can understand why in India this standard should be applied only to enterprises having for their object the improvement of agriculture. Were the same standard applied to the results of the working of the various departments of the State, in determining the claims of these departments for continued existence, I fear they would have no better ground to exist longer than had the defunct Cotton Department; while, in this country, that great institution, the South Kensington Museum, which is doing so much for the education of the British public, the equally important institution at Kew, would have to be suppressed were their results judged of by this shop-keeping standard. It is true that the out-come of all successful agricultural enterprise must of necessity, be a gain, but it does not follow that this gain can be made to assume a money form for the State.

Of the many difficulties encountered in conducting the work of the Cotton Department, not the least was the suspicions with which its operations

were viewed by the ryots generally. They could not imagine it possible that a Government, apparently influenced only by ordinary commercial policy, could act, as it were, disinterestedly. In many instances they not only refused the use of their land for the experiments, though a liberal money compensation was offered, but not unfrequently refused to accept, for sowing, superior cotton seed when offered free of all charge. They seemed firmly to believe that the sole object of Government in giving attention to cotton culture, was to get a reason for raising the rent of the land.

After the closing of the Cotton Department, the State withdrew from all active interference in cotton cultivation, and, for some years but little was done by the State in any other direction towards agricultural improvement. A few isolated experiments were conducted here and there under district collectors, notably the late Mr. John Sullivan, who, in the Coimbatore collectorate, conducted many useful agricultural experiments, chiefly in the introduction of new crops on the Nilgiris, then constituting a portion of the Coimbatore district. Amongst other crops he introduced there, was a variety of wheat obtained from South Italy, which at one time was largely cultivated on these hills, and, even now, is grown to some extent there. This gentleman also introduced barley, and several crops now well established on the Nilgiri Hills. But, generally, the experiments conducted by collectors at this period seldom yielded results of a useful nature, not so much from want of knowledge or want of interest on the part of collectors, but from want of leisure to give the experiments the required attention, and from the frequency with which they were transferred to other collectorates.

Agricultural shows have been held in various parts of South India, with a view to the promotion of agricultural improvement. About twenty-five years ago, shows of this nature were frequently held in the different districts. At these shows prizes were offered for good specimens of agricultural stock field produce, agricultural implements, tools, &c. The shows were held at the head-quarters of the collectorates. The prizes were numerous, but small in amount. The average cost of such a show was about £200, the whole of which was provided by Government. In the districts of South India, among a people so backward as are the rural classes there, generally, the holding of agricultural show, could not but be attended with advantage. But the shows were, at first, undoubtedly looked upon with great suspicion by the agricultural classes. The Revenue Board of the Presidency, in referring to one of these provincial shows observed, "The committee at Cuddapah has great difficulties to contend with, and experienced considerable opposition. The show, therefore, can be regarded as having effected little more than dissipated the suspicions and fears of the people." Afterwards, in referring to the results of the first series of these shows, the Board remarked, "The provincial exhibitions, generally, have been as successful as, under all circumstances, could have been expected." About three or four years later (1859), a number of provincial agricultural shows were again held in Madras, fifteen having been held in that year, at a cost of about Rs. 85,000. The results of these shows, appeared to have been considered disappointing, for the Board of Revenue, who again had the control and general management of the shows, thus wrote :—

"On the present occasion, long notice was given, and full publicity ensured. The sum placed by Government at the disposal of the local committee was ample, and liberal prizes were offered for competition. The Board regret, however, to state that, with few exceptions, the result has not been satisfactory. The novelty of the thing has, to a great extent, worn off; the preconceived idea, of the majority of the exhibitors, apparently, that the trouble of producing a specimen was in all cases deserving of reward, without reference to the character of the article, and their corresponding disappointment, the depreciating accounts of unsuccessful competitors, the fear of cholera and, in some instances, the superstitious belief that the unfavourable seasons of late years were to some extent produced by the 'evil eye' of those to whom the produce of their labours was publicly exhibited, have combined to produce this result. The interest, however, of the spectators seems to have been unabated, and that good has resulted from the movement the Board believe. The cultivation of valuable special products has been extended, and in some cases originated—improvements in farming, in cattle breeding, and in implements, have been encouraged, and some acquaintance with the advantages of machinery afforded. Some branches of manufacture, which promise to be valuable, have been developed, especially in fibres, and it may confidently be expected that the seeds of emulation and enterprise that have been sown will bear fruit in the future."

If the results mentioned in the latter part of this quotation were really as stated, I venture to think that these provincial shows were successful, and that they ought to have been continued from year to year.

During the last 20 years, but very little has been done in holding agricultural shows. Two have been held near the City of Madras, and one on the Nilgiris, and one or two in other districts; but none since 1874. In one district, that of Nellore, cattle shows were held for several years in succession; but these also have been discontinued. At the present time, therefore, this highly important means of improving agriculture is altogether unemployed in South India.

In England, with its highly advanced agriculture, we have in every county an agricultural association, and in many counties several district or local agricultural societies, all actively at work in promoting agricultural progress. These associations and societies in the British isles spend annually very little less than half a million pounds sterling; an expenditure which, I think, can be justified on strictly commercial principles, and yet, according to the present Indian official view, such an expenditure would be considered unjustifiable. I am strongly of opinion that agricultural shows should be held annually in every district of South India. The cost would be but trifling compared with the vast revenue the land yields the State, and I am confident that eventually satisfactory results would be secured. For a time we must be content to sow, feeling assured that, if proper means are taken, a harvest of good results will certainly follow. Agriculturists are slow everywhere in adopting improvements. It is unfortunate that, in dealing with the great question of agricultural reform in India, narrow-minded, unintelligent views have been allowed to crush the germs of reform. The matter must be viewed from the same standpoint as ordinary educational efforts. If the expenditure of £100,000 a year on literary education in South India is justifiable, surely the expenditure of a few thousand pounds annually over that country, in promoting the material interest of the classes amongst whom we are so anxious to create M.A.'s and B.A.'s is, to say the least, equally justifiable. But, then our land administrators are "classical scholars," not agriculturists, and their panacea for the deplorable state of the agricultural classes—and, let it be remembered, India is essentially an agricultural country—is education in Greek and Latin.

When Sir William Denison became Governor of Madras, attention was again directed to agricultural improvement, and this was kept up until Lord Napier, who succeeded Sir William Denison ceased to be the Governor of the Presidency. A large number of agricultural implements and machines were then purchased in this country, but, when they arrived in India, it was found that they could not be worked under suitable conditions, Government then having no suitable land under its direct control on which the machines could be worked. The necessity for testing these machines, &c., under proper superintendence suggested to the authorities in 1865, the propriety of establishing a Government farm; and a piece of land of about 300 acres, situated about six miles to the south of Madras, which was then covered by a prickly-pear jungle, was selected as the site of the farm. The selection was made because the land was the property of Government, and because the medical authorities had declared that it was absolutely necessary to clear the land, as in its then state it was the cause of much fever in the neighbouring town of Saidapet. A committee of Government officials was appointed to manage the farm. At first, operations were confined to clearing a few acres of land, sufficient to afford opportunities for trying field implements, chiefly light ploughs. For some years after opening the farm, but little was done beyond clearing the prickly-pear jungle, laying out the land in fields, making roads, and erecting cattle-sheds. The committee got together some useful varieties of farm stock, and conducted several small experiments in growing new crops. But their attention was chiefly confined to implements of which they imported several useful kinds. At this period of the farm's existence, the chief aim of its conductors was simply to show that European implements of a suitable kind, could be worked with success by the cattle of the country. They also gave attention to water-lifts, of which they purchased and erected several of different kinds for experimental trials.

In 1871, this committee was abolished, and the general control of the farm was given over to the Presidency Board of Revenue. It was then proposed that the farm at Saidapet should be a central experimental station, with branch experimental stations in each district of the presidency, the whole to be conducted by a small department, then organised with head-quarters at Saidapet. The objects to be kept in view by the department were specified by Government to be as follows :—

(1.) To ascertain, by experiment, the proper use of rotation in crops in this country.

(2.) To introduce the system of root or green crops, in lieu of fallow without artificial irrigation.

(3.) To introduce new crops.

(4.) To provide new kinds of seed; and fresh seed for the crops now cultivated.

(5.) To make experiments in the use of water for the cultivation of crops now termed "dry" crops, and for raising grasses and other crops to be used as fodder.

(6.) To make experiments in the use of lime and other manures, mineral and animal.

(7.) To introduce new and improved implements of rural labour.

(8.) To improve the working cattle, sheep, horses, and other varieties of live stock in the country.

These objects have been steadily kept in view in the management of the department, as far as its very limited means permitted, or as the controlling authorities would allow.

The first difficulty that presented itself in attempting to carry out the scheme was, the absence of qualified natives, who alone were to be placed in charge of the district stations. To meet this difficulty, Government authorised the entertainment, at Saidapet, of a number of youths who were to be trained there, for employment afterwards as superintendents of these stations. These youths were to become qualified for their difficult duties merely by taking part in the ordinary operations of the farm. Though liberal stipends were offered, and promises were held out of future employment on liberal salaries, no well educated youths, of the stamp required, could be induced to join this apprentice class.

The fact was, as agriculture was at that time known to the people generally, it was estimated a pursuit only fitted for the unintelligent portion of the community. A class was formed of the sons of subordinate officials and others, who duly appreciated the high stipends (Rs 40 per month) offered, but it was soon ascertained that mere field-training would never fit men of the sort forming the class to hold the responsible position of superintendents of experimental stations. After a very full trial, the fact was recognised—a fact well known before to those acquainted with the subject—that in order to provide qualified native superintendents for the district experimental stations, it was absolutely necessary to secure well educated youths, and to subject them to a prolonged training of a systematic kind. In this view, the Revenue Board of that day fully concurred, as the following extract from one of their published proceedings shows :—

"(1.) That unless systematic instruction in agriculture and the sciences bearing on it is given at the Saidapet farm, competent superintendents for the experimental farms, which are to be instituted, cannot be trained there.

"(2.) That without superintendents trained in this way, the experimental farms will be of little or no use.

"(3.) That the means for giving such a training, the lecturers, the students, and the opportunities for practising what is taught, and the funds, are all available.

"(4.) That the good effects of the instruction will not be limited to a few superintendents of Government farms, but will slowly leaven the agriculture of the whole country, as in England, America, France, and Germany.

"(5.) That as a scene of systematic instruction open to all comers, the Saidapet farm will be infinitely more useful to the public than it is at present."

It was only after a great expenditure of time and effort in discussing the question, that a reluctant consent was obtained for the establishment of an agricultural college, on a small scale, at Saidapet in which youths could be trained for employment, as superintendents of district experimental stations, and agricultural instructors; for private employment, &c. A comprehensive scheme was organised, and its details extensively published in the form of a prospectus. Though the institution was originated in view to train district farm superintendents, &c., no inducements of any kinds were held out of State employment for those who passed successfully through the institution. Indeed, there was a nervous anxiety at the time that every candidate should clearly understand that, in qualifying as an agriculturist in the institution, he would thereby establish no claim whatever on Government. In connection with the institution, 24 bursaries were established, each worth about £15 a year and tenable during 2½ years of the three years of training. These bursaries could only be got and retained by really industrious students after six months' attendance at the college, and who continued during their whole course of training to keep up to the standard of progress laid down. A high minimum of marks was to be gained at each of the twenty or more examinations of each session, while evidence of a thorough practical acquaintance with the working of ploughs and other field implements was insisted on.

After a sufficient time had elapsed to allow of the thorough publication of the prospectus, and for a full discussion in the native press of the objects and nature of the new institution, applications from would-be candidates began to be received in considerable numbers, and from nearly all parts of India. No candidate was accepted who had not qualified in the educational standard prescribed for ordinary State employment, or for proceeding to a University degree, or who failed to pass the special (equally difficult) entrance examination of the college. All candidates had to produce medical certificates of physical fitness for active employment, certificates of character, &c., and each candidate selected was between the ages of 18 and 24.

Notwithstanding the previous repeated failures in filling the apprentice classes, when such substantial advantages were offered, there was no difficulty now in securing any number of qualified, educated youths. The institution began work in 1876, with a first class, in temporary sheds. The erection of commodious but unpretentious buildings was sanctioned, in which to carry on the work of the institution. The permanent accommodation was to consist of lecture-rooms, class-rooms, a reading-room, and a library; and separate buildings were to provide accommodation for a veterinary hospital and a chemical laboratory; while, in addition to the farm, botanical grounds were to be established; but only the chemical laboratory has yet been erected. The nature of the training afforded by the institution, will be gathered from the following extracts from the college prospectus :—

"The instruction given in the institution will embrace a thorough study of agriculture, and of such portions of chemistry, geology, zoology botany, and the veterinary art as bear on the theory and practice of agriculture. In addition to these special subjects, the following will also receive attention :—Farm book-keeping, land surveying, mensuration, and drawing. The instruction will be given by means of lectures, class-room discussions, and field classes.

"During the portion of the day set apart for practical instruction in farming out of doors, every student will be expected to take part in whatever work is going forward on the farm; compliance with this regulation will be strictly enforced. Each student will be expected to make himself acquainted with all the operations daily performed on the farm, and will be required to keep a journal or diary of the same."

In 1878, a second class was formed, and applications for admission into it were even more numerous than they were for admission into the first class. That there was a widespread demand for agricultural instruction was amply evident.

In reviewing the work of the institution at this period, after it had been at work for nearly three years, the Government of the Presidency, in a published order, stated, "the progress and working of the institution have, on the whole, been very satisfactory."

A change of policy, however, took place at about this time in the treatment of the institution, partly under the influence of the general State policy of reduction of expenditure, from which that department suffered. And of the twenty-four bursaries attached to the institution, nine were then suppressed, and these were afterwards reduced to five only in a class; while the value of the bursaries was reduced from about £12 to £3 per annum. The entire saving to the State by these reductions would amount to only about £100 a-year; but the effect, combined with other causes, was highly injurious to the institution, for, when it was again attempted to form a new class, only seven eligible candidates were secured.

The practice of paying stipends, or bursaries, to youths undergoing special training, is almost universal in India, in the Medical, Forest, Educational, and Engineering Departments. Very few students from the agricultural districts can afford the expense of journeys, frequently long and the cost of maintenance away from their homes, during a three years' college course. The provision of bursaries to aid indigent able students, is as necessary, to say the least, in South India, as in Scotland, Ireland, or England. A time may, it is hoped, arrive when agricultural education in India may not require to be aided in this way; but as long as such aid is necessary in every civilised country, it surely was premature to withdraw such aid from the but recently started agricultural institution in Madras.

Only one class of students has completed the full period of training in the Madras College. Of these young men, the majority are filling agricultural situations, and generally with credit; eight of them are employed as agricultural instructors in the Bombay Presidency; but, in Madras, none of the graduates of the college have yet been employed by Government, though there were several well fitted, after undergoing a little special training for the posts of agricultural instructors, and for superintendents of experimental stations, the establishment of which has been deferred so long from the impracticability of previously getting qualified native superintendents.

In Madras, the Educational Department is now beginning to give attention to agricultural instruction, the subject being now taught in several of the rural schools, but nothing of a comprehensive nature can be done in this way, until qualified agricultural teachers are available. And men can become so qualified only by undergoing training in the Madras Agricultural College, which, at present, is the only institution of the kind in the whole of India, and which, I venture to believe, is as fully deserving of State support as any other technical institution in the country.

I never could understand the nervous fear that appears to exist in some quarters, lest students of the college should look to State employment as affording a career in after life. The State employs, in the administration of its vast landed estate, thousands of officials of all grades who are totally without any agricultural education. Many of these officials are employed solely in valuing the land for rent, in collecting agricultural statistics, and in many other ways connected with agriculture. Surely there can be nothing wrong in any agricultural student looking forward to employment in any of these capacities, provided he possesses, in addition to his agricultural knowledge, the qualifications all must possess who seek for such employment. I should have thought that, for the performance of agricultural duties, preference would be given to men who possess a knowledge of agriculture; but so far graduates of the Agricultural College have encountered nothing but difficulties in seeking for State employment where a knowledge of agriculture seems essential. From what I can gather, it appears that the obstacles are put in their way chiefly by the officials of the inferior classes, who do not like the idea of better educated men than themselves getting admission into their ranks.

The Agricultural College has been organised as the central institution for agricultural training in the Presidency of Madras, and it was intended only to afford higher agricultural education. It was proposed that elementary instruction in agriculture should be afforded in the high school of each district with which the branch experimental stations were to be connected, but, as yet, none of these agricultural classes or stations have been established. The college suffers from the absence of these classes, which were intended to be its main feeders; while the course of training in it has been prolonged, from the necessity of the institution undertaking elementary as well as more advanced instruction.

Youths of the ordinary ryot class, the sons of small occupiers, will, in the agricultural classes, at the high schools and middle class schools in the districts, meet with such facilities for gaining a knowledge of the principles of agriculture as appear suited to their requirements. The sons of ryots of the better class, and of small zemindars, with others who

desire a more complete agricultural education, will, it is proposed, pass from the local agricultural instruction classes to the college at Saidapet.

I have dwelt at considerable length, and in much detail, on the subject of establishing the Agricultural College at Madras, because I am anxious that the facts should be thoroughly known and appreciated. The experiment is one of the utmost importance in India, and it should receive fair treatment. Should any erroneous conclusions be formed regarding it, agricultural education, so much needed in that country, may be retarded for years. There are always a number of persons ready to cry out failure when anything new is being tried, and already there are persons glorying in the fact, as they assume it to be, that the college has not been a success, as if it was yet possible to form any definite conclusions on an experiment of such a nature, and conducted under so many difficulties. These persons assert that the bursaries drew the students, and that when the bursaries were done away with, the attraction ceased. Such persons, however altogether (wi llingly or unknowingly) misstate the facts. The bursaries were, undoubtedly, of much benefit to the student in enabling them to meet the heavy cost of not unfrequently long journeys to and from between the college and their homes at the beginning and end of each session, and, indeed, also in meeting the personal expenses of the students at Saidapet. But many of the students must have spent a great deal more on travelling charges and text-books alone than the entire amount they received in bursaries, or scholarships. The aid thus originally given was only such as was barely necessary. It could in no sense be looked upon as an attraction sufficient to bring sudents hundreds of miles from their homes. The majority of them came from places more than 200 miles from the college, several from remote parts of the Bombay Presidency, to undergo hard training of previously unknown kind for three years at the Agricultural College, more especially as there was no prospect held out as there is in the technical institutions of the Forest, Educational, Medical, and Engineering Departments of India, of State employment for successful student.

The Famine Commission have proposed a very extensive scheme of agricultural instruction for Indian civilians at the expense of the State. The cost that would be incurred, for affording each such civilian a knowledge of the principles of agriculture, would provide bursaries sufficient for the entire requirements of the Madras Agricultural College, and secure to it a regular attendance of at least 100 qualified students, while not adding to its working charges; for, I need hardly remark, that a course of lectures for a class of seven or eight students is quite as costly as for a class of thirty or upwards. The benefit that would result to India from the general diffusion of agricultural knowledge amongst the rural classes cannot be overvalued. If, as the Famine Commission report asserts, great benefit would result to India if the European Land Revenue officers possessed a knowledge of the principles of agriculture, it surely is equally true, and, to a far greater extent, that a similar knowledge amongst the thousands of native officials scattered over the country, in close daily intimacy with the agricultural classes, would be productive of far more good in the promotion of agricultural improvement.

Ordinary education, which is gradually spreading its beneficial influences over the country, will, in time, create inquiry, even in the mind of the ryot, and efforts to improve the present state of matters will, no doubt, be made; but the general reform so urgently needed in the husbandry of the country, would not, in this way, be secured in the next 100 years, and the demand for reform is of far too urgent a nature to wait for even a single year's delay. Seeing that the State in South India, though administered by Englishmen, grudgingly spends the one-ninth per cent. of of its rent roll, for promoting agricultural improvement throughout the presidency, there is nothing surprising in the fact that native landowners should be so apathetic regarding the condition of their properties, and the well-being of their tenantry. Before any decided comprehensive improvement can be made in native husbandry, agricultural education must be placed within the reach of every class of agriculturist. The fact that the land pays four-fifths of the gross revenue of the presidency, and that two-thirds of the population are employed in the cultivation of the land, should never be lost sight of in considering questions relating to the improvement of Madras agriculture.

I have already referred to the establishment of the Central Experimental Farm at Saidapet. The following extract from a report submitted by me to Government, shows the nature of the work in which the farm is engaged :—

"The farm being the only one of the kind in South India, it has, necessarily, been obliged to undertake much work in experimental agriculture, of a kind not usually undertaken by experimental farms in other countries. From the almost entire absence in any writings on the agriculture of the country, the ignorance of the people generally, who are engaged in agricultural pursuits, and the imperfect character of the records of the results of previous efforts in improving native agriculture, there was no choice but to institute on the farm experiments of a very elementary character. It will readily be understood that experience gained in this way accumulates but very slowly, as each result needs to be confirmed under different conditions and circumstances before any decided conclusions are possible. The institution has had to do the work of an acclimatis and agricultural society. It has been engaged in introducing and modyfying machines, implements, and tools of other countries adapted to the requirements of Madras agriculture. Attention has been given to subsoil drainage, improved methods of tillage, the restoration of exhausted soils, the utilisation of irrigation water, the fertilisation of arable soils by the use of lime, saltpetre, oil-cake, poudrette, and other manures available in South India, but hitherto unused by the ryot ; the introduction of the new crops suited to the climate of India and adapted for cultivation under an improving agricultural practice, such as mazie, *Sorghum saccharatum*, Carolina paddy, Guinea grass, and other grasses ; New Orleans and other improved varieties, of cotton ; tobacco of all kinds, the production of live fences in view to affording protection, shelter, and fuel ; the introduction of water-lifts, barn-machines, ploughs, cultivators, reaping knives, &c., of improved construction suited after undergoing modificaton for use in South India, the improvement of native live-stock by careful breeding and feeding, and by importing and acclimatising animals of good breeds for inter-breeding with native stock."

The following analysis, made shortly after the farm was established, will give some idea of the poverty of its soils at the time; the soils analysed were some of the best on the farm :—

Constituents.	No. 4. Field	(eastside).	No. 1 Field.
	Surface soil.	Sub-soil.	Surface soil
	Per cent.	Per cent.	Per cent.
Alumina	4·420	2·060	3·240
Oxide of iron	1·800	2·900	1·350
Phosphate of lime	·240	·009	·120
Carbonate of lime	·700	·560	·310
" magnesia ...	trace.	trace	trace
Sulphate of lime	do.	do.	do.
Chlorides	1·080	·720	·900
Moisture	2·760	1·420	2·090
Organic matter	2·500	1·740	2·120
Sand	85·900	90·400	89·870
Total	99·400	99·800	100·000

The farm, being without natural pasturage of any value, it became necessary, soon after it was opened, to undertake experiments in producing fodder for the valuable stock it possessed, Attention was first given to the crops which, in Europe, furnish green fodder ; but it was soon ascertained that, with the exception of lucerne, they were ill-adapted for culture in the hot plains of South India. Most of the plants grew fairly well in the cold season, but died off immediately the hot weather set in. Amongst these crops were *Lolium perenne, Lolium Italicum, Trifolium incarnatum*, lucerne, vetches, millet, and a great variety of pasture grasses. Seeds of grasses and fodder crops were also obtained from the United States, Mexico, New South Wales, Queensland, China, *Egypt, Italy, &c.* The prairie grass and buffalo grass of the United States, were quite unable to stand the great heat of Madras. Several varieties of native grasses from Queensland have thriven as well as could be desired, but they are far inferior to European grasses.

Guinea grass (*Panicum jumentorum*) has been thoroughly established and now affords the chief pasturage at the farm. The cultivation of Guinea grass has been wisely extended. The grass is much coarser than any European pasture grass. All kinds of stock eat it freely, and thrive on it. When it was first introduced at the farm, it was grown as an irrigated crop. But it was thought, that if the habits of the plant could be altered, it might become adapted for cultivation on unirrigated land. Accordingly, several experiments were commenced with this view, the results of which have proved highly satisfactory. At the farm, at the present time, there are considerable areas of this crop, which, for at least three or four years, have depended entirely on the rainfall. This result has been obtained chiefly by inducing the plant to send its root deeper into the soil, and by gradually accustoming it to smaller and smaller applications of irrigation, water applied at gradually lengthening intervals, until finally discontinued. *Sorghum saccharatum* and *Sorghum caffrorum*, imported from China.

United; States and Australia have, through the farm, become thoroughly naturalised in Madras. When these valuable crops are more generally cultivated, there is every probability that the manufacture of Sorghum sugar will be largaly engaged in. The experiments made at the farm show that both plants contain a large amount of sugar, that the saccharine juice is very easily extracted, and that the waste, after crushing affords a very valuable cattle food. The Agricultural Department of Madras is using its best endeavours to extend the cultivation of these crops chiefly in view to the provision of fodder for use in the hot dry season, when the natural pasturage is all burnt up. Crops of from 15,000lbs. to 20,000lbs. per acre of most excellent fodder have been raised on the poor soils of the farm, without the aid of irrigation, during growing periods, varying in length from eighty to one hundred and five days. But by far the best results in growing fodder were obtained with the previously despised indigenous cereal crops of the country. Amongst these I may mention *Sorghum vulgare, Penicillaria spicata, Panicum Miliaceum, Panicum miliare, Panicum Italicum, Eleusine coracana*. and of the leguminous order, *Dolichos uniflorus*. Several of these crops, under very ordinary tillage, and without irrigation, have yielded crops of fodder of over 20,000lbs. per acre, in periods of from seventy to one hundred days. With occasional irrigation *Sorghum vulgare* has, within twelve months, in several cuttings, yielded crops of fodder

weighing upwards of 50,000lbs. per acre, and in one experiment as much as 80,000lbs. per acre was obtained, and standing generally over the ground about twelve feet high. The cost of producing fodder from these native plants is seldom higher than five shillings per ton, a price very considerably below its feeling value. The fodder is usually rich in saccharine matters, and very succulent and digestible.

Many experiments have been made with native grasses; the majority of them have been found to be very coarse, and almost worthless except when very young. There is one grass, however, Cynodon dactylon, which gave very good results under high manuring and occasional irrigation. Further experiments are being made with native grasses, and with the grasses of other countries likely to thrive in South India. The discovery and extended cultivation of some really good grasses in South India would prove of immense advantage to the country.

Maize, introduced from America, Egypt, and North Australia, has thriven at the farm, and a large amount of seed has been distributed over South India.

Wheat of Northern India has been tried, but its cultivation has not yet proved a success, chiefly due to the great heat encountered at Madras. In some portions of the presidency, at elevations of from 20,000 feet and upwards, wheat of fair quality may be produced, but generally, the variety grown is inferior sp... ...

Of fibre crops, many varieties have been introduced and cultivated at the farm. Of these, I may mention *Cannabis sativa*, *Corchorus capsularis*, *Crotalaria juncea*, *Lin... ... Boehmeria nivea*, and cotton of various kinds.

When the farm was instituted, it was believed generally that cotton could not be grown successfully on ... light soils as those constituting the farm. However, it has been shown most conclusively there, that abundant crops of very fair cotton can be produced at a profit; while over the presidency generally, on soils far superior to those of the farm, the yield of clean lint is only, on the average, about 60 lbs. per acre; the average outcome per acre on the farm is fully three times this weight, while the price obtained is as high as for any cotton produced in South India. The farm has grown extensively Egyptian, New Orleans, Upland, Sea Island, Yea Valley, and other varieties, the seed of which has been distributed to native cultivators and others. Many other kinds of crops have been experimented with; crops obtained from tropical countries abroad; crops introduced from the other provinces of India; and crops of South India not generally cultivated, or badly cultivated, apparently deserving of attention. But I cannot occupy your time in referring more fully to these crops. Those who are interested in the matter, and who wish for further information, will find full details in the annual reports of the Madras Agricultural Department, and in the "Saidapet Farm Manual, the latter a compilation from these reports. During the last ten years, many field experiments have been conducted at the farm with manures available in South India, but which, until recently, were almost unused in native husbandry. The results obtained with these manures have been widely published in the reports of the department, and by other means. The experiments have shown that there is a great amount of valuable manure now wasted which the ryot could with great advantage, apply to his starved soil. Seeing that South Indian agriculture is so dependent on irrigation water, the proper utilisation of this water has occupied a good deal of attention on the farm. It has been shown there that good crops of paddy can been produced, even on sandy soils, with an expenditure of water less than one-half the quantity generally used in native husbandry; results obtained chiefly by deeper tillage and the use of organic manures. Experiments extended to unirrigated land have shown that, with deep tillage and the moderate use of vegetable manures, these soils are enabled to take up large quantities of moisture from the air during night, and to retain and store it; thus practically securing irrigation from the air. In this direction a great deal could be done in developing the drought resisting powers of a large area of land in South India, a result the import nce of which I need not occupy time in pointing out.

The heavy expense incurred by the ryot with his primitive arrangement for raising water from wells, early attracted the attention of the managing authorities of the farm, and many experiments were instituted with pumps and water-lifts of different kinds, driven by steam-power, wind-power, by cattle, and by manual labour. Several of the water-lifts, of the patterns most highly approved, for a long time, been regularly worked on the farm, thus affording native cultivators interested in the matter every opportunity of judging for themselves the working capabilities of these machines. One of these water-lifts, which can be made up by almost any village carpenter, raises the water at less than half the cost at which it is raised by the primitive arrangement generally used in South India. This improved water-lift has been constructed in many places from drawings, or models supplied from the farm.

In my first paper (7th May 1880) I referred very fully to the advantages the European pattern plough possessed over the ploughs employed by native cultivators. The Saidapet farm has now, for 12 years, been worked entirely by ploughs of the modern make. They are each drawn by a moderate sized pair of cattle, and driven by a single native ploughman. Ploughs have been imported from England, Sweden, and the United States. The light pony ploughs, made by Messrs. Howard & Co., of Bedford, and Messrs. Ransomes, Sims, and Head, of Ipswich, have proved great successes. Some of the ploughs now working on the Saidapet farm, and that have been regularly worked there for the past 12 years, are still in a thorough working order; of course, they have been kept in thorough repair.

The results of the experiments made at Saidapet have shown conclusively that it is a great mistake to recommend ryots to buy low-priced ploughs simply because they are low-priced. It is a far greater economy to pay £... or £3 for a ... well-made iron plough, than to pay 10s. or 15s. for a rudely constructed plough, made of wood with iron working-parts, which is constantly needing repairs—often when work is pressing—and seldom lasts longer than two or three years. There are certainly many ryots who do not possess the means where with to buy a plough of the kind I recommend, but there are tens of thousands who do. It would be as ridiculous to state that steam-ploughs cannot be used in England, because each farmer has not the means to supply himself with such an apparatus, as to state that in India a good ploughs of the modern shape cannot be introduced, because the ryots are too poor to buy these ploughs.

The improvement of live stock has occupied much attention. There are no facilities at Saidapet for maintaining a large breeding herd of cattle, but a number of bulls are kept there for improving the stock of the neighbourhood. A breed of cattle imported from Aden, has been introduced with success. The breed is noted as a dairy breed. It is hoped that, by the use of bulls of this breed, the milk producing capabilities of the cows of the indigenous breeds may be considerably improved. When I mention that the average yield of milk of an ordinary native cow is less than two quarts per day, you will understand what room there is for improvement, an improvement which would be a benefit to the people generally, for nearly all would be consumers of milk, if they could obtain it at a moderate price. Experiments made on the farm show that an average cow of Aden breed will yield daily at least six quarts of good milk. Experiments have also been made in determining the milking capabilities, under good management, of different native breeds, and of crosses with European breeds. The housing and general management of horned stock have also received attention. How necessary this is, you will understand when I tell you that the cold rains which accompanied the cyclone that broke over the neighbourhood of Saidapet in 1877, destroyed, in the Revenue Division in which it is situated, 11,687 cattle, and 7,218 sheep, in a live stock numbering 80,0... head of cattle, and 16,000 sheep. On the farm, which was exposed to the full force of the cyclone, the loss was only three sheep. Shelter in India is almost as necessary for live stock as it is in England.

I should have liked to have described to you more fully the actual work of the Madras Agricultural Department, but I have already trespassed so far on your time and attention I must forbear. The reports before alluded to describe fully this work and such indications of progress in agricultural reform as have been ascertained. Looking back over a period of twelve years engaged in this uphill enterprise, though I cannot point out any great or bright examples of progress, I feel satisfied that much good has been done chiefly in collecting facts and spreading information which, when the time comes for energetic work in agricultural reform, will bear fruit. Already, as I have pointed out, agricultural education, which would have been an impossible undertaking only a few years ago, is now beginning its beneficial influences in the country, influences which I firmly believe, will do for Indian agriculture what could be attained by no other means.—*Society of Arts Journal.*

AMERICAN VIEWS ON NITROGEN IN PLANTS.

THERE has lately been so much discussion in this country as to the sources from which plants derive the nitrogenous elements necessary for their healthy and proper development, that the following paper on the subject delivered before the Pennsylvania Board of Agriculture by Professor Reidenbach, may be read with interest:—

I. Almost all if not all, the nitrogen contents of all vegetation is derived by the plant from or through the soil. It has been maintained by some that certain orders of plants particularly from among agricultural vegetation, the broad-leaved root crops, derive at least a small portion of their nitrogen through their leaves from the atmospheric nitrogen or nitrogenous compounds. This to say the least, is extremely doubtful.

II. Nitrogen exists in the soil in three classes of condition:—

(a.) Those compounds which are insoluble, and are the intermediate products of vegetable decay—classed as nitrogenous organic bodies, &c.

(b.) The soluble compounds of nitrogen, including ammoniacal and nitrate salts.

(c.) Free nitrogen held in solution in soil water are in the air, held in the pores or condensed on the surfaces of the pores of the soil.

III. The nitrogen of the soil is derived from the four sources:—

(a.) From the decay of former vegetation as stored in the soil.

(b.) From the air carried down as ammonia, nitrates, and organic dust in solution; or suspension in falling rain, snow, and dew.

(c.) From the circulation of air through the pores of the soil.

(d.) From additions in the form of barnyard manure or chemical artificial fertilizers.

IV. Nitrogen in the insoluble form, and as free nitrogen, cannot be assimilated by the plant. Hence the two food forms of nitrogen are ammoniacal and nitrates ..., and in the light of our informa... on the subject ...

seems very probable that it is in the latter form or as nitrates, that the plant finds the conditions in which it is best able to avail itself of nitrogen as food offered to it. Here as in many other cases where we attempt to question the processes of nature we find ourselves unable to obtain a definite answer to our query. In this instance there are on record certain admirable experiments, some quite recent, which seem to indicate that in some cases, with certain plants under certain conditions of age and treatment, the plant is better able to avail itself of the nitrogen offered in the form of ammonia. But the general statement, given above, is expressive of the most successful practice and experiment.

V. The soil has, to a certain extent, the power of retaining within itself the soluble nitrogen compounds (ammonia and nitrates) by partly physical, but more by chemical absorption.

VI. But, in consequence of their solubility these same assimilable forms of nitrogen are also likely to be lost by the action of the percolating waters. A discussion of these principles would be interesting; but we pass this by to the consideration of several inquiries which these principles render of extreme practical importance.

(a.) What is the relation of atmospheric nitrogen to the food supply through the soil.

(b.) What conditions are favourable for rendering the nitrogen of the soil stored or added, available?

(c.) What conditions are favourable to the retention of assimilable nitrogen in the soil and bringing it to those layers of the soil through which the main portion of the roots ramify.

(d.) What relation do different kinds of crops bear to the food supply of nitrogen?

(e.) If nitrogen is to be added as a fertiliser, in what form is it most conveniently and cheaply applied?

In other words we inquire, "How can we bring the nitrogen of the soil into condition favourable to plant growth? How prevent its undue loss. How arrange our crops to most economically utilize the nitrogen into soil? And how can we add nitrogen to the best advantage?" I must repeat here that I can only give but a brief outline of the answer to each topic.

(a.) What is the relation of atmospheric nitrogen to the food supply through the soil?

You are aware that about four-fifths (79·100) of the atmosphere by volume and slightly less by weight (77.100) is free nitrogen, which is inert, and as free nitrogen is not available for plant nutrition. In addition to the free nitrogen the atmosphere also contains traces of nitrogen in the form of ammonia and nitrates, formed by action of decay, and carried into the air and also by other process. Ammonia is rarely in excess over the nitrates. These compounds being soluble in water are carried down by rain and dew into the soil. Careful determinations show that the amount thus obtained from the measured fall—that is, from rain and snow alone—is from eight to ten pounds per acre, on the average for each year. The amount carried down by dew has not been ascertained, but it is probably an important amount. Indeed, it may often be very considerable. To this we must add the atmospheric source of nitrogen, free or of compound, fixed and retained by the soil by some chemical action with which we are not acquainted, brought into the soil by circulation of the atmosphere through its pores. Experiments made at Rothamsted, England, by Gilbert and Lawes indicate this as a very important source of nitrogen for plant food. We thus see that the atmosphere not only supplies all the carbon of the plant, and the water necessary, but also is a reservoir of nitrogen, from which there is a certain, though variable, supply given to the soil. How far this supply of nitrogen is sufficient is an important and as yet unanswered inquiry.

(b.) What conditions are favourable for rendering the nitrogen of the soil, stored or added, assimilable?

We have already referred to the nitrogen in the soil in two classes of conditions, available and not available for the plant. It is of value to the farmer to know if he can assist Nature in bringing the unavailable nitrogen into an assimilable or available form. I briefly mention some of the leading conditions for bringing about this change. The presence of mineral fertilizers, particularly of potash and carbonate and sulphate of calcium—that is, limestone and gypsum. The presence of oxygen of the air and such substance as can supply oxygen, among which red oxide of iron, as found in our Adams county red shale, sulphate as gypsum. Moisture acts as an agent or change. A free circulation of the air also promotes the same change. Among other reasons why these conditions are favourable to our purpose, they tend to promote the conversion of other nitrogen compounds into nitrates, the process known as nitrification. The mineral fertiliser phosphates and potash salts facilitate to a wonderful degree, particularly on clover and other leguminous plants, the bringing of the nitrogen of the air into a condition of availability. On the other hand, the presence of caustic lime causes a serious loss of available nitrogen in converting even the already formed nitrates into ammonia and preventing their formation, ammonia thus formed passing into the air. It is hardly necessary to add that the physical condition of the soil has much to do with this same nitrification—such treatment as promotes moisture during dry, hot weather, and renders the soil friable, are important adjuncts; also the presence of sand and marl. I may add a condition which we are not able to control, but we can modify its action. I refer to the fact that nitrification is more active during hot weather; but if the soil is very dry at the same time, or so compact as to exclude oxygen, ammonia may be formed from nitrates themselves, and thus be lost to the immediate use of the plant. You thus observe that during winter the nitrogen may remain as ammonia stored for the use of the vegetation during its active state. I have not spoken of ozone, or of ferments, or of rootlets, or of other causes of nitrification; because, though important, they are not under the active control of the former.

(c.) What conditions are favourable for the retention of assimilable nitrogen in the soil?

The mention of the causes of loss will suggest the remedies. The principal loss is found in the solubility of nitrates and ammonia in water. In soils with near lying impervious subsoil, the drainage may cause a very considerable carrying away of these other nutritive elements, as is shown by analyses of spring, well, and river waters. Another loss is found in the formation of ammonia, and yet another is caused by the absence of those mineral compounds which act as absorbents, chemical and physical, of nitrogen compounds such as phosphates carbonate of lime, and gypsum. One remedy against loss is to have a soil in that condition of looseness by ploughing and hoeing as increases the absorbing power for water, and decreases the evaporating power.

(d.) What relation do different kinds of crops bear to the food supply of nitrogen?

We consider this question first in the amount of nitrogen found in different crops. If we have an average crop of twenty-eight bushels of wheat, with twenty-five hundred pounds of straw, about forty-five to forty-eight pounds of nitrogen will be found present. In a crop of two and one-half tons of meadow hay, fifty to sixty pounds (that is, to each ton, twenty to twenty-four pounds), and in a crop of two and one-half tons of clover, from one hundred and fifteen pounds of nitrogen (each ton containing forty to forty-six pounds). In general the leguminous crops, clover, beans, vetches—are rich in nitrogen, while the cereals and grasses are relatively poor in nitrogen. Now comes the remarkable fact, shown by many investigations, but recently and remarkably demonstrated in over thirty years' culture on trial plots of various crops by Gilbert and Lawes, that the poor in nitrogen crops—namely, cereals and grasses—require the presence of a larger quantity of assimilable nitrogen than do those rich in nitrogen. The experiments are grouped in three classes, made in each case on both kinds of crop.

(a.) With nitrogenous manure.

(b.) Without any manure.

(c) With mineral manure containing phosphates and potash, but not nitrogen.

The results may be tabulated thus:—

1. Without any manure, the nitrogen in all crops gradually diminished and also the soil content was lessened; that is, the crop diminished.

2. With mineral manures, the amount of nitrogen in the cereals still diminished, as also in the soil, but at a somewhat less rate; while the nitrogen of clover and beans is diminished but little, and the *soil content, even increased*. In other words, the mineral fertilizer particularly potash, enabled the clover to use more nitrogen, and thus to produce a good crop, and at the same time increase the store of nitrogen in the soil, even rendering it assimilible.

3. What is more remarkable, the crops rich in nitrogen derive far less benefit from nitrogenous manures than do those poor in nitrogen.

4. Root crops exhaust particularly the superficial layers of soil of their nitrogen, under any of these conditions.

We have no time to-day to inquire into the reasons of these facts, but they are of most practical importance.

Two conclusions must appear:—

(a.) The leguminaceæ must draw a considerable portion of their supply of nitrogen from the air, and, as already stated, through the soil.

(b) Mineral fertilizers have at least as valuable indirect action, in reference to supply of nitrogen, as direct in furnishing potash and phosphorous to the growing plant.

(e) If nitrogen is to be added to the soil in fertilizers, in what form is it most conveniently and cheaply applied?

Our answer has already been suggested. Clover is the best, from the amount of nitrogen it gathers in its own tissues, and from the increase it effects on the soil, besides the considerable amount found in its roots. Of mineral manures, nitrates are the best, particularly in dry weather. Sulphate of ammonia, in a wet season, is equally good. For leguminous plants, particularly for clover, no large quantity of nitrogen is required by ordinary good soil, but use a complex mineral *fertilizer*, containing a good percentage of potash.

From these statements we must conclude that *from the air* through the soil the plant gathers a large portion of its supply of nitrogen, but that crops having unequal power in thus *utilising* the supply of nitrogen from the air, such a rotation of crops can be employed as will keep the supply of nitrogen in soil always sufficient for the plant use.

ON THE BARK OF BROUSSONETIA PAPYRIFERA AS A MATERIAL FOR PAPER-MAKING.

Memorandum by D. BRANDIS, *Inspector-General of Forests, on the bark of Broussonetia paprifera as a material for paper-making,—dated the 29th November* 1880.

IN a memorandum on the subject of the cultivation of bamboo for paper stock, dated 8th July 1875, I made the following remarks regarding the Paper Mulberry :—

In conclusion, it may not be out of place to draw attention to a tree which is grown largely in Japan as coppice wood on a short rotation similar to osier-beds, and which furnishes a large proportion of the paper stuff used in the country. This is the Paper Mulberry (*Broussonetia papyrifera* : 'Forest Flora of North-West India' page 410.) This tree appears to accommodate itself readily to different conditions of climate ; it thrives in Western Europe, on the South Sea Islands, and in Siam, and there seems every reason to believe that its cultivation may succeed in North-West India. I know of few trees more promising (in a suitable climate) for the supply of paper stuff on account of its free and rapid growth and the abundance of its fibre.

In the report on the progress and condition of the Royal Gardens at Kew during the year 1879, just received, the following passage regarding this subject occurs :—

Broussonetia papyrifera.—' The bark of the well-known Paper Mulberry supplies the material from which the tappa cloth of Polynesia and the bulk of the paper of Japan and China is manufactured. The Japanese cultivate the plant very much in the same way that we grow osiers, and they use only the young shoots for the manufacture of paper. A sample of the bark, which came into the hands of Mr. Routledge, is, stated by him to be ' nearly, if not quite, the best fibre I have seen.' * * * * * ' I must admit it is even superior to bamboo.' * * * ' It requires very little chemicals, and gives an excellent yield—62·5 per cent. in the grey, *i.e.*, merely boiled, and 58 per cent. bleached.'

The tree is indigenous in the Upper Salween forests of British Burmah, and as soon as reserves have been demarcated in that district, and officers placed in charge, efforts should be made to establish regular plantations. In March last I visited, on the banks of the Maytharouk River, a settlement of paper makers from Siam, engaged in making the well-known snow-white paper which is sold in the bazaars in Burmah. The procedure is of the simplest character, and the great advantage of this fibre is that it is white naturally, and that it is readily cleaned. It should also be cultivated as an experiment by forest officers at other places in Burmah, in forest gardens, or regular plantations.

And I would recommend that it be tried at the Sitapahar and Ramanpokri Plantations in Bengal, at Shillong, and at the Kulsi Plantation in Assam. It is not impossible that it will be found to succeed elsewhere in India, for the trees thrives in Western Europe where it stands frost and snow, in China and Japan, and on the South Sea Islands.—*Indian Forester.*

DARBY'S DIGGER.

DARBY'S Digger for several years has been familiar to frequenters of the principal agricultural shows as an imposing and somewhat complex apparatus. The determination, enthusiasm, and practical tact of the inventor has enabled him to overcome many difficulties and secure the satisfactory working of his machine. At the Royal Agricultural Society's Carlisle meeting in July 1880, deservedly received a special med ! as "a new implement for the cultivation of the soil by steam or other mechanical force." Carlisle machine has satisfactorily dug 400 acres, and is still doing remunerative work. Now, how ever, a stronger and rather more effectual implement has been turned out, which has been carefully tested during several days lately at Writtle, three miles from Chelmsford, and will be again at work this week at the Bath and West of England show at Tunbridge-wells. The appearance and construction of the new machine are little changed. It consists of a locomotive boiler, with fire-box in the centre, tubes on each side, and a funnel at each end. The eight-horse power engine, fixed on the top of the boiler, has a single cylinder 9in. diameter. with 12in. stroke and 120lb. pressure. The engine is suitable for thrashing or other farm work. On the crank shaft are two pinions, one driving the four travelling wheels, which are 8½ft. high with tires 2ft. wide, the other driving the diggers, which are at the back of the apparatus, and consists of three sets of forks, each set containing 14 steel inch square tines with chisel points, which keep themselves well sharpened and are little liable to break. When the machine is to be moved through gateways, or has to propel itself along the road, the steering gear is removed and the wheels are turned half round, when the width is reduced to 8ft. The steerage apparatus, formerly at the rear, now runs in front, preventing compression of the finished work. The regulation of the depth can be simply and promptly managed without stopping Spiral metal springs on the shaft regulate each set of forks and give them the requisite amount of play. An extra spring in front of the pinion carrying each set of forks would beneficially diminish jarring. Wrought iron has in many parts been substituted for steel, and in case of breakage is more easily replaced. The Governors on the engine would insure more steady work.

The digger has done good service for hire, the farmer at Writtle paying 20s. an acre for digging the rye-grass stubble just eaten off by sheep. On these terms Mr. Darby provides coal, of which one ton is consumed for the day's work of ten acres. The hirer draws water, of which about 200 gallons, or 18 cwt. are required every hour, which is drawn from the cart into the tank by an injector. A man and boy suffice to work the digger. The land at Writtle is a friable loam, dry and in a favourable state for cultivation. Neighbouring grain crops are looking particularly well, being more forward, and having suffered less from the drought and ungenial east winds than the cereals in most other parts of the country. Neither clovers nor meadow grass can now, however, prove full crops. Even the recent showers cannot provide the wanting bottom grass. The first grass crops cleared promptly away, the second may probably be more bulky. The digger takes fully 20ft. at each stretch ; the tines cut 10in. to 11in. breadth ; the depth can be regulated from 2in. to 12in. When we saw it about 6in. depth was being done, but the depth varied a little when going up or down hill. The three great forks, 6½ft. each, in rhythmical order as to the machine advances are raised about 15in. and thrown back about 2ft. In quick succession each fork inserts its 14 blades into the soil and deftly turns the furrow slice. The three forks acting one after another power is economized ; weight is also thrown off the wheels ; the thurst of the forks besides helps the apparatus forward. The best and most regular work was done when the machine was going, as it readily can do, at the rate of 100ft. in two and a quarter minutes. At a slower pace the slices were not as regularly cut or turned over. By a slight alteration of the mahinery the land can be turned entirely over as is often done in digging, placed on edge as in ploughing, broken down fine or left rough. An important feature of the work is the tearing out of twitch, thistles, docks, and other weeds, uncut, and thus more effectually insuring their destruction. Several Essex farmers who have had two seasons' experience of the digger, assure me that their land which has been dug has now fewer thistles than that worked by horses or steam plough. Proceeding across the ground already dug, the apparatus, although weighing 14 tons, is so well balanced on the four broad wheels that it does not seriously compress the loose soil, but turns it up in a very workmanlike manner. The calculated weight on the wheels per inch width of the tires is stated by the Royal Agricultural Society's engineer to be 816lb. Ponderous although the machine appears, it turns readily whether on the rye grass stubble or on the upturned ground in little more than half a minute. Its capabalities for cutting up hard well-firmed ground have recently been fairly tested by its successfully digging half a mile of a field road which had been in constant use for two years. In stony ground the tines are stated to stand better than the shares either of horse or steam ploughs. When the land is thoroughly wet the digger would probably drag heavily, but in such circumstances cultivation by any known agencies is undesirable. Making ascents, even reaching one in 25, skids are placed in the wheel, and effectively secure a firm grip.

The practical performances of the Digger now entitle it to take rank as one of the recognised implements of modern agriculture. It will doubtless, still undergo simplification and improvement ; it may even be reduced from its present price of £1,000 ; with its power economically applied in a very direct way it constitutes a cheap and effectual mode of successfully preparing the soil for most crops ; it appears capable of turning over ordinary loam soils 6in. deep at a cost of 7s. an acre, or several shillings less then it can be done by horses. It is likely to be more extensively used, not only in this country, but on the Continent of Europe and in the great treeless, stone less prairies of America.—*Times.*

ARTIFICIAL INDIGO.

A RECENT discourse was given at the Royal Institution by Professor Roscoe, F.R.S., on "Indigo and its artificial production." The Professor reminded the members of the institution that 11 years ago he had laid before them an account of a discovery in synthetic chemistry of high importance, that of the artificial production of alizarine—the colouring substance of madder. That was the first time the colouring substance of plant had been artificially obtained from mineral product.. He had now, he said, to give an account of a second striking case of synthetic chemistry in a similar direction—the artificial production of indigo. It was another proof of the fact that the study of the most intricate problems of organic chemistry and those which appear to many to be furthest removed from any pratical application are in reality capable of yielding results having an absolute value measured by hundred of thousands of pounds. The value of indigo imported into this country during 1879 amounted to close on two millions sterling, so that if artificial indigo can be produced at a price to compete with natural indigo, there is a wide field open to its manufacture. Indigo has been known as a colouring matter from very early times. Cloth dyed with indigo has been found in the Eygptian tombs. Pliny and Dioscorides describe the method of dyeing which is the same as that followed in Bengal at the present day. The early inhabitants of this island obtained it from the European indigo plant *Isatis tinctoria*, the woad plant or pastel. After the discovery of the passage to India by the Cape of Good Hope, the Eastern indigo, derived from a species of indigofera, gradually displaced woad as containing more colouring matter. This however, was not done without strong opposition from the European Powers and their Sovereigns, some of whom issued edicts prohibitory to its importation. The identity of the colouring matter of woad and of the Bengal plant was not established till the end of the last century. Concerning the origin of indigo in leaves, various conflicting opinions have been held. Schunck has, however proved beyond all doubt that neither in the woad plant, the Indian no. the Chinese and Japanese indigo plant does indigo blue exist as such. The leaves contain a colourless principle. Which has been named Indican

but this readily decomposes into (1) a sugar like body and (2), indigo blue. It was shown by experiment that even bruising a leave will produce this decomposition; but to secure the result for commercial purposes is a long though not very complicated process. Before the synthetic production of indigo could be attempted, an exact analysis of the natural indigo had to be known, not only as to its molecules, but as to the arrangement of the molecules among themselves. The synthetic production of indigo had proved a far greater puzzle than that of alizarine. The first step as to the constitution of indigo was made as far back as 1840, when Fritsche showed that aniline could be obtained from indigo. After some intermediate step, it was found a crystaline body, to which the name of isatin was given, was obtainable from indigo, and then in 1878 it was found conversely indigo could be obtained from isatin. There are three processes now known for obtaining indigo from isatin, but two of these are too costly to be of commercial value. Baeyer's process seems, however, to be even more then promising—to have established itself. He started with cinnamic acid from oil of bitter almonds, but this was two costly. Dr. Caro and Mr. Perkins have discovered how to obtain the cinamic acid from tolvene—a coal-tar product. From cinnamic acid, however obtained can be produced an acid complex in character, and to which a name, descriptive of its composition is given—ortho-nitrophenyl-propiolic acid. The artificial production of indigo many even now be said to be within measureable distance for commercial success, for the ortho-nitrophenyl-propiolic acid (called for short propiolic acid), the colourless substance which on treatment with a reducing agent yields indigo-blue, is already in the hands of the Manchester calico printers, and is furnished by the Baden Company for alkali and aniline colours at the price of 6s. per pound for a paste containing 25 per cent. of the dary acid. With regard to the nature of the competition between the artificial and the natural colouring matters in the first place, the present price at which the manufacturers are able to sell their propiolic acid is 50s. per kilogramme. 100 parts of this can only yield according to theory 68·58 parts of indigo-blue, so that the price of the artificial (being 73s. per kilogramme) is more than twice that of the pure natural colour. Hence competition with the natural dye-stuff is not to be thought of until the makers can reduce the price of dry propiolic acid to 20s. per kilogramme, and also obtain a theoretical yield from their acid. This may or it may not be some day accomplished, but at present it will not pay to produce indigo from nitro-phenyl-propiolic acid. Nevertheless, a large field lies open in the immediate future for turning Baeyers's discovery to practical account. It is well known that a great loss of colouring matter occurs in all the processes now in use for either dyeing or printing with indigo. A large percentage of indigo is lost in the "cold vats" in the sediment. Another portion is washed off and wasted after the numerous dippings, while in order to produce a pattern, much indigo must be destroyed before it has entered into the fibre of the cloth. Moreover, the back of the piece is uselessly loaded with colour. The proper way of looking at this question at present is to consider ortho-nitro-phenyl-propiolic acid and natural indigo as two distinct products not comparable with each other, inasmuch as the one can be put to uses, for which the other is unfitted, and there is surely scope enough for both. Still, looking at the improvement which will every day be made in the manufacturing details, he must be a bold man who would assert the impossibility of competition with indigo in all its applications, for we must remember that we are only at the beginning of these researches in the indigo field.—*Times*.

ORANGES.

FOR a time in England the orange was not—we must go back far into the mists of antiquity. As early as the year 1290, it is recorded that seven oranges (*poma de naranja*) were landed at Portsmouth from the cargo of a Spanish ship, but for two centuries after that there does not appear to have been any particular commerce in them in this country. Then they became an important item in our imports, Billingsgate being then, as now, the great landing place for them. The Chinese claim the orange as a native fruit, and though, as Mrs. Bayle Bernard points out in "Our Common fruits," there being no reference to it in the travels of the accurate and observant Marco Polo has led some to doubt this, yet it is more likely that he may have overlooked or forgotten it than that it should have spread so widely there, and no record remain of its introduction, had it been transplanted thither. So thoroughly, too, was it formerly identified with that country that the sweet fruit was once universally known in Europe as the Chinese orange, and it still bears that name in America and even in India. A large part of our present supplies comes from the Azores: but Spain, Portugal, and Sicily contribute immensely, and send us their crops earlier than do the Azores Islands. Pariculariy large is the importation from Valencia, which is one of the busiest seaports and the most thriving of Spanish cities. But the Azores, and especially St. Michael, the largest of the group of nine islands, furnish us not only with vast quantities, but the fruit is of a superior character, though we often get other oranges when we innocently buy what are represented to be "Sweet St. Michaels." From this island there is a regular trade by means of steam vessels, each carrying 10,000 boxes or more, and their arrival in the neighbourhood of Billingsgate creates a busy scene; the porters with huge "knots" on their heads, going to and fro as fast as they are able between the vessels and the fruit brokers' warehouses in Pudding-lane and the surrounding thorough fares, where the fruit is sold by auction three or four times a week.

At a meeting of the Adelaide Gardeners' Improvement Society, the longevity of the orange tree was discussed.

Mr. J. F. Pascoe said that in view of the great importance of the cultivation of the *Citrus* tribe in this colony there need be no apology made for dealing with the matter at considerable length. There were large areas now being cultivated with oranges, and we were beginning to export the fruit, which was acknowledged to be of superior quality. In Sydney our oranges had obtained a special first prize, whilst the Sydney-grown fruit had only been awarded an ordinary prize. If the orange trees would only live for the short period assigned to them in this colony, viz., about twenty to twenty-five years, it would not pay, for during the first five years the tree born no fruit, during the next five they produced very little, and if during the next ten or sixteen years they bore abundantly, the crops would scarcely recompense for the long period of unproductive cultivation. Before we got really good thin-skinned, good flavoured fruit, the trees must have acquired age, and therefore the early death of the trees through the ravages of disease could not be regarded in any other light than as a national calamity. Mr. M'Donald being a man of experience in gardening, and holding a position of influence among gardeners, had done some good by disputing the longevity of the Citrus tribes and there was no doubt that still greater good would be gained by a discussion of the whole question. Most probably Mr. Robinette had hit at the foundation of the evil when he suggested that it was due to the stock upon which the sweet orange was grafted. If seeds were taken from fruit raised upon sickly trees or those which were weakened by any cause, and the seedlings were afterwards grafted, it might be that the trees grown this way would be shortlived. But Mr. M'Donald did not seem to notice that there is a difference between natural decay and decay caused by disease, and, in opposition to the facts adduced, still made a pretence of clinging to his idea, ignoring the statements of some of our most eminent botanists and horticultural writers and pinning his faith to so much of one person's statement as suited him—that of Don Jose de Canto whose remarks were made with reference to the orangeries of the district of all others most liable to the attacks of the disease. If that gentleman's very able letter—or so much of it as they had been favoured with—were carefully read without prejudice, it would be found to bear out, literally and generally, all that Mr. Pascoe contended for; and if they followed the course adopted at the Azores instead of quietly watching the destrubtion that was going on, and bemoaning their fate they would stand a chance of obtaining the same result. The fact of Don Jose de Canto's letter were as follows:—Until 1836 the orange tree budded, blossomed, and fruited with unvarying regularity. The grower would as soon have suspected the sun of variation from his diurnal course as the orangeries from their yearly round of duty. They were handed from father to son, and, lasting as they did from generation to generation, it is not surprising that they became a symbol of permanence. These trees cost the growers no care, no attention, no labour, save the labour of picking and packing, so far as we can understand. The people might dance and drink the year round and the orange would blossom and fruit the year round without trenching without manuring, without draining;—it may be without pruning. The plant was neither fickle nor fastidious, and the islanders rejoiced in their orange trees. Suddenly, however, there came a change. This bright picture of the growing green-leaved, self-contained tree, surrounded by a joyful, sun-loving, dancing people dissolved away, and gives place to a pale-leaved and sickly tree, surrounded by a care-faced and inquiring population. Their first proceedings were those of the panic-stricken, they were carried to extremes. From absolute indolence they rushed into alarming activity; but it was the blundering activity of ingorance. Having had little need to inquire into the physiology of the plant, or the relations subsisting between the soil and the plant, they adopted measures to set things right which outraged both, and only made things worse, but gradually, by the aid of the suggestions of science and a teachable disposition, a middle course was hit upon, and restorative processes were prescribed with an intelligent knowledged of the patient's requirements. At first the trees were overloaded with manure and stifled with shelter and a great deal more was done to them than they well could bear. Now they perceive that though drainage is at the foundation of successful orange growing; that next to this, trenching to a great depth is essential, and, thirdly, that manure must be applied—but with discretion. It is true the trees are more fickle than they were, and die more frequently, and the fruit will not keep so long. But growers can again count with tolerable certainty upon their crop. The disease of the orange was first discovered in the Azores in 1836, when it was found that the oldest and best trees, as much as 200 and 800 years old, and producing each 6,000 to 20,000 oranges, were disappearing. It was observed that all the trees affected produced a very heavy crop the very year that the disease manifested itself, that the leaves became yellow and fell off in great quantities, and on the trunks or stems near, and sometimes beneath the ground; the bark opened, and drops of a kind of yellow gum exuded. The drops resemble tears (*lagrimas*, in Portuguese), and therefore the disease was named *lagrima*. Many orangeries were quite destroyed, and a remedy was eagerly sought. Opinions as to the cause of the disease were much divided Many thought it must be that the orange-tree had a limited period of existence, and this being reached, the tree must thus naturally decay. As we then only propagated trees by layers, this explanation was not thought to be unreasonable, but afterwards it was found that seedlings were attacked in the same way. Then it was found that superabundance of moisture in the soil was one o the worst conditions for the disease. Soon it was discovered that the destruction of the diseased bark and wood in the stem of the trees was the best method to save it. From February till August a skilled horticulturist visits every tree, and at the slightest sign of exudation of gum he cuts the bark across to allow it to run out. If the disease is in an advanced state, the bark and the whole of the diseased wood is cut out, the roots being bare to a distance of a foot or two feet from the stem, every portion of diseased root being cut away. By this means the tree is cured of the disease is found at an early stage; if not, it is dug out and a fresh tree put in from a reserve which is always kept for such contingencies. Although the disease still continues, the gardens now look very prosperous, for the remedy is known . . . . So we are returning to the old traditional culture. We are clearing the shelters, pruning the interior of the trees for the admission of air and light, are less libdral with manure, and keep the ground free of weeds, except when we want to excite vegetation. We have abandoned propagation by layers, and graft good chosen kinds upon seedling stocks. For shelter we prefer trees with their foliage, and take care not to let them grow too high. From these abstracts of the contents of the letter referred to and the leader, it would be seen that in the Azores for hundreds of years they had grown the orange successfully and without trouble, and previously to the outbreak of the disease (*lagrima*) they had trees 200 to 800 years old, producing immense crops of from 5,000 to 20,000 each. In 1836 the disease broke out, spreading consternation and ruin but remedies were discovered in time, and in 1868, when Don Jose de Canto wrote the disease, though still existent, ceased to cause uneasiness; and although the fruit was inferior to that formerly produced, confidence was restored, and growers were "returning once more to some of the old traditional culture." It certainly appeared a strange method of reasoning to endeavour to prove by the statement made in the above letter that the orange was a short-lived tree. The opinion ventured that those trees which have attained great age have got into places particularly favourable by Nature and circumstances was a most important one, and contained the very gist of Mr. Pascoe's argument. Nothing he could say would more fully sustain it. It was a well-known axiom, "Like causes produce like effects;" and knowing as they did, not only single trees but groups and plantations, of vast age and in great vigour, it was their duty and (with present prospects) necessity to inquire into the attendant circumstances with a view of remedying existing evils. The idea that the genus citrus had lived its allotted time, and had so degenerated that its course might be said to be finished, seemed to him too ridiculous for consideration, and totally opposed to all theories of rise, progress, and decay that he had ever met with. It was a very convenient doctrine for

Greeks and Mahomedans, and those who believed "Whatever is, is right," or were too indolent to investigate causes. Disease in fruit trees and fruit-producing plants was of common occurrence, and the *Citrus* family did not stand alone; but perhaps of all the fruit trees they were acquainted with they had enjoyed less opportunity of studying the nature and habits of the orange than that of any other. The culture of it in its natural habitat was unknown to them, and its natural age was so great that they could do little in a generation; but, having it in their midsts they must study its nature and treat its diseases as they studied the nature and disease of other fruit trees. When the odium broke out in France, the people did not stand idly bemoaning their loss, nor did they imagine the vines had lived their time, but they searched into the character of the disease, and found a remedy by which we at the present day benefited. The "American blight" attacked the apple trees, but the gardeners found out in time that the aphis could be beaten, so far as the roots were concerned, by grafting upon "blight-proof" stocks. The apricot, peach, plum, almond, and other trees were subject to fungoid growths and encroachments, but gardeners found a remedy in sulphur, &c. So with respect to the orange, a careful study of the subject, with careful observations of all the conditions, would be very interesting, though perhaps slow; but in time a fact would be discovered here, and something from there, until a mass of information would be gathered which would enable them to cultivate the orange as successfully as any other fruit tree. That our orangeries were seriously diseased was an admitted fact—from every district in which trees were planted came the same story. One by one they were losing their oldest and best orangeries, and many of those newly planted were looking very queer, but so little attention had been paid to the subject that they could not even tell what the disease was, or give any definite idea of its cause. Its effect they all knew too well, but as far as he was aware, no one had made any systematic attempt to cope with it. Several, for very shame's sake, had made pretence of doing something, but, having no definite object in view, had accomplished nothing. He thought their attention should be chiefly directed to the nature of the soil, the method of production, treatment during early stages of growth, and manner and time of watering. As regarded the first, Risso told them that at Genoa and Florence they were grown in a strong yellow clay, richly manured; this was considered by Italian gardeners to be best suited to the orange tribe. He also said that in France clayey loam, rotted vegetable matter, and rotted horsedung were considered the best compost. Our ideas as to a suitable soil were quite opposed to this, and we sought a sandy loam with a gravelly subsoil. In his (Mr. Pascoe's) opinion some most radical changes and improvements must be made in the method of production. It was his firm belief, after carefully watching the matter for years, that the stock they worked upon was the chief cause of the mischief—in fact he had seen the stocks of one-year old trees as they came round from Sydney so bad with disease that it seemed a sin to sell them for planting. The question then arose, how were they to propagate. Layers were generally condemned—how deservedly he was in doubt; the stocks in present use they knew to be bad; then what must they use? Experience only would tell them. Miller recommended citrous: London citrous and Seville oranges, and he had heard experienced horticulturists recommend the poor man's orange and the shaddock. His advice was to try them all, though he believed the Seville would be found the best stock the orange family could be worked on. Mr. Moore, of Sydney, during his investigations into the nature of the disease in Europe, found those trees worked on Seville stocks to be almost free from disease, and it is a noticeable fact that the great majority of those trees in Spain now flourishing and from 600 to 700 years old are Seville, and were planted before the sweet orange was introduced into Europe. The treatment of the tree when young was of vast importance. That any tree should be pampered and forced, or allowed to produce heavy crops when young, was totally opposed to all physiological laws, and Lindley said the abstraction of fruits and flowers augmented the vigour of the branches, or of the parts in connexion with them, and that the removal of any part which takes up a portion of the food employed in the support of the flowers increases their luxuriance. The manner and time of watering Mr. Pascoe would leave to men more practical than himself. They were told on good authority that the *Citrus* family did not like coal or excessive moisture; but to see the way in which they were inundated sometimes, one would almost imagine they were semi-aquatic plants.—*Journal of Applied Science.*

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The Monthly General Meeting was held on Thursday, the 23rd June 1881.

W. H. Cogswell, Esq., President, in the Chair.

The Proceedings of the last monthly Meeting were read and confirmed.

The following Gentlemen were elected Members:—

His Grace the Most Rev. Dr. S. Goethals, Baboo Shamlall Sen, Lieut.-General Umber Jung Bahadoor Rana, Messrs. A. A. Shircore, S. Gowan, Edward Cleveland, W. E. Crum, H. M. King, D. Cruickshank, J. H. Barry, W. Palmer, C. H. Moore, Dr. D. O'Brien; Managers, Debroghur Division, Upper Assam Company, and Blackburne Tea Garden, Assam.

The names of the following gentlemen were submitted for Membership:—

A. W. Hurle, Esq., Serajgunge,—proposed by Mr. J. G. Mougens, seconded by Baboo P. C. Mittra.

J. E. Weingartner, Esq., Locomotive Department, Saidpore,—proposed by Mr. T. Walton, seconded by the Secretary.

The District Engineer of Jessore,—proposed by the Secretary, seconded by Mr. G. L. Kemp.

Baboo Rakhal Dass Holdar, Manager, Chota Nagpore Estate, Ranchi,—proposed by Baboo P. C. Mittra, seconded by Baboo P. C. Ghosa.

Cunningham Hudson, Esq., Merchant, Calcutta,—proposed by Mr. W. H. Cogswell, seconded by Mr. W. Stalkartt.

The Manager of the Rungting Tea Company, Darjeeling,—proposed by Mr. Albert Smallwood, seconded by the Secretary.

Baboo Amrita Naryan Acharjea Chowdry, Mymensing,—proposed by Mr. R. de Bombal, seconded by Baboo P. C. Mittra.

Captain W. H. M. Francklyn, Tounghoo,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Rejoined.—T. F. Hamilton, Esq., Merchant, Calcutta.

CONTRIBUTIONS.

1. Records of the Geological Survey of India, Vol. 14, Part 2. From the Government of Bengal.
2. Report of the Committee of the Bengal Chamber of Commerce for half-year ending 30th April. From the Chamber.
3. Introduction to the annual accounts of the Sea-borne trade and navigation of the Bengal Presidency for 1880-81. From the Collector of Sea Customs.
4. Journal of the Asiatic Society of Bengal extra number to Part 1 of 1880; and Proceedings for April 1881. From the Society.
5. Seed of *Reana luxurians.* From T T. Allen, Esq.
6. Seed of *Pinus longifolia.* From the Superintendent, Botanic Garden, Saharunpore.
7. Seed of *Pithecolobium saman* (Guango.) From the Agri.-Horticultural Society of Madras.
8. Seed of the Carob tree (*Ceratonia siliqua.*) From the Agri.-Horticultural Society of the Punjab.
9. Sorgho seed of the red variety (*Sorghum saccharatum.*) From the Director, Department of Agriculture, N.-W. Provinces.

The above seeds are available to Members.

10. A small collection of Orchids and seeds from the Andamans. From O. H. Brookes, Esq.
11. Specimen of *white* gram and sunflower seed. From R. Nicholson, Esq.

GARDEN.

The following are extracts from the Superintendent's monthly report.

"The weather has been propitious for propagation. Advantage has been taken of the early rains for gootying and grafting in the Orchard, and I anticipate the garden will have sufficient grafts to meet the increasing demand for this class of plants.

Our stock of beautiful and rare plants having attained sufficient growth, are now being propagated from, and I hope that at the close of the rains, they will be sufficiently augmented to meet general demands. There are many beautiful plants available for issue in the garden, but they are so numerous, that I fear it would make this report too lengthy to include them in it.

Manure experiments.—The following have been sown.—Maize, bajra, sun, dharus, in the economic portion of the garden, under the same conditions, as at the experimental farm at Bangalore; the seed has germinated well, and in due course will be reported on.

Over half an acre of ground is now planted out with American maize seed, acclimatized at Nepal, and presented by Mr. Girdlestone last year to the Society.

This seed germinated well, and the plants are looking vigorous and healthy, and will be fully reported on hereafter.

Panicum spectabile.—Raised from seed, occupy a small plot in our economic garden, and are making vigorous growth.

The greater portion of the sheds destroyed by the storm, has been re-erected, but has somewhat interfered with ordinary current work; it is a now desirable that Members should indent for their annual supply of plants so as to make room for fresh propagation. The two tanks are filling rapidly under an improved system of drainage. The tank at the west entrance being higher than it was after the rain last year, we may hope to have a full supply of water for next dry season.

I would draw attention to the large supply of useful plants now available for issue, among them Teak *Casuarinas* and *Inga saman.* Also to the very large quantity of Arabia Coffee seedlings. Stock of Rose plants available are varied and considerable, also Crotons. The garden has now in addition to its previous collection of Orchids, a fair number of *Vanda Giganteum, Vanda Lowii, Dendrobium Dalhousianum, Cypripedium,* &c. Also a considerable quantity of *Memecylon tinctorium;* this charming plant when in bloom has its branches covered with dense clusters of cerulean blue flowers of a pleasant perfume. I may add that one of our *Agaves* has flowering spikes on it, affording a good opportunity for any Members desiring to make a hedge.

Having succeeded in forwarding a parcel of violets per post to Simla which is reported to have arrived in splendid condition, I think I may safely venture to say, that for the next six months at least, this method, if adopted for Mofussil members in remote stations, and not over a week's transit, will enable them to realize their full privileges which to a great extent has hitherto been either permitted to lapse, or given to friends in Calcutta. Crotons, Coleus, Palms, and many other plants in their infant stage can be specially packed; the postal charges are trifling.

The multiplying power in propagation of plants in this garden is unlimited and with the minimum of cost in transit thus suggested, a fair outlet for plants from this garden should be created, the interests of Flori. and Horticulture advanced, and the very natural sequence of an increased demand, the lowering of expenditure, *pro rata,* in disbursement of plants.

The garden servants have enjoyed special immunity from fever during the period that it was raging in the neighbourhood; I encouraged them to eat the green papaya cooked as a curry, the men being permitted to take the fruit from the garden gratis.

The Lady Superior of St. Vincent's Home informs me that since she has planted Neem trees "Azadirachta," in her grounds, the inmates have been specially exempt from fever; there is no doubt this plant possesses fever dispelling properties, and as the seed can be procured for the gathering in Calcutta, the experiment of planting the same in the fever districts is worth trying. The plant is easily raised and needs no special care."

In connection with the virtues ascribed to the "neem," tree in the above report the Secretary drew attention to the fact stated in O'Shaughnessy's *Bengal Dispensatory* that Dr. White, of Bombay, used the bark of this tree as a substitute for Cinchona and found its success nearly equal as a febrifuge remedy. He further submitted a note from Dr. D. O'Brien, of the Sobeating Estate, Debrogurh, applying for seeds of *Eucalyptus rostrata.* Dr. O'Brien states that he raised some plants of that variety five years ago, and they are now 25 to 30 feet high, but very slim. "They were planted about the compound of my bungalow and to these trees I must attribute our complete freedom

from fevers, although the people (coolies) about are very subject to fevers."

EXHIBITION OF MODELS OF AGRICULTURAL APPLIANCES.

Read a letter from the Secretary to the Government of Bengal, dated 11th May, suggesting that the Society undertake the formation of a collection of models and drawings of Agricultural appliances for which the Lieut.-Governor is willing to grant a sum of Rs. 500. The Society having previously agreed to grant space for such exhibition.

Read also a preliminary report from a Sub-Committee of the Council stating what in their opinion would be the best mode of meeting the wishes of Government.

Resolved, that a copy of this report be forwarded to Government in reply to the Secretary's letter.

TRIAL SHIPMENT OF FRUIT FROM MELBOURNE.

The Secretary next submitted an interesting and useful memorandum, prepared by Mr. James Inglis, Executive Commissioner for India, at the recent Melbourne Exhibition, copy of which he had been favored by the Hon'ble A. B. Inglis, of this city.

The following are extracts from this memorandum :—

"In previous papers issued from this Court by Mr. Buck on the subject of the export of Australian produce to India, it has been noted, that in any dealings on a large scale, it is of little use to study the requirements of the European residents. The wants of the natives must be ascertained, and if those can be met, the trade is worth consideration.

Fruit of all procurable kinds is greatly in demand by the natives of India, especially in the northern parts, where fruit is scarcest ; and where there is a numerous middle class who can afford to buy it.

Large quantities of apples used to be brought to Calcutta by the Ice ships from America. The multiplication of Ice machines of late years, has somewhat checked this supply : but there is still the same demand as formerly.

Apples dried and fresh, dried apricots, figs, raisins, pistachios, almonds, walnuts, pomegranates, and grapes, &c. are imported from Afghanistan. Dried fruits and nuts in the largest quantity. The cost of carriage is great, as hundreds of miles have to be traversed by camels who carry the fruit.

The statistics for importation from Cabul and Candahar, taken from the Inland Trade Returns, are about £ 1,20,000 worth yearly.

The price of apples, of smallish size, at Cawnpore, in the centre of Northern India and in Calcutta is about a rupee, or from 1s. 6d. to 1s. 8d. a score. The grapes are of a long whitish kind, with thickish skins, very sweet, and they are packed in round chip boxes, three rows to each box. Each grape is cut from the bunch and laid separately on layers of cotton wool. In this way they bear long journeys, a large percentage keeps good for months, and they sell in Calcutta at an average of about a rupee per box. I estimate each box to contain say about 100 grapes.*

It is proposed by Mr. Buck, Director of the Department of Agriculture and Commerce, N.-W. Provinces and Oudh, and president of the Indian Committee for the M. I. E. to send for India to the Horticultural Society of Victoria, samples, prices and other information of all the fruits imported ; and the information thus obtained will doubtless appear in the Society's annual report.

The apples are being packed in different ways, and the present shipment is in fact purely an experimental one, with a view to gather useful hints from the result whatever it may be. Every method and every season should be tried : say by following this up with small shipments monthly, until the right plan and right season are definitely ascertained. Dried fruits especially should be tried, and the best mode of drying should be ascertained by experiment."

The Secretary also read a brief memorandum which he had drawn up on the above to the following effect :

"Having been invited by the Hon'ble Mr Inglis, of Messrs. Begg Dunlop & Co., to be present at the opening of the boxes containing a trial shipment of apples and pears, I think it may be useful to put a few remarks on the subject on record.

This shipment was, unfortunately, through a misapprehension of the P. and O. Office, allowed to remain for 14 days or so at the Jetties, so that seven weeks had elapsed after its despatch from Melbourne before the boxes were opened and hence they arrived under adverse circumstances. Notwithstanding this delay one-third of the contents was, apparently, in good condition, and a larger proportion would have, doubtless, reached in fair order had a better system of packing been adopted. The present mode of packing in closed up boxes, layer over layer, a dozen or so deep, is very objectionable. A much better plan would be to pack in baskets slung up in the inner deck of the steamer, or better still, (if not found to be too expensive) in crates somewhat in the same fashion as eggs are imported in such large quantities from France into England. If the fruit were carefully selected and carefully packed in the manner proposed, at least 75 per cent. should reach in good condition, as the passage from Melbourne to Calcutta occupies so comparatively short a time. Care should also be taken in sending the best kinds of fruits. The apples and pears of this first trial consignment which I tasted were of an inferior description, the former not better that what used to be imported in ice ships from Boston.

In connection with the above I would beg to call to the notice of the meeting the fact of a small experiment in this way in January 1878, by a Member of the Society (Mr. S. H. Robinson.) Mr. Robinson brought out on the Khedive a hamper full of apples from Devonshire of the ribstone pippin and flatnosed pippin kinds, both keeping or store apples. In this hamper 60 were brought, lightly packed in the hamper each in separate pieces of paper. After a voyage of 6 weeks two only had decayed, and 4 were somewhat bruised : the rest were all good and retained their flavor fairly. The hamper was kept in the cabin the first two weeks of the voyage, and for the rest of the voyage was kept cool in the ship's ice room but not in the ice."

INTRODUCTION AND DISTRIBUTION ON AN EXTENSIVE SCALE OF SEEDS OF CERTAIN KINDS OF FIELD CROPS.

Submitted various recent communications from Captain J. F. Pogson, of Simla, in respect to the introduction from other countries for distribution of seeds of certain field crops, of which the following are extracts :—

"Now that official attention has been turned to the improvement of Agriculture, Government should, I think, take up the important subject of importing certain of our field crops. For example from Benares to Meerut, the early ripening varieties of Indian corn should be imported from America. Then there is the early yellow Canada, ditto yellow Dalton, early Compton and other early kinds. Then for all districts north of Meerut later varieties would suit, and from Umballa on to Peshawur the latest ripening varieties of maize. The produce of such seeds would realize the same price in London, as the price of American grown corn. I enclose a half page cut out of "Buists Almanac and Garden Manual," for 1880, received in the box of his seeds. This Golden Millet, and the others are, I believe, unknown in India, and might also be introduced for field culture. We also want superior varieties of barley, and especially those which when properly prepared yield pearl barley.

In a second communication of 1st June, Captain Pogson continues the subject :

"We all know, that no improvement in Agriculture is possible, without an improvement in the variety and quality of the seed sown.

Our wheats are all good, and where from bad soil the grain has degenerated, a change of seed, and the use of manure, would at once put matters to rights.

But our maize and millet grain have greatly degenerated, and fresh seed from America is most urgently needed to rectify this serious defect. This introduction of seed, I hold it is the province of the Government to supply.

I submit that too much stress cannot be laid on the subject of introducing early, second early, middle, and late varieties of maize. The object in view being to have a variety of this most valuable cereal, which will ripen in the locality of its introduction, at the same time, as does the inferior indigenous maize, so that the ground may be cleared for the wheat, barley, and other cold weather crops. In the northern parts of the Punjab, the late ripening maize of America would be a positive boon, and bring very considerable wealth to its cultivators. From Jullunder to Meerut, the middle ripening varieties would suit, and yield like results, and so on, going eastwards till Bengal is reached.

Let us take gram, (*Cicer Arietinum*) as the next crop to be improved. Few officials in the governing circles of Simla, N.-W. Provinces and Punjab, know that very large quantities of gram are consumed in Italy, and I believe in all Roman Catholic countries ; (France, Spain, Austria, &c.), as human food, egg curry with gram dall may be considered fasting or mortifying diet. But I know few dishes more tasty. Leave out the curry condiments, and you have an egg stew, or as we would call it, "Egg Kormas and Gramdall."

Answer. Want of seed which Government should at once introduce. Mr. Nicholson has demonstrated that it (*white gram*) will grow in Mirzapore as well as the inferior kind, and to continue the cultivation of the latter is by no means desirable.

This undeniably superior gram, (it tastes like pea, and gram combined,) would, as a matter of course, command a very much higher price in all markets, and the producer would at once be benefited. But the hands of the Collector of Mirzapore are tied, and he cannot purchase such seed gram from Mr. Nicholson, and so the improvement cannot spread.

Let us now turn to the Punjab. From Delhi west-wards, gram is very extensively cultivated, and a good deal is sent down the Indus, and from Kurrachee is shipped to Mediterranean Ports. Trieste being the principal one.

We are supposed to be on friendly terms with the Court and people of Cabul : and it follows that if the money be forthcoming, (say Rs. 1,00,000, £10,000) that no difficulty would be experienced in obtaining seed gram from Cabul and closer, for all we at present know to the contrary.

The Punjab Agriculturist would at once cultivate the white gram, the seeds being given free, and the only clause being, that the recipient must retain sufficient seed for next year's sowing. To encourage extention of this cultivation for five years, prizes of turbands should be offered, and silver bangles for every ten acres of land, placed by any individual zemindar, under Cabul gram. Thus 100 acres would entitle to ten bangles and a pugree of honor.

Rice is another grain which should be looked to, and I fear we sent to the wrong place for it. Carolina rice does not suit India, and should try China and Japan for first class seed rice. In Japan they cultivate a variety of rice, so rich in oil, or fat, that the Chinese will not eat or use it. Now this rice would suit the Hindoo exactly, who would have naturally buttered rice to eat, with his plain boiled dall. For the London Market the seed rice of China would yield the proper article, much starch in the grain is needed, and I think the Chinese kind would yield the full supply.

In a third letter of 15th June, forwarding a specimen, Captain Pogson offers the following remarks :—

"By this-day's bangy post, bearing, I have sent you a half pound sample of a superior variety of barley, sown by me in October, 1880, and harvested on the 28th of May 1881. I have also sent three ears of this barley, so that a satisfactory inspection and opinion may be formed as to the quality and commercial value of this particular description of barley.

In 1880, Mr. Nicholson, of Mirzapore, was so good as to send me some of this barley for sowing, and stated in his letter that the native Agriculturists held in great estimation, and were anxious to obtain such seed barley for cultivation.

Mr. Nicholson did not mention whence he obtained the original supply of seed, so I cannot tell whether it is Indian, or from the Continent of Europe.

My fowls, eat this barley with avidity, but they won't touch the common barley, thus as far as feeding poultry goes, the variety is a desideratum.

To test its value as human food, I had some ounces half roasted in a pan, (coffee bean fashion) and *quantum suff* put into the soup. The

addition made it excellent, thus taking the place of "Pearl Barley." The imported "Pearl Barley," is much too costly for ordinary use, and British troops, I believe, regard it as a hospital luxury. Now if the proper description of mill was forthcoming, this variety would supply all classes with indigenous "Pearl Barley," at a very cheap rate.

I have preserved my entire crop for use as seed, and will with pleasure place it at the disposal of the Council of the Agri.-Horticultural Society for distribution to Members, and all who may feel disposed to cultivate it, and thus secure a good supply of seed for sowing in the cold season of 1882.

From its appearance, I am inclined to think, that it should be called "*Barley wheat*," the Hindee term "*Gae jow hoon*," is perfectly applicable, and would be the popular name *Gae jow hoon*.

Mr. Nicholson has shown, that it is as easy to grow superior barley in the plains, as the inferior kind, and when this truth dawns on the native Agricultural mind, the cultivation of the common barley will be abandoned.

If Tea Planters who are Members of the Agricultural and Horticultural Society would this year import seed of the "Hordeum Zeocriton," of the United Kingdom, the cultivation of this barley would soon lead to the manufacture and export of superior "*Pearl Barley*," and the new industry would especially benefit the Agricultural classes. The seed raised in the Himalayas, would answer perfectly in the plains, whereas imported seed sown in the plains, would, I fear, be a failure, the change of the climate being so very great.

I will in due course let you know how much seed barley I possess at present, the gram has not been removed from the ear.

The Society might import the kind of mill used for converting seed barley into *Pearl Barley*, and its exhibition would lead to numbers being imported by the trade."

The specimen of barley was much admired. It was agreed to import the mill in question, as suggested by Captain Pogson, and included in the proposed collection above alluded to.

In connection with the foregoing the Secretary, when calling attention to the two specimens of *white* gram (a seer of each) on the table, referred to a letter from Mr. R. Nicholson, of Mirzapore, the donor of which the following is extract :—

"I have been growing white gram for the last six years, but not to any extent as I feed my cattle on oats. I originally got it from Mr. Nickells of Benares. He told me he got it from the Maharajah of Benares. From the want of rain, I fancy the quality of the gram has greatly deteriorated this year. Both specimens now sent are from this year's crop. No. 1 is the fine good grains that were picked out."

The gram specially No. 1 was considered very superior to the ordinary gram and that its cultivation should be extended.

The barley I sent to Captain Pogson was raised from a handful of seed given to me by one of my servants some five or six years ago, he told me a man coming from Benares he believed gave it to him.

As I have a limited piece of land I have only sown a little ground to keep up the seed. Two years ago I gave two seers to one of my native officers who lives in the Jounpore district. He tells me that from his first crop he gave seed to some of his friends and that the grain is much prized, and he gets many applications for seed. He also told me the meal made from it was very superior and that the *chupaties* made from it were quite as good as from wheaten meal.

It yields much more meal than the same weight of the best native barley, and there was little loss of weight in grinding it as the proportion of bran was trifling.

Last year I sent seed to Mr. Peppé of Birdpore, in the Bustee District, he wrote to me he had a fine crop, and expected to be able to sow at least four beegahs this year, he also said it was much esteemed by his ryots, and that the only objection he saw to it was that as soon as it was fully ripe the seed-shed very much but he hoped to prevent that this year by cutting before it was over ripe.

As referring to the subject before the meeting, the Secretary drew attention to an application just received from a gentleman in Oude for a large quantity of good oat seed which he wished to raise there with the view of introducing a superior description. Such applications were constantly received not only from Members, but other residents in various parts of the country. The Society annually imported seeds of field crops, such as wheat, barley, oats, clover, lucerne, maize, cotons, tobacco, &c., but as its means would not permit of a large sum being appropriated to such purpose, it could only meet such applications on a limited scale.

On a review of the whole subject, there was a feeling in the Meeting that the introduction annually of good varieties of seeds of field crops, on a large scale, was a matter well deserving of the attention of the Government of India in its Agricultural Department.

POTATO CULTURE.

Read a letter from Colonel H. R. Wintle, of Futteegurh, dated 6th June—" Regarding the potato [from Melbourne stock] you sent me "—observes Colonel Wintle—" I am afraid I must say they proved a failure with me. I sowed some whole and some cut up; the produce was not satisfactory in size or quantity. Out of the 11 seers put in I only got 9½ seers. I have kept them for seed, they are all sprouting and shall put them in again in October, and perhaps the yield will be better.

The finest and best crop of potatos I ever had, was from a packet of potato seed I had out from Sutton and Co.s I sowed the seed broadcast, the produce was small potato of the size of marbles weighing all about 14 seers. I kept these and the following cold weather put them in, and the yield was, as I may say, the finest and best crop I ever had weighing, I should say, about 12 maunds. The price of the packet of seed was 6 pence."

The Secretary intimated he had requested Messrs. Sutton to send a few packets of the same seed for distribution to Members desirous of trying it.

MODE OF GROWING ANÆTOCHILI.

Mr. J. Coles Hardinge, the Honorary Secretary of the Agri.-Horticultural Society of British Burmah, gives in the following communication a mode of treating the Anætochili, which he has found very successful :—

"I see in the last published number of your Society's Journal (this year) a note by your Head Gardener about growing Ænectochilus, and his want of moss to grow them in. The climate of Calcutta and Rangoon is not very much different, so I think if he adopts my plan, he will be as successful in growing these beautiful plants as I have been.

I get shallow earthenware pans (about a foot in diameter) several drainage holes being made in them, these I fill with tolerably large pieces of clean broken brick and charcoal, sprinkling a handful or two of old rotten cocoanut husk powder, *i.e.*, the powder which falls from the husks when beaten), between the interstices of the broken brick. n this I lay the pieces of Ænectochilus cut into lengths of one or two inches (or more if there are many, during the rains, when they soon root and begin to grow, the roots firmly adhering to the pieces of bricks. In the rains, they are placed under a shed with an open trellis teak wood roof over which some creepers have been trained, they require plenty of light, but should be shaded from the direct rays of the sun, these plants stand any amount of *drip* which the generality of Orchids do not, and nothing is more fatal to many of them with large fleshy leaves such as *Vandas*, and *Phalænopsids*.

In the dry weather, they are kept in the same situation and watered daily, care must, however, be taken say in November, December, not to water them too freely or they rot off, the bricks and mould turning sour. Every year just before the rains I give them a fresh handful of coir dust, not "smothering" or covering the bulbs, they being left well exposed in December. January the leaves begin to get discoloured and fall, and their season of rest is between that month and April when they should be sparingly watered. I use no moss at all, for I have gathered these plants myself during the months of June and July, when it rains nearly every day, in the vallies about the hills on the Islands of Pulo Penang, Pulo Ramos ; and others adjacent : their home is the deep crevices of damp boulders near running streams or where there is a constant steamy moisture from evaporation, where I found them in the greatest abundance, there was plenty of day light, but the rays of the sun could never reach them.

I may mention that last year Messrs. Hugh Low & Co.'s Orchid Collector while passing through Rangoon was quite struck with the size and hardiness of my plants, and he made a memo. of my method to take home with him for adoption in England."

COMMUNICATION ON VARIOUS SUBJECTS.

1. From H. Beveridge, Esq., C.S., Bankipore, states, with reference to the memorandum on Munjeet in the last Number of the Society's Journal, that it is cultivated in certain parts of the Backergunge district

2. From the Collector of Backergunge giving some particulars on the cultivation of Munjeet in his district.

3. From Captain J. F. Pogson, a note regarding *Gossypium arboreum*.

4. From Under-Secretary, Government of Bengal, further particulars regarding *Sida rhomboidea*, in continuation of the papers submitted at the March Meeting.

5. From the Secretary, notices regarding the flowering of Bamboos.

6. From Captain Pogson, particulars regarding the identification of wild strawberries in connection with recent papers respecting the efficacy of *Potentilla* leaves for cattle disease.

The above papers were transferred for publication in the Journal.

7. From the Deputy Commissioner of Sumbulpore, applying for seed of the Manilla hemp plant.

8. From the Secretary Agri.-Horticultural Society of Lahore, to the same effect and information as to mode of cultivation. (Information given, but plants not available.)

9. From the Executive Engineer, Cuttack, applying for information regarding culture of the Date tree, cost, yield of Sugar, &c., as he thinks it might be profitably cultivated in the Canal lands and banks of the Orissa district. (Complied with.)

10. From Messrs. Andrew Yule and Co., applying for information regarding the culture of the Maple at Darjeeling, in connection with a large supply of seed recently received by them from America through the intervention of the Society. (Complied with.)

MINERALOGY.

WE observe that the Government of Madras have resolved to grant certain privileges to parties "prospecting" for metals, and have passed the following resolution.

ADVERTING to the question of *prospecting* which, in the first paragraphs of the marginally noted Orders, the Government resolved to omit from consideration in framing leases for mining for gold and metals other than gold, it has since occurred to Government that some kind of temporary exclusive privilege may properly be given to prospectors who desire to test specific localities closely.

2. Ordinary prospecting does not, in the opinion of the Right Hon'ble the Governor in Council, require any special protection, but where prospectors have obtained promising indications, it may be reasonable to grant what may be termed "*proving*" leases for a limited time over a limited area to test results more closely, say for six months or a year, over half a square mile, though the area might be extended if the block was compact. This arrangement would afford reasonable facilities for testing before applying for a mining lease, and would protect intelligent and scientific research.

3. It is necessary that the area should not be excessive to avoid risk of excluding others who may have more *bonâ fide* intentions than the concessionaries.

This will be ample to protect *bonâ fide* prospectus, and is just one of the ways by which Government can help our new industries without resorting to the guarantee system.

GARDEN.

USEFUL GARDEN RECEIPTS.

(From Hogg's Gardeners' Year-book.)

TO MAKE PURE BLOOD MANURE.—The receipt for making this most valuable fertiliser for garden crops, flower borders, and pot plants, was given me by Sir Daniel Cooper, Bart., and may be relied upon as constituting a genuine artificial manure of great importance, and which can be made in small quantities as desired :—Muriatic acid, 4oz. ; protosulphate of iron, 4oz. ; blood, 16lbs. As soon as the blood begins to smell, pour upon it the muriatic acid and protosulphate of iron previously mixed, and it will be reduced to an inodorous powder, which will keep any time, and is of a fertilising strength equal to guano. The action of this manure is to produce flowers and fruit instead of leaf and stem.

PETROLEUM *vs.* AMERICAN BLIGHT.—I have been able to almost entirely get rid of that pest to my apple trees, American blight. Last year the trees were completely covered, but after the fall of the leaf I had them carefully dressed with petroleum, which was applied to the affected parts with a paint brush. Contact with the petroleum seemed to destroy the insects, and I was in hopes they had entirely disappeared. This summer, however, there have been signs of them again, but whenever the blight makes its appearance an application of the brush dipped in petroleum at once extinguishes it. The contact of the oil with the leaves and fruit buds apparently does no injury, and I see that with a little patience and perseverance my trees, which were in a fair way for being ruined can be preserved.—E. B

TO CLEANSE FRUIT TREES OF MOSS.—Not only the mosses and lichens which so generally affect fruit trees, but the eggs of insects, may be effectually destroyed by dressing the trees in winter with a wash composed of a saturated solution of soft soap and common salt or brine. The trunks and large branches ought to be first scraped with a scraper made of old hoop or any other implement that may be improvised for the purpose, and when all the scales of bark are removed, apply the mixture with a painter's brush, working it well into the crevices. This is much preferable to, and not so unsightly as, washing with lime.

METALLIC PAINT.—To 40 gallons of Stockholm tar add 4½ gallons of naptha of about 18 deg. Baume, specific gravity, mix carefully, and let it stand for twenty-four hours ; then draw off the purified tar mixture from the dregs, and to 40 gallons of this mixture add 30lbs. of dry ochreous iron ore, commonly called bog iron ore, in the form of a fine powder, which must be thoroughly incorporated with the tar ; then about 40lbs. of commercial white arsenic and 100lbs. of oxide or sub-oxide are added, and the whole is reduced to a thick paint by a mill or otherwise.

TO REMOVE MOSS FROM LAWNS.—I have had lawns almost completely taken possession of by a thick carpet of moss, which has well nigh obliterated every trace of the grassy turf. After experimenting with every imaginable remedy, I have found nothing so certain as a good dressing of wood ashes. The effect is not immediate, but during the following summer the moss disappears, and a thick turf of fine grass with a profusion of white Dutch clover succeeds. In some parts of the country, where wood is not used as a fuel, it is sometimes difficult to obtain wood ashes. In this case the simplest way of procuring them is to collect all the prunings of hedges, shrubs, rough bushes, and other waste materials of a similar character that are to be found about most places, and burn them in a heap. Enough ashes will generally be got to supply the needs of the place.

TO DESTROY GRASS AND MOSS IN PAVEMENTS AND WALKS.—Dissolve 1lb. of powdered arsenic in 8 gallons of cold water, boil and keep stirring ; then add 7 gallons of cold water and 2lbs. of crushed soda, stir the whole well whilst boiling, and with a rose watering pot apply to the walks in dry weather, from March to May inclusive being the best time. The above quantity will be enough for 25 square yards. An inclining board should be placed at the sides of the walks or grass to keep off the hot liquid. Salt will destroy weeds for a time. If you have box edgings, the salt or the soda and arsenical solution above-named must be kept from them, otherwise they will be killed.

TO SOFTEN OLD PUTTY.—The best application for softening old putty is caustic soda or potash—preferably the latter. To make either soda or potash caustic, dissolve them in water mix, with freshly burned and slaked lime, and after the mixture has settled, pour off the clear liquid for use. Putty will be very rapidly softened if kept moist with this liquid Caustic alkali is also the best, and, in fact, the only thing that will remove paint spots from the glass of windows after they have once become dry. Or dip a small brush in nitric or muriatic acid, and with it anoint or paint over the dry putty that adheres to the broken glass and frames of your windows ; after an hour's interval the putty will become so soft as to be removed easily.

TO REMOVE WORMS FROM LAWNS AND POTS.—Half an ounce of corrosive sublimate (bichloride of mercury) dissolved in 15 gallons of water will cause worms to come to the surface ; but care must be taken that fowl do not eat them, otherwise they will be poisoned. A peck of freshly made quicklime mixed with 40 gallons of water, and allowed to stand till it clears, it applied through the rose of a watering-pot will have the same effect. These mixtures may also be used to remove worms from flower pots.

ORCHIDS FOR AMATEURS.

DENDROBIUMS rank among the very finest of all orchids. Most of the species which we named in the March number of the *Villa Gardener*, will grow well in the warm end of a Cattleya or intermediate house. They may all be grown either in pots or baskets, but those most fitted for basket culture are Chrysotoxum, Densiflorum, Devonianum, Parishii, Pierardii, Thyrsiflorum, and Wardianum. The others do fully as well in pots. Strong-growing kinds should have a good depth of material to root in such as nobile ; weak rooters, such as Parishii, should have but little material.

The two great secrets in the successful cultivation of the Dendrobium are a decided season of growth and a decided season of rest. This is best secured by affording a pretty brisk heat from the time the growth commences, until it is fairly finished, and then the plants should be kept comparatively cool. During the growing season a plentiful supply of water is necessary, and during the resting period only just as much as will prevent shrivelling. It is only by such treatment that *D. nobile* can be made to yield a profusion of flowers. By keeping the plants warm and moist they go on growing, but flower only sparely ; but by the opposite treatment abundant floriferousness may be had. The evergreen kinds should not be kept quite so dry as the deciduous kinds. During winter the baskets in which these are gorwing should be damped weekly with the syringe.

DISA GRANDIFLORA.—This is a very fine cool-house orchid, and when there is only such a house as we have recommended, it should be put in the coolest position possible, and near to a ventilator, for it must be borne in mind that too great a heat is against the plant's well-doing. The ordinary orchid mixture will suit it well. Some growers add a little very fibry loam, but we cannot say that it does better in it than in the ordinary mixture.

LÆLIAS.—Anceps and Autumnalis should be in the smallest collection. Anceps does best in pots, but Autumnalis requires a basket or a block. Both thrive well in moss and charcoal, and a fair supply of water, while growing, especially if they are on blocks. Both are winter-flowering plants, and require a good season of rest after they have flowered. Re-potting, basketing, or blocking should take place just before new roots are pushed in spring.

LYCASTE SKINNERI is a real gem for an amateur. There are many varieties, but all are good. Its main requirements are:—The cool end of an intermediate house or warm end of a cool one ; moss and charcoal, with a little fibry peat ; plenty of water while growing, and moderate dryness while at rest. Scale is apt to trouble it, but the use of the sponge will keep it under.

MESOSPINIDIUM VULCANUM and sanguineum are two neat, free-growing plants which freely produce elegant spikes of sanguineous flower. Both are easily cultivated.

MILTONIAS are good, free-growing, free-flowering orchids. The cool end of the house, and a couple of inches of material to root in ; steady moisture, and shade from sun, will secure success in their cultivation.—*Count y Gentleman's Magazine.*

FORESTRY.

A PLEASING and useful custom has lately arisen in some of the duty American States of setting apart one day in the year to the of tree-planting. The 28th day of April was "arbor day" in the State of Michigan, and we understand that a very large number of trees were planted, and that much interest was shown in the occasion.

IF we could only induce the natives of this country to follow this good custom, great benefit might be conferred in the country.

IT would be advisable too, if Government would also aware prizes in money for such of these trees as had arrived at the age of three years, and were healthy and flourishing. These two customd introduced, the Forest Department might, so far as preservative work is concerned, be abolished.

THE Persian Government has lately taken into consideration the propriety of granting concessions for the exploitation of the forests of Ghilan and Mazanderan, and for working the mines. Divers promises have been made ; but every body who understands Persia will know that those mean absolutely nothing. The only institution in Persia that have any pretensions to success are the regiments drilled by the Austrian officers under Colonel Schemer, the cavalry drilled as Cossacks under Colonel Domontovitch ; and, to some extent, also, Monteforte's police. Under an administrator like the Sipah Salar, these might flourish for the time, and even improve ; but the moment European supervision ceases, the reforms will fade away.

TEA.

THE latest report we have from Ladak, contains good news for the tea planters of Upper India. For a considerable time Indian tea was not allowed to cross the frontier into Chinese Turkestan. We now learn that "A messenger from Yarkand, who reached Ladak on the 15th June with letters, reports that the prohibition on the import of Indian tea into Chinese Turkestan has been cancelled. A Ladak trader who received letters by the same man, confirms the report. A notice, it appears, has been issued at Kiliau, that Indian tea may be allowed to pass in without hindrance, and that duty would be levied on it at Yarkand. The price of Indian tea in the Yarkand market is now nearly four times that current in Kangra." This should open up an entirely new market for the Kangra planters, and those of Upper India generally. The principal demand in the direction of Turkestan is for brick tea, and its manufacture is very simple, and will be amply repaid by the high prices ruling. The cause of these high prices is, of course, the great distance the tea has to be carried, and the difficulties in the way of carrying on the trade across the Himalayan passes. These are high, as much so as 17,000 feet above sea level, although the general height is from 10,000 to 14,000 feet. The roads are very bad, and at the best are but bridle paths. Once the foot of the hills is reached, goods are transferred from the back of bullocks, mules, &c., and are carried over the mountains by goats and

sheep. These little animals carry about 25 lbs. each, and take about three months to cross the hills. This is one of those routes on which a wire tram would be useful and cheap, and we commend the idea to those enterprising gentlemen who are always casting about for some scheme on which to base a prospectus!

At "Ye Old English Fayre," recently held at the Royal Albert Hall, an opportunity was presented of introducing fine Indian teas to the notice of the public, which was promptly seized by the Indian Teas Districts Association. A box of fine Darjeeling tea was given for the occasion. The refreshment stall, presided over by the Countess Cadogan, was decorated with photographs of Indian tea gardens, and illustrations at the process of manufacture. Cups of Indian tea were sold at one shilling each, and brought in a good sum to the charity, at the same time spreading the knowledge of, and sitimulating inquiry for, the teas of the Indian Empire.'

THE TEA TRADE.

THE solidity and caution of the British character have passed into a proverb. The volatile Frenchman is supposed to go into matters of the greatest moment that may be fraught with the most serious consequences with a light heart; but such levity has never been attributed to the average Briton. He is supposed to take even his pleasures sadly; much more is he certain to be grave in his business relations, and to enter upon no operations even of lesser importance without long and careful consideration. "Lightly come, lightly go," is one of the proverbs which are supposed to decorate the walls of his counting-house; and the endurance and persistency of British trade, which still holds its own all over the world, are commonly attributed to the forethought and caution with which it has been established and promoted. The British merchant does not begin to build a tower without counting the cost, and from this it results that the towers of his trade are completed and stand against all the assaults of nature and of his competitors.

It is difficult, therefore, to understand how it is that the China tea trade is such a notable exception to the general rules of British commerce. To judge by acknowledged results, it is impossible to believe that any such caution as is supposed to govern British commercial operations generally, is employed in Hankow and Foochow at the opening of the season's business at these two great ports. To begin with, uncertainty is surely an element to be avoided if possible; but the supply and demand of tea are as uncertain as anything in which there is some regularity can be. It is fairly certain that in nine years out of ten more tea is available than the Home markets can take. Year after year the Home circulars reiterate that all chance of profit has been lost by the oppression of excessive supplies. The result is a greater competition in London to sell than to buy, and prices are fixed by the generosity of the buyers instead of by the firmness of the holders. If the Chinese mind could be got to realise the importance of accuracy in the statement of facts and the collection of statistics, the way of the tea-buyer would be a little more plain. As it is, there are two important elements that we can never ascertain. How much leaf is available for export in a given season and what is the actual cost of bringing this leaf to market are matters merely of rumour, and as the relaters of these rumours are too much interested, except in very rare cases, in falsifying them, reliance on them is indeed leaning on a bruised reed. Allowing for the fluctuations resulting from occasional disturbing causes, consumers must pay for an article on the average something over the actual cost of production; and in that excess lies the profit to those engaged in its distribution. If then we could learn with certainty the actual cost of growing, picking, preparing, packing, and transporting to Hankow a chest of tea, we should have one of the necessary elements to the conduct of a successful trade. But until the country is opened up, and it is possible for the merchant or his agents to travel freely in the interior and make the necessary investigations on the spot, this knowledge is unattainable. The same facilities are necessary to enable us to arrive at a knowledge of the amount of leaf available for export in a given season. In India there are statistics gathered by the Government, giving the area of ground devoted to tea-growing, the approximate amount of capital employed, and the age of the gardens, with the average yield of every acre. And a man who buys tea on the market in Calcutta, can do it intelligently and with a fair prospect of success if he uses ordinary caution. But all this is impossible in China. Our knowledge of supply is derived from the vague and unreliable reports of the Chinese brokers, whose object it is to under-estimate the production, and increase competition accordingly. We can only collate and criticise their statements that the weather has been very unfavourable; that there has been too much or too little rain or snow; that the middle-men lost so much money in the previous year; that their operations will be largely restricted by want of funds; that the Chinese bankers with whose money so much of the first crop is moved, are indisposed to make the usual advances, &c., &c.; and by and by we find that the irrepressible tea plant has overcome all those drawbacks, and that the market is as full of musters as ever. At last, however truthful the brokers may have appeared to be when they were telling these melancholy tales, there are always ten thousand packages more available, at a buyer can be found. But worse remains behind. The foreign buyer has no control over the quality of the crop, for he has to buy it exactly as it comes to market ready for shipment. This was of comparatively little importance when China was the only tea-producing country. The best tea then meant the best of the year, for one crop of tea was compared with another of the same country and the same season. But India is now furnishing a standard against which China has to measure herself. India, where the production of tea grows so fast that the export this year is expected to reach sixty million pounds; and where a new soil and foreign control produce strength and quality, surpassing, except in rare instances, the best that China can afford. We can no longer send forward safely the whole China crop, and allow India to supplement its deficiencies. The Home consumer is now taking the whole of the Indian crop, and turning to China to fill up the void left by India.

Considerations such as these ought to temper the ardour of the buyers who have flocked as usual in the last fortnight to Hankow. For unless they have due weight, nothing but loss can be expected. To be safe, China ought to export this season to Great Britain, some thirty to forty million pounds less than last year. This will not be the case unless a catastrophe occurs; a catastrophe that must occur sooner or later, if these warnings are not attended to. If there is the usual hurry to buy tea this week in Hankow, if the first crop brings remunerative prices to the tea-men, a large yield is certain. When the tea reaches here in the autumn, it must be sold, for it is of no other use to the Chinese. When it gets to London it must be sold, for no one there will take the risk of holding so perishable an article. We are not sanguine that the caution which characterises other branches of commerce will be employed this year in Hankow; for it is a far cry from London to Hankow, and there is no race of men so hopeful as are chasses at the commencement of the season.—*N. C. Herald.*

THE MYSTERY OF THE CHINA TEA TRADE.

WE do not think it necessary to make any apology to our readers for directing their attention to the letter which appears on another page under the signature of "Chaa Szee." Most of the residents here have such a direct interest in the matter he treats on that, we think it well to make a few remarks on what appears to us a very important subject. Our correspondent states, and apparently it would be difficult to deny it, that shippers of tea are paying in Hankow from 6*d.* to 7*d.* per pound over rates current recently in London. The question then to be solved is,—are there any reasons sufficiently good to warrant such an advance? One answer to this would be—and there is probably some reason in it—that the sale he refers to was not a fair indication of the value of the tea; that the tea was, in fact sacrificed. We have taken some little trouble to find out whether such might not have been the case, and the conclusion we have arrived at is that the tea in question would probably have fetched from 1*s.* 3*d.* to 1*s.* 4*d.* instead of 1*s.* 1*d.*, had it been more carefully handled on arrival in London. This then will apparently do away at once with half the discrepancy which he asserts to exist, but it must not be forgotten that this is a risk which a large proportion of shipments must always run. It also appears that his sale is a fairly recent one, for he states that he purchased the tea in December; it could not, therefore, be on the London market before the latter end of February, when we are informed that teas of good quality were scarce and wanted, a state of things which will not exist when present purchases arrive. It is, therefore, a fair argument that the value of such tea will be less when the deficiency ceases. For the sake of argument, however, we will assume that the present value of such tea in London is 1*s.* 3*d.* per lb. Is there any just reason why 1*s* 8*d.* should be paid for similar, or, according to our correspondent, for inferior quality? To our minds one fact only would justify such an advance, and that is the certainty of a marked deficiency in supplies. Reports from Hankow refer to a deficiency in the first crop of from 10 to 15 per cent. Without going so far as to deny that this may be possible, we must confess to being somewhat sceptical on this point, nor do we thing that a short first crop necessarily means a short total export. The season 1878 and 1879 is, we doubt not, still within the recollection of many of our readers, and if we are not mistaken there was a very large actual decrease in the first crop. Still the total supply of the season was ample, or, judging from the disastrous results, more than ample, that season being acknowledged as one of the worst the trade ever experienced. We are therefore unable to see that a problematical deficiency is a sufficiently good reason for paying in China 5*d* per lb. more than teas are worth in London.

But are buyers in London, at the time present shipments arrive, likely to act upon the supposition that there is a short supply, or will they treat the statement as nothing more than a report? The cry of "Wolf" has been so often raised and so often proved to be devoid of truth that we have no hesitation in stating that not the slightest heed will be paid to this report until an actual deficiency will be apparent. Judging from the fact that they will carry over from last season a large surplus stock; that the supply from the south of China promises to be large; that, as our correspondent observes, there is the certainty of a large increase from India, we can see no chance of any deficiency being felt in London for many months to come. Granted that the whole Chinese crop is inferior in quality, we should—it may be in our ignorance—have supposed that this was a strong reason for paying less than usual, whereas that the contrary as the case seems a tolerably well authenticated fact. That there will most certainly be a dearth of fine teas of China growth seems inevitable, and those shippers who, taking this into consideration, have only paid enhanced prices for fine teas, may probably find that they were justified in doing so, but because the whole crop proves to be inferior, appears to us to be a very poor reason for raising the price all round, or at least for qualities such as our correspondent mentions. Taking a calm unbiassed view of the whole matter, we can form no other conclusion than that shippers are running enormous risks, which circumstances, at any rate at present, do not justify. As soon as the inferiority of the China crop will be known in London, the inevitable result, to our mind, will be to considerably enhance the value of Indian teas and to the same extent depreciate the value of China teas. The public at Home is by this time so accustomed to obtain tea of really good quality for 1*s.* 8*d.* per lb., that they will not be easily satisfied with anything inferior. This tea is made up of a judicious mixture of Indian and China, and to make up for the deficiencies of the latter more Indian will be used and less money paid for the China.—*N. China Herald.*

COFFEE.

COFFEE LEAF-DISEASE.

MR. SCHROTTKY'S SEVEN MONTHS' CAMPAIGN.

TO THE CHAIRMAN AND MEMBERS OF THE PLANTERS' ASSOCIATION OF CEYLON.

SIRS,—When in November last, while on a touristical visit to Ceylon, I decided to make use of a month's leisure, to institute with the help of some practical planters a series of experiments with the view to determine whether it was really beyond the reach of Chemistry to give coffee planters a remedy or palliative of coffee leaf-disease (this most dire infection) I had no idea that the work would occupy seven months.

I came very early to the conclusion that science in this case would not be so helpless, as she is generally represented to be, and that the disease (being fairly accessible) could not only be topically destroyed by a number of chemicals, but that the conditions of the sap of the tree could be artificially so altered as to make it less favourable to the development of the disease in the leaf cells. But to reduce this conclusion into a practical form, to devise a practical and cheap method of using any of these chemicals as topical applications or otherwise, and after having found a method, to obtain such proof of the results of the same as would be readily understood and acknowleged by practical men;—this I have found an arduous task which I more than once despaired of bringing to a satisfactory conclusion,

and which has occupied a time that I have only been able to give to it by greatly neglecting and sacrificing my interests elsewhere.

With some professional repute engaged, I was naturally reluctant to leave such an important work half done, and with its practical issues involved in doubt, it is therefore with more than ordinary pleasure, that I proceed now to sum up the results these experiments have yielded up to date, and which I think warrant some very satisfactory conclusions regarding the method I recommended for the mitigation, if not prevention of leaf disease, *vis* vaporisation with carbolic acid.

Having a practical object in view, I have investigated the whole subject (as far as I was able, having only a general and not a special knowledge of mycology) mainly from a practical point of view, and desiring to make this paper as short and concise as possible, it will, I hope, be understood that my main conclusions though stated in a few words have not been arrived at without full consideration of every fact that I have been able to observe myself, or been able to collect from such of the planters whom it has been my privilege to meet in my seven months' study of the subject.

THE FUNGUS.

As described generally by mycologists, and more specially by Mr. Marshall Ward, what is known as coffee leaf-disease is a parasitic fungus (*Hemileia vastatrix*) propagated by spores, whose germinal tubes when in contact with the lower surface of living coffee leaf, enter into its stomata, establish themselves in the intercelular tissue, develops at the expense of the cell sap into mycelium which finally forms a receptacle (the Uredo) from which arrives and break through the epidermis of the leaf kidney-shaped orange-coloured Uredo-spores, forming clusters of what constitutes the well-known rust. The same mycelium also produces a secondary spore, the Teleuto-spore.

Before fruiting the presence of the fungus or rather of its mycelium in the leaf tissue, is evidenced by pale yellow circular spots (called pinspots) transparent or opaque. The healthier the disease, the more opaque the spot.

The fungus has been clasified (by Berkeley and Broom I think) as belonging to the Uredineæ. Any doubt as to whether this classification is correct has been removed by Mr. Ward finding the Teleuto-spore.

It is, therefore, perfectly reasonable to look forward to Mr. Ward (the mycologist specially engaged in Ceylon in the investigation of the different forms of this fungus) describing to us, before he closes his work, the three different cycles of 'generations of this fungus, and the other hostplant on which the transition takes place, this being a distinguishing feature of the Uredineæ.

But what makes this disease so formidable an enemy is the peculiar capability of the Uredo-spores (or rust) to produce themselves indefinitely by their constant germination and reproduction without the necessity of passing through the cycle of generations. These orange-spores, of a heavy oily character, germinate in contact with moisture (dew, rain, &c.) and their contents pass into a germinal tube. The spore becomes an almost empty cell, and the whole fabric is then extremely light and capable of wide diffusion.

Wind is, in my opinion, the chief cause of the dissemination of the spores before, but far more so (on account of their lightness) after germination from one disease spot to another, from one leaf to another, from one tree to another, from one field to another.

As far as I have observed, and from information I have collected, the leaf-disease fungus spreads, during the periods favourable to the germination of its spores and to their establishment in the leaf from chronically diseased centres and travels in the direction of wind currents.

The idea that an estate is absolutely free from disease for, say, three months, and that then it appears simultaneously all over the estate, has, I think, its origin in untrained and defective observation, and is greatly due to the extraordinary rapidity with which the disease spreads when all circumstances are favourable.

The germinated Uredo spore will not establish itself in an incongenial nidus. Where congenial conditions do not exist, it will, even when over a stoma, simply dry up.

We may take it for granted that, considering comparatively, force and direction of wind and neighbourhood to diseased parts of an estate, each square inch of lower leaf surface of a coffee estate will receive an almost equal number of spores that maintain adherence. But on different trees the disease establishes itself in a different (but for the same tree rarely varying) force. There exists, therefore a condition of the coffee tree, or more properly speaking, a condition of the sap of the leaf cells which is peculiarly favourable to the development of the disease. In some trees, this condition is continually present, and on these the disease can nearly always be found; it is there in a constant and chronic form. In the generality of trees however, this condition occurs only twice a year, and it is during those two periods that the disease spreades itself from a few confined disease patches more or less all over the estate.

In the majority of districts these two general attacks of the disease cay be distinguished into a south-west and north-east monsoon attack, and then coincide closely, but generally precede by a little the natural, so to speak autumnal fall of the coffee leaf which takes place to a more than usually appreciable extent twice a year. In many cases only one such fall will be acknowledged.

These are periods, comparatively speaking, of a minimum of activity, of a minimum or alkalinity of the sap of the tree—periods when the trees are preparing their gathered stores of nutritious material for a new flush of leaves, when the cellular starch deposits are either changing or on the the point of changing into glucose, in order to enable its passage from one cell to the other for the formation of cellulose at the apical or axillary buds.

It is the period just before a maximum activity of the tree, during which the condition of the sap of the leaf cells appears to be most favourable to the penetration of the germinated Uredo-spore into the stomata of the coffee leaf and to its establishment in the intercellular tissue. The germinal tubes of this fungus share, no doubt, the apparent property of other absorptive vegetable forms, *vis.* that of an instinctive knowledge of the presence of congenial food. The condition of the sap of the coffee tree most congenial to the establishment of the fungus is, I take it, when the cellular starch deposit, the leaf are in a state of transition into glucose or sugar, which substance, I am greatly of opinion, furnishes the chief food of the fungus. And this transition, be it well borne in mind, can only take place in the presence of a free acid. The sap of weakly trees seems to be always in that condition.

It remains only to be said that while I agree with others in considering the chief damage done by the disease due to the premature fall of leaf, I would add to this, that I feel assured that the disease has a reactionary influence; that it leaves behind in the tree, after a severe attack, a subtle poison, causing a subtle disposition in the tree to recreate the condition favourable to its re-development, which interferes with and is antagonistic to the natural disposition of the tree to form stores of insoluble starch deposits. From these starch deposits, fruit in the first instance is formed. The fungus requires its food in a soluble form and after a series of attacks the trees appear to readily furnish it. Combine this with the premature fall of leaf, and short crops and the non-setting of blossom can be easily accounted for.

EXPERIMENTS.

WITH PROBABLE REMEDIES FOR THE DISEASE.

My experiments were directed, 1st, to ascertain whether the condition of the tree by assimilation of any chemical could be rendered less susceptible to the disease, and 2nd whether a practical method of topical application of some chemical or other, could not be devised that would act better than the sulphur and lime treatment, and which would not result, as the latter seems to have done in the majority of the cases, in leaving the trees, for some considerable time afterwards, in a more susceptible state as regards the disease than if they had never been treated.

1st SET OF EXPERIMENTS.

To eliminate all chance of error and of mistaking cause and effect in these experiments, I decided to introduce the chemicals direct into the cambium of the stem by a system of lateral absorption which I called inoculation. Doubt was expressed at the time as to whether absorption through the cambium could take place. This matter has finally been set at rest; for experiments made by me at Holbrook estate with cinchona trees, showed that trees of about 150lbs. weight each, exclusive of roots were capable of absorbing through the cambium in 7½ days up to 6 lbs. of different chemical liquids, the non-assimilated portion of the chemicals accumulating in the leaf cells until (only however in some cases) total collapse of the same ensued.

These inoculation experiments have been detailed by me in a paper written at Doteloya and published in January, and need not be republished. My general conclusions are:—chlorides, nitrates, bi-sulphates, super-phosphates, and all acids and sour organic manures are apt to increase the susceptibility of the tree to the disease. Sulphates, phosphates, or generally speaking neutral salts that can combine with another atomic weight of acid, all alkalies and antiseptic chemicals (other than chlorides and such as do not owe their antiseptic character exclusively to their oxidising or deoxidising power) decrease the susceptibility of the tree to fall a victim to the disease. Pre-eminently successful among the latter I found carbonate of potash and carbolic acid. When absorbed into the system of the tree while the fungus was healthily established in the leaf tissue, either of these chemicals prevented the fructification of the pin-spots, in some cases entirely; in no case more than 22 per cent. of them fruited, while on adjoining untreated coffee, under exactly similar conditions and during the same period, from 76 to 100 per cent. of the observed pinspots had fruited.

Carbolic acid was the chemical I experimented with almost conclusively, after the preliminary experiments were over, as it had given me even more satisfactory results than the carbonate of potash.

It was applied to the stem of the tree mixed into a paste with fine soil and water in about 5 per cent. strength, a slip of stout paper being tied round the tree in the shape of a cup to hold the paste.

The chemical penetrated in sufficient strength into the cambium cells to cause their collapse for some distance inwards, but the strength and causticity of the chemical decreased of course until weakned enough to effect entrance into the living cell without causing collapse. Traces thereof (in a combined form of course) were bound to exert their influence on the leaf cells.

One of the chief properties of carbolic acid is its capability of arresting organic change or decay, this power being appreciably asserted in its most dilute form. The fungus, according to my conclusions, luxuriates in cellular tissue, contents of which are in a transient stage. The faintest trace of carbolic acid will arrest this, will stop for some time the conversion of the starch deposits into sugar; that is to say, will prevent the formation of what constitutes, in my opinion, the chief food of the fungus—the result will, of course, be that the mycelium, if still young, will die without fructification for want of suitable food. And this has virtually been the practical result of the above treatment. But the effect of the carbolic acid thus used is of an evanescent character, and I came, somewhat reluctantly, to the conclusion that for this method to be of any pratical value, considering the wide and universal prevalance of the different forms of the fungus, it would have to be supplemented by topical application calculated to destroy these forms.

This led to reconsideration of the results of the second set of of experiments, ending in my being able to combine the essential features of both.

The inoculation process involved some danger to the trees for in some cases the carbolic acid penetrated in sufficient strength to collapse all the cambium cells; but this danger could have been easily eliminated by weakening the strength of the application.

2nd SET OF EXPERIMENTS.

Instituted to determine with what success the fungus, in its more or less developed state, could be destroyed by external applications, choosing such substances and chemicals as were known to be inimical to fungoid life.

Out of the many substances tried sulphate of iron and copper, arsenical solutions, acids, potash, &c., &c., two chemicals were found in our preliminary experiment at Doteloya, to have an eminently decided effect both on the fully developed orange spores of the *hemileia* and on the yet unfruited *mycelium*, which both it killed *without* injuring the healthy tissue of the leaf. These two were sulphate of soda (10 per cent. solution) and carbolic acid (1½ per cent. solution).

Either chemical in these solution changed the orange-coloured spores into whitish looking bodies considerably shrunk, appearing under the microscope as white empty shells, the unfruited mycelium dried up and left a brown spot as far as its ramifications extended.

The observations were made under the microscope. Both these chemicals were tried on a practical scale by syringing their solutions through the foliage. The sulphate of soda application was practically a failure, not more than ten per cent. of the spots and spores being destroyed by it. The fungus seems to possess a power of refusing contact with it when applied as a spray, and this practical difficulty will probably occur with most saline solutions.

The application of carbolic acid gave more satisfactory results. Mr. James Blackett and Mr. Drummond, on close examination of the area a few days after the application, decided that from 40 to 60 per cent. of the diseased patches and spores of the fungus, on the trees had been destroyed without injuring the young shoots or leaves. But the practical difficulties of syringing a whole estate seemed insurmountable, and to quote from Mr. Blackett's appendix to my report on the results of these preliminary experiments: "*the external application of the solution of sulphate of soda or the diluted carbolic acid have too many drawbacks in my* [*Mr. Blackett's*] *opinion to make them at all practicable.*"

Mr. Blackett laid more weight on the results of the first set of experiments, and I put aside therefore all consideration to topical applications, until I came to the conclusion that the results of the inoculation process with carbolic acid were not sufficiently good to enable us to battle with the disease with any chance of success.

I then once more considered carefully the subject of external applications the practical difficulties of applying liquids &c., and finally decided to try carbolic acid absorbed into and used as dry powder in the same manner as sulphur and lime, as an external application. I used this powder, consisting mainly of finely slaked and sifted coral lime, a strength of about 3¾ per cent. acid.

Though the carbolic acid is essentially an alcohol, it enters into a feeble combination with caustic lime, and forms what may, though somewhat incorrectly, be called a carbonate of lime.

On exposure to the atmosphere the carbonic acid thereof combines with the lime, sets the carbolic acid free, which thus escapes as vapour into the atmosphere.

Used in this way, the carbolic acid powder has given me such satisfactory results that I have had no reason yet to change either its strength or the mode of application. The treatment of a diseased area with this powder cast broadly through the foliage of the trees results in stems, branches, leaves, and every square inch of ground being covered with an appreciable layer of the powder. The ground, stems and branches are covered most thoroughly, but a portion of the lower surface of the leaves seems to the naked eye always to have escaped somewhat the application, though under a magnifying glass, the fine, impalpable particles of the powder can even there be seen in multitudes.

The effect of the treatment on the disease is 1st. the destruction of spores and other forms of the fungus on the ground, 2nd, destruction of spores on fallen leaves, on the stem and branches, 3rd, destruction of spore patches on the foliage of the lower branches and the drying up and prevention of fructification of the pinspots on the same; and 4th, the *partial* destruction of spores and drying up of pinspots on the diseased foliage of the higher branches.

Bearing in mind the great importance that has been laid by Messrs. Abbay, Ward, and others, on the gathering and burning of the diseased leaves which only represent a small fraction of the spores that have been shed in any one area, the benefit derivable from a wholesale destruction of not only the spores on the fallen leaves, but also of those that have fallen on the ground and the majority of others distributed elsewhere in the treated area will, no doubt, be fully appreciated.

The treatment will have a maximum destructive effect on the different forms of this fungus on the ground, on the foliage of the lower branches in the absence of high winds and in coffee which covers the ground well, and when there are heavy dews or a slight shower *after* the application to supply the moisture necessary for contact. I have not yet finally decided whether heavy rain *immediately* after the application neutralizes the benefit. Heavy rain a day or two afterwards does not. Under favourable circumstances, pinspots and spores, even on the highest branches will be affected by the vapour being retained within the area. It will, on the contrary, have a minimum destructive effect during high winds, on badly covered ground, open patchy, places on trees on bordering the upper side of road, &c.

The vapour of the carbolic acid in an area thus treated under average favourable circumstances is distinctly noticeable by its penetrating smell for about eight to ten days after application; and in addition to the destruction of countless numbers of spores on the ground and on the fallen leaves by the 3¾ per cent. carbolic acid powder, there has been unmistakeable evidence collected that so long as the atmospheric air is tainted with the vapour of this most powerfully antiseptic chemical, the disease can make no progress. The carbolic and vapour is, of course, during this period breathed and absorbed into the system of the tree by the stomata of the leaf, and its effect of reducing the susceptibility of the tree to the disease is very much the same, and rests on the same basis as the effect of the inoculation process with the same chemical, and which already has been fully explained.

It will now be easily understood that if an estate is dosed in a proper manner, and at a proper time with this carbolic acid powder, it may be carried through the period of an attack with little appreciable damage.

I have since March last now treated over 800 acres of coffee with this method of vaporization; have also carefully, from time to time, examined what had been done in January last, as well as what of the large area had been done first, and have now finally come to the conclusion that by two applications costing Rs. 4 to Rs. 5 each per acre, used at a proper time and under average favourable circumstances, an estate can be carried through an attack of the disease with little damage, and that the diminishment of spores (when operations are carried on over a considerable area) and the general improvement in the tone of the trees which seems to follow the treatment will make the area less liable to suffer from the disease during the next favourable period for its development.

But still I would advise that four applications costing a total of Rs. 16 to Rs. 20 per acre, including everything, should be given during the first year. An expenditure of Rs. 8 to Rs. 10 or even less the second year should suffice. The preparation and application of the powder is extremely simple. The coolie understands it readily, and, though disagreeable work does not object to it; so that under average intelligent management I believe it perfectly feasible to battle successfully with leaf disease with the above reasonable expenditure.

The degree of success obtainable will depend on how and when the applications are given. Detailed instructions as to how and when this treatment should be applied will form the subject of another paper which I have under consideration, and which I hope to finish after another visit to the estates that I have treated before my departure to India.

The fungus will best be regarded in the light of a weed which has been allowed to over-run and firmly establish itself on an estate. It will involve some trouble and a good deal of expense in the first instance to try and keep it under, but in the natural course of things the damage done by it ought to be sensibly reduced at each periodical attack following the treatment I have recommended; and the cost of keeping it out of a certain area, when operations are carried on over an appreciable extent, will be after a year or eighteen months very trifling. For though the danger of infection from neighbouring untreated estates is considerable, the spores thus re-introduced into a treated area will amount only to a very small fraction of the countless millions of spores that are accumulated by unhindered growth and fruition of the fungus within a given area. It is almost needless, I think, for me to add that disappointment will result if any planter thinks he has only to scatter a handful of powder over one part of the estate, to see the disease disappear out of the other part. [illegible] the battle is earnestly begun, there are two qualities that will ensure success—PATIENCE and PERSEVERANCE.

The following records and reports of the observation of the different planters with whose assistance I carried on my experiments, and who tried and tested the treatment as finally recommended will, I trust, be accepted as independent testimony that my conclusions are based on data and results, that were apparent not only to the trained eyes of an experimentalist, but which were also apparent to the careful and intelligent observation of pratical planters.

The cause and effect of the vaporisation treatment with carbolic acid on the incipient forms of the fungus when established in the tissue of the coffee leaf cells, and of reducing the susceptibility of the tree to the disease, I find exactly the same as in case of the inoculation process. The observation and results of the experiments made with the latter process may therefore be fairly accepted as proof of the merits of the former in that repect, when operations are made under circumstances that admit of the vapor breathed and absorbed into the system of the tree.

To be continued.

CINCHONA.

DR. THISTLETON Dyer brings to the notice of the India office a new variety of cinchona plant. He is not aware of its botanical name, but the bark is known in the London market as *China cupres*. It grows from 2,000 to 3,000 feet above sea level, and is at present confined to Central America.

WE hear that some cinchona blossom picked from the Emulina trees has been pronounced by Dr. Trimen to be of the true Ledgeriana type. This with the fine price realised for the bark at a recent sale should set at rest the question as to whether the variety is of this valuable kind or not, and should satisfy those who may have purchased seedlings from this estate that they have secured Ledgeriana plants and not a worthless hybrid.

PLANTS of the Cinchona Ledgeriana at Rs. 500 a thousand are bad enough, but the latest extravagant price paid for this variety is quoted at £36 per ounce for seed. The seed was taken from trees of a superior kind, of a good age, and the bark of which had been tested, [illegible] ertising the seed is in Java.

VALUE OF CINCHONA TREES.

BY a strange coincidence, at the precise time when we were publishing the incredulous comments of our London correspondent on the valuation of cinchona trees by the Directors of a South India Limited Liability Company, we received from the proprietor of the Mousrakande Estate, Haputale, an account of the yield and valuation of bark from a single *succirubra* tree on his fine property, which curiously enough shew results exactly coincident with the value assumed by the South India directorate in question.

The tree was not selected from amongst many, but taken at random; its age was nine years, and it was barked not rooted up, yielding 16 lbs. dry stem bark and 9 lbs. branch bark. Here we have a total yield of 25 lbs. of dried bark from one tree nine years old. The broker's valuation of this was, stem bark 5*s*. per lb., branch bark 3*s*. 7*d*. to 4*s*. 6*d*. per lb, and a few chips at 3*s*. 3*d*. to 3*s*. 6*d* per lb, this valuation shews the excellent quality of the cinchona grown in the Haputale district. Mousrakande estate has, we believe, an altitude ranging between 2,500 and 5 000 feet.

The analyses of these various products gave the following results:—

Stem bark, crystallized quinine sulphate	...	2·69	per cent.
Branch bark, crystallised cinchonidine	...	1·26	do.
Do. crystallized genuine sulphate ...	...	2·09	do.
Do. do. cinchonidine ...	...	1·80	do.
Do. do. cinchonine (alkaloid) ...	...	2·30	do.
Chips cinchonine (alkaloid) ...	...	4·00	do.
Do. crystallized genuine sulphate ...	...	1 47	do.
Do. do. cinchondine	...	1·60	do.
Do. do. cinchonine alkaloid ...	...	2 20	do.

There may not be any very remarkable results to be found in these various analyses, but it is nevertheless a fact that the quantity of bark taken off brings the value of this one tree up to about £5. Of course, it would be very injudicious to base any large calculation on such returns, but the fact is indisputable—*Ceylon Times.*

TOBACCO.

GROWTH OF TOBACCO IN IRELAND.

IN the House of Commons on Monday, Mr. Gladstone said, in reply to Sir Eardley Wilmott, that there had been no recent discussion of the question with regard to the growing of tobacco in Ireland. If that question should arise, undoubtedly, it would be with reference to the kingdom at large. The hon. member was perhaps aware that for a period of fifty years the growth of tobacco was permitted in Ireland, and that the growth of it was also protected by differential duties. He might also know that the withdrawal of that permission was recommended by a Committee in 1830, inasmuch as the experiment had not been successful. At the same time, he regarded the prohibition of the growth of any agricultural product by law as a thing very unsatisfactory—(hear, hear)—and consequently he was at all times very open to the reception of any statement or suggestion tending to show that if that prohibition were removed, they might satisfactorily levy a duty on that commodity when grown at home as on that wh[illegible] was bro[illegible]ht into the country.

STATISTICS.

THE earnings of the Eastern Bengal Railway for the first nine days of July 1881, were Rs. 74,978, or Rs. 436-8-10 per mile, as compared with Rs. 87,957, and Rs. 512-1-11 respectively for the first ten days of July 1880. The mileage in both years was 171¾.

THE earnings of Indian Railways for the week ending 9th July were as follows per mile :—

B., B. and C. I. Railway	...	209	5	1
Madras do.	...	136	8	7
For nine days ending 9th July :—				
G. I. P. Railway ...	...	377	1	2
E. B. do. ...	...	436	8	10
H. & N. S. do. ...	...	133	7	4
E. I. do. ...	...	632	2	11
O. and R. do. ...	...	162	15	6
For 12 days ending 30th June :—				
R. S. Railway ...	...	299	7	10

THE following are the earnings of the Indian Railways per mile, for the periods referred to :—

G. I. P. Railway	5 days ending	30 June	302	8	9
H. N. S. do.	5 ,,	30 June	121	6	9
O. & R. do.	6 ,,	30 June	104	1	7
E. B. do.	12 ,,	30 June	684	0	11
E. I do.	12 ,,	30 June	950	11	1
B. B & C. I. do.	week ending	2 July	821	2	4
Madras do.	,,	2 July	168	9	11

THE earnings of the Eastern Bengal Railway for the week ending 16th July, was Rs. 84,662, or per mile Rs. 492-15-0, as compared with Rs. 77,457 and Rs. 450-15-10 for the corresponding week of last year. From 1st to 16th July 1881 and 1880, the earnings were Rs. 1,59,640 and Rs. 1,65,414 respectively.

THE earnings of the East Indian Railway for the week ending 16th July were Rs. 7,07-915-4-3 as against Rs. 6,35,479-10-4 for the corresponding period of 1880, or Rs. 470-9-9 and Rs. 421-9-10 per mile respectively. From 1st to 16th July 1881 and 1880, the earnings were Rs. 16,58,876-3 3 and Rs. 15,13,165-15-8 respectively.

THE following is the population of Calcutta, as ascertained by the recent Census ;—

Wards.			1876.	1881.
Shampooker	...	...	24,531	25,487
Koomartolly	...	...	32,482	25,682
Burtollah	...	...	25,167	25,527
Sookea's-street	...	...	20,115	20,572
Jorabagan	...	...	37,305	36,318
Jorasanko	...	...	34,395	32,824
Burra Bazaar	...	...	22,438	20,769
Colootolla	...	...	48,502	47,323
Moochepara	...	...	37,427	39,241
Bow Bazaar	...	...	22,476	21,627
Puddopooker	...	...	19,557	20,516
Waterloo-street	...	...	5,445	5,785
Fenwick Bazaar	...	...	25,573	26,051
Toltollah	...	...	25,883	26,063
Collingah	...	...	12,194	11,840
Park-street	...	...	4,358	4,968
Bamun Bustee	...	...	6,269	6,125
Hastings	...	...	4,919	4,953
Town Proper	...	...	409,036	401,671
Fort William	...	...	2,803	3,348
Port of Calcutta	...	...	17,696	28,200
Total for Town	...	...	429,535	433,219
			(1872)	(1881)
Total for Suburbs	...	...	257,149	251,439
Calcutta and Suburbs	...	...	686,684	684,658

MR. GRENFELL, in his article "What is a Pound ?" In the *Nineteenth Century* for this month, says that the amount of the precious metals in use for other purposes than circulation is too small to have any influence on their value. The opinion of the Governor of the Bank of England should carry some weight, but when it is considered that gold and silver are very fairly durable, and do not waste rapidly from use; and when the quantity of each produced during about the last 400 years is also considered, it is not easy to understand how the passing of these metals from hand to hand in the course of trade could have absorbed so much as has practically disappeared from circulation. From 1493 to 1875 the quantity of silver produced reached 397,125,267lbs. Avoirdupois, which at 4*s.* 6*d.* per oz., gives a value of £1,429,650,961. From 1876 to 1880 the total production of silver is estimated at 76,900,000lbs. weight, of an estimated value of £21,786,250. The production of gold from 1493 to 1875 reached in weight, 20,797,359lbs. Avoirdupois, worth at £4 per oz., £1,331,030,976 ; and from 1876 to 1880, 1,663,000lbs. Avoirdupois, value £106,600,000. Of the silver produced from 1493 to 1875, £167,651,880 came from Mexico, £68,688,400 from Peru, and £82,978,720 from Potosi (Bolivia). From 1876 to 1880 the production of the United States was £39,900,000, as compared with Mexico £27,000,000. "Other countries" produced a total estimated at £10,000,000. The proportion of gold to silver was 1 per cent. from 1493 to 1520. It then sank gradually from 7 in 1521—44 to 2 from 1560 to 1660. From 1661 to 1840 it fluctuated from 4 to 2. In 1841-50 it rose to 7. From 1851-55 it was 18 ; 1856-60 19 ; 1861-65,4 ; 1866-70, 13 ; 1871-80, 8. Of the whole supply of gold, three-fifths has been produced in the last forty years.

Plants of the Cinchona Ledgeriana at Rs. 500 a thousand are bad enough, but the latest extravagant price paid for this variety is quoted at £036 per ounce for seed. The seed was taken from trees of a superior kind, of a good age, and the bark of which had been tested, and the firm advertising the seed is in Java.

AUSTRALIA and New Zealand are but young countries. A few years ago no people inhabited them save a few scattered aborigines and those vast island were practically uninhabited for all the good effected by those living in them.

The following will shew what is being done in one industry alone, and this list, be it remembered, only includes a few of the leading cattle owners in the districts of New Zealand:—The following return of sheep held by (squatters) taken from the *Government Gazette* for Canterbury and Otago, New Zealand gives an idea of the vast flocks owned by single farmers in the Australasian Colonies :—New Zealand and Australian Land Company, 300,000 sheep ; Mr. Robert Campbell, 380,000 ; Mr. George Henry Moore, 90,000 ; Messrs. Dalgetty & Co., 208,000 ; Messrs. Clifford and Weld, 80,000 : Sir Dillon Bell, 82,000 ; Hon'ble William Robinson, 68,000 ; Sir Cracroft Wilson, 48,000 ; Mr. Kitchen, 80,000 ; Mr. Allan McLean, 50,000.

THE United States Post Office Department has issued a statement of the results of an inquiry as to the amount and distribution of the postal business of the country during the year ending December 31, 1880.

The whole number of letters posted was	1,053,252,876
,, ,, ,, post-cards ,,	324,556,440
,, ,, ,, newspapers ,,	812,032,000
,, ,, ,, magazines and other periodicals	40,148,792
The whole number of packages of merchandise	21,515,832
Various	468,728,312
Total....................	2,720,234,252

The number of letters posted average twenty-one for each man, woman, and child in the United States. This total is then analysed, and the relative numbers of each State given in a table. The two extremes are, Alaska, with its unlettered population, and the district of Columbia, the centre of the postal system, and the seat of National Government. In Alaska, only one inhabitant in five is credited with one letter a year, while in the district of Columbia there are 85 letters posted for each inhabitant. The most letters are written where there is proportionally the largest intelligent adult population who are away from home namely, the newer States and territories. Colorado heads the list of letter-writing communities, with fifty-five and a fraction to each inhabitant. The settlers in Arizona write 32 letters each a year, Dakota 30, Montana 40, Nevada 32, California 26, Idaho 25, and Wyoming 42. The States, which supply most of the letter-writers of the territories, in addition to being the great seats of manufactures and commerce, come next, New York with 42 letters to each inhabitant, Massachusetts with 39, Connecticut with 33. The people of the South are not letter-writers generally, nor are they as much given to migration as the people of the North. The result is that the contributions of the Southern States to the mail bags are extremely small. The annual average for each inhabitant of Alabama is 7, Arkansas 8, Georgia 9, Kentucky 9, Missippi 6, North Carolina 6, South Carolina 7, Tenuessee 7, West Virginia 8. The figures for other Southern States are, it will be seen, somewhat higher :—Florida 11, Virginia 11, Texas 12, Louisiana 15, New Mexico 13. The more Northern States which write the fewest letters are Delaware 16, Indiana 13, Wisconsin 17, and Washington Territory 15,

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THE

INDIAN AGRICULTURIST.

A MONTHLY

JOURNAL OF INDIAN AGRICULTURE, MINERALOGY, AND STATISTICS.

VOL VI.] CALCUTTA :—THURSDAY, 1st SEPTEMBER 1881. [No. 9.

NOTICE.

SUBSCRIBERS to the STATESMAN, FRIEND OF INDIA, *and* INDIAN AGRICULTURIST *are informed that arrangements have now been made by which these journals will for the future be published under the general superintendence of the undersigned.*

All communications regarding literary matter should be addressed to the Editor of the paper for which it is intended.

All communications concerning the general business of the STATESMAN AND FRIEND OF INDIA *Office, Advertisements, and Subscriptions to the* daily STATESMAN AND FRIEND OF INDIA, weekly FRIEND OF INDIA AND STATESMAN, *and* INDIAN AGRICULTURIST, *should be addressed to the MANAGER,*

WILLIAM RIACH.

13th June 1881.

CONTENTS :

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

ACKNOWLEDGMENTS.

TROPICAL AGRICULTURIST, No. 1, Colombo: *Ceylon Observer* Office, 1881.

QUESTION Papers of Class 1, of 1876, in Madras School of Agriculture, Madras, Government Press, 1881.

ANNUAL TRADE on the Foreign Trade of the N.-W. P. and Oudh for 1880-81. Allahabad, N.-W. P. and Oudh, Government Press, 1881.

CORRESPONDENCE.

WHEAT.

TO THE EDITOR.

SIR,—I am thinking of doing a little experimental wheat-growing, can you tell me

1st.—The average breadth of the rows, when wheat is sown by drilling;

2ndly.—The average breadth of the intervening fallow intervals;

3rdly.—How to make use of some substitute for a drilling machine, or how to drill without a machine? Answers would oblige.

F.

10th August 1881.

TEA AGENCIES.

TO THE EDITOR.

SIR,—The high charges made by agents of tea gardens have been more than once noticed in the papers, but there is another point connected with these agencies, which, as far as I am aware, has not been brought to public notice. I refer to the fact that agents as a rule refuse to furnish regular weekly reports to the proprietors. As the proprietor is the person most interested in the condition and the prospects of the garden, in which probably the whole of his life's earnings are invested, it is but proper he should get such reports, and yet, as a proprietor informs me, such is not the case. There would be some excuse for such a procedure if it entailed any great trouble, but surely the reports which the manager sends to the agents could be copied without much trouble in the office of the agents.

PLANTER.

THE FARMERS OF INDIA.

(*To the Editor of the Pioneer.*)

SIR,—The writer of an able article under the above heading, in your issue of 11th instant, remarks that the *tuccavi* rules are a dead letter, and that neither Government nor the zemindar move hand or foot in the matter. I am not concerned now to discuss how far the intricacy of the *tuccavi* rules has led to this result. But at the same time it may be well to remove the current misconception that to pour advances over the country would be a sovereign remedy for the difficulties in which the ryot is involved. This would be very well if we were dealing with a *tabula rasa*. If we were starting a body of cultivators in a freshly reclaimed tract, it would undoubtedly be expedient to give them advances at an easy rate. But this is not the case in a long-settled country. Here nearly every cultivator has a standing account with his bunniah. He makes over to his banker the bulk of his produce, and draws on him for money as he wants it. This, no doubt, is a fatal arrangement for the ryot; but it is so deeply rooted in the customs of the country that it is hopeless at present to abolish it. With a cultivator in this position the well-meaning attempt of a paternal Government or zemindar to assist him, only lands him in greater difficulties. The case is exactly analogous to that of a man who deals with a London tailor. As long as his customer pays him a little from time to

time, and is regular in his orders, the tailor never dreams of taking serious measures to recover his debt; but let him find that his customer has gone to another shop, and he has no mercy on him. Similarly when the bunniah sees that his debtor has gone elsewhere for advances, he sells him up at once, and the last state of the wretch is worse than the first. In short, if a zemindar is not prepared to take over the entire responsibilities of a ryot, it is useless giving him an advance; and what this means, any one who has any idea of an ordinary ryot's financial position can easily understand. Further than this, there is a marked difference between the position of Government and an ordinary zemindar, in realizing arrears of *tuccavi* Government under a special law can collect its arrears of *tuccavi* with its revenue arrears without reference to a court. But the landlord is forced (and the tenants know it well) to go through the weary process of executing his decree, and he then comes in contact with an official who is known to the Board of Revenue as a *kurk amin*, but who arrogates to himself the title of "commissioner of sales;" and in truth, his power and influence approximate to those of his brother commissioner of a division. He practically does as he pleases. He has only (for a consideration) to notify to a refractory creditor that he is coming on a certain date to sell him up. The defaulter's effects disappear as if by magic. His cattle pay a visit to a friend. His pots and pans are dispersed among his neighbours, and the expectant creditor when he arrives with "the commissioner" on the ground, finds him sitting in his empty house smoking the *hookah* of contentment. In sales too our "commissioner" is but too apt to sell a bargain to a friend, because he knows that a "Property-Defence Association" is as yet unknown. Until the present procedure of recovering these advances is considerably simplified, it is hopeless to expect Court of Wards estates or independent landlords to give these advances on anything like an extensive scale. The possible solution of the difficulty lies in the extension of the right to distrain standing crops for arrears of *tuccavi*.

BANDA-I-KHUDA.

THE AGRICULTURAL DEPARTMENT.

(*To the Editor of the Madras Mail.*)

SIR,—I have had the pleasure to see in one of your issues, that an Agricultural Department has been started from the 6th instant, and that a Secretary has been appointed to conduct the work with the Government of India. The notification published embodies a long list of subjects that the said department undertakes to direct its attention to. Whether this department is to be worked like the one that was abolished in 1878, or to have a different constitution, I do not know. It would be a mere waste of public money to pay high salaries to Secretaries and others, and render no good to the people for the money thus spent. If this department has been inaugurated *bonâ fide* for the country, something like the American Beaureau of Agriculture would be a real blessing to the country. This idea will not be a new one, for it had its origin in Lord Mayo's time, and afterwards a glimpse of it was caught by that expensive body, the Famine Commission. If such a proposal of the Famine Commission, which has cost more than a lakh of rupees to the country, is to be partially utilized by the mere appointment of a Secretary, to satisfy that political section in England who take some interest in the welfare of India, and argue in the British House of Commons as to the adoption of the suggestions of the Famine Commissioners, merely on the consideration that a great outlay would first be required to carry out all their suggestions connected with the Department of Agriculture, the country would find its finances spent in such a way that no good whatever would be done to the people. The working of the department that was abolished in 1878 might have given an insight as to whether such a department would really benefit the country or not. It would be better therefore to alter the constitution a little by creating local Agricultural Departments, worked by men trained in modern agriculture. These officers should be brought into contact with the native farmers, and show them the real advantages of the systems they advocate. There is a hope still that Lord Ripon will take all the suggestions from the minutes of Lord Mayo, and his Councillors, as well as from the report of the Famine Commission, and thus leave a name behind him.

NATIVE FARMER.

COCOANUT CULTIVATION.

(*To the Editor of the Madras Standard.*)

SIR,—In one of your late issues you strongly advocate "cocoanut cultivation" in Madras, as it would be a source of great revenue not only to the proprietors of the trees but also to Government. Admitting that the juice of the cocoanut tree is useful, yet, the fruit of the trees grown in the town cannot be used for curries or sweets, or in making oil as the cocoanuts grown on the Western Coast or in Ceylon. The fruit of the cocoanut tree cultivated in Madras is never used, and a reference to our cooks will verify my statement. The tender cocoanuts are extensively eaten by Hindus and others during the hot weather, and these are also sold on the roadways and purchased by weary travellers, to whom they are welcome. I am glad that you have mooted the subject of cocoanut cultivation, and hope it will not end here, but that some persons who have funds at their command would carry out the suggestions contained in your article. Had I the means, I would readily take the hint, rather than invest in gold mining and bite my fingers in the end.

T.

CARDAMOM PLANTING.

(*To the Editor of the Ceylon Observer.*)

SIR,—It has hitherto been the custom to plant single cardamom bulbs taken from old bushes. It struck me sometime ago that, as the object was to grow a good bush, a simpler plan would be to put several plants to a hole. I found that it has succeeded admirably. Even seedling plants three to four inches high can be safely put out during the heavy rains. Three to four plants to a hole, and each plant nine inches apart from the others. The young plants threw out several shoots in a few months, and the result is a magnificent bush in a year. The old method is a slow, tedious, and far from a profitable one. The present prices for cardamoms, *properly gathered and cured*, are really very handsome, and should they even go down to a third, the return from an acre of cardamoms is more profitable than coffee yielding two and-a-half cwt the acre. The planting out of this product should be vigorously carried on. It requires a very small outlay comparatively, if the method of planting as above suggested is followed.

R S

"THE PLANTERS' PEST."

(*To the Editor of the Englishman.*)

SIR,—You were good enough some little while ago to favour me with space under this heading, and I must apologise for again troubling you, and begging a repetition of the favour.

In my former letter I noticed the scantiness of the information given us by Mr. Wood-Mason in his telegraphic report upon this subject of blight, but, when doing so, I was certainly under the impression that this report was at any rate only an instalment of the information we were ultimately to receive. It seems, however, that this is not so, and that we have the entire "*ridiculus mus*" laid out *cap-a-queue* before us, and I need hardly tell you what an inadequate meal this is for a hungry though blighted planter.

It seemed at first incredible to us that Mr. Wood-Mason had really deserted us when our heaviest troubles were beginning and the blight was thick upon us. Now, however, it has to be accepted as a melancholy fact that the Blight Inquisition has shut up, closed, and collapsed like a concertina, or a crush opera-hat, when sat upon. Blight victorious chortles in its joy, and there is nothing left the planter and his hopes but to sink into his boots in that damp despondent state which we can easily imagine to be the lot of the sad and unobtrusive periwinkle.

"*Eheu fugaces rupees, nunquam nobis redeundi!*" is the universal wail both up and down the brae.

As it seems useless now to expect the further information sought for in my former letter, I should like to ask what was in fact the end and aim of Mr. Wood-Mason's mission to Cachar. Was it to study the insect from a purely scientific and entomoligical point of view, or, after complete investigation of its general habits, &c., to co-operate with us in devising some check or cure for its ravages on the tea-bush?

If the former, Mr. Wood-Mason is the happy possessor, and possibly discoverer of an insect, probably unique, which, in its maternal large-heartedness lays, as he says, an egg *and* a bristle. (Can this, then, be the reason why a friend signing himself UP YONDER answers my letter in the *Englishman* by one in the *Indian Tea Gazette*, remarking that blight insects are always born twins? or rather, as he playfully writes it, "two in a litter," putting it between quotation-marks which led me at first to suppose the idea was not original, though a little consideration has convinced me it is, at least regarding blight? Seeing, however, the amount of blight we manage to get through here with our more modest insect which only gives us one at a birth—and a bristle—I think myself lucky in living here rather than "up yonder," which I should imagine cannot be a very paying place for tea, and so should recommend my friend to come a little *down* and *hither* (though I scarcely think such funny things take place "up yonder" as he would have us believe!) If the latter, I maintain that his investigations are as yet by no means complete, and that so far he has failed altogether, I do not think that even the most sanguine of Mr. Wood-Mason's

admirers would venture to assert that his report affords any solution of the difficulty. The doubtful cure therein suggested is impracticable and doubly impossible, firstly, on account of the excessive cost involved in working it out in its entirety, and secondly, from the impossibility of procuring the staff required. There remains, moreover, the question whether the cure would not be worse than the disease as regards injury to the bushes.

It there is any doubt as to the points requiring elucidation, I am sure that an application to the planters, directly, or through the agents, would at once bring forth the required information freely. What I regard as imperative in any investigation of this sort, is that there should be perfect co-operation and identification of interests between the investigators. This, I take it, is not a matter and question of pure, but applied, entomology in its relation to the tea industry, and any hasty or partial observations, from either the planter's or naturalist's point of view, taken singly and independently, without regard to each other, or the end aimed at must frustrate that end, and be, in my opinion, both incomplete and barren of result. A bare statement of a few isolated facts concerning the insect, unsupplemented by such information as I suggested in my former letter, is as worthless practically as a similarly drawn up description by a planter of the actual injury done by the pest to the tea-bush would be, so far as finding out a remedy goes.

Given, however the complete life history, and *fons et origo mali*, we can go logically to work, and fix on the most convenient point and mode of attack, if attack be possible. If it is not, we shall at any rate save useless expenditure on experiment and fruitless effort.

Who then is to give us this information? and here, of course, it is to the naturalist we must look, and looked for it undoubtedly should be, and that soon too, if any measures are to be taken and head way made against the blight of 1882, for if any measures be possible, it is only reasonable to suppose that they should be put in force early before the insects grow overwhelmingly numerous.

It would be much to be regretted were the matter now to be allowed to rest, only to be taken up afresh after the loss of much valuable time, and with much old ground to be gone over again. Surely a question involving the loss of say two-thirds or three-quarters of the outturn of two or three months in the height of the season, is a matter of sufficiently serious interest to call for continued effort and perseverance in its handling. Still, if the second half of 1881 be not more fruitful in research than the first, the chance of successful dealing with the pest in 1882 grows very small indeed *Marchons. donc!*

A BLIGHTED PLANTER.

Cachar, August 6, 1881.

THE CROTON OIL TREE.

(To the Editor of the Ceylon Observer.)

SIR,—With reference to the letter of "C. D." to the editor of the *Indian Agriculturist*, published in your issue of 13th April, I now have the pleasure to send you Mr. Whyte's reply.

As regards the croton now growing on this estate, I am able to state positively that it is not a shrub and injurious to coffee or cocoa. On the contrary, the coffee thrives well under and close up to the tree, both the croton and coffee giving good crops. Other statements have been so well answered by Mr. Whyte that it is unnecessary for me to reply further to "C. D.'s" letter.—Yours truly,

J. HOLLOWAY.

June 22nd, 1881.

Kandy, 20th June 1881.

Dear Mr. Holloway,—I have to thank you for sending me the *Observer*, containing "C. D.'s" letter, copied from the *Indian Agriculturist*, in which he alludes to my notes on the croton oil tree *(Croton Tiglium)*. I ought to have replied to your letter sooner, but have been otherwise much engaged.

"C. D." seems to look on the cultivaton of this *noxious weed* (his term for the croton oil tree) as a monstr'ous piece of folly, and "seizes a spare moment to express a hope that no such steps may be taken," ignoring the fact that we in Ceylon should only be following in the footsteps of India, whence the chief supply of croton seed is imported into England.

You will observe that "C. D." in his letter also describes *his* croton oil plant—which by the way *he knows well*—as an ugly sprawling evergreen shrub, frequently used as a *hedge* stick, but which is not stiff enough for the purpose.

Now from this, and the remainder of the description given of the plant he refers to, I feel confident "C. D." is confounding the croton oil trees with another plant—possibly an Indian species of the genus croton. I think, however, the plant in question is much more likely to be the physic nut, *Curcas* (formerly *Jatropha) purgans*, the *Wal Endaru*, or wild castor oil of the Sinhalese, a soft-wooded smooth-barked shrub bearing cymose clusters of three-seeded fruit, or seed capsules of the size of a pigeon's egg.

If I am right in my surmises as to the plant referred to by "C. D.," you will no doubt recognise it at once. It agrees almost exactly with part of the description given by "C. D." It is to be found as an ingredient, I may say, in almost every native *fence*, for in our rural districts we have not yet got the length of *hedges*; and even the term *fence* is a misnomer for the wretched stray sticks that are stuck carelessly in the ground, on the faith that Nature will be kind. We teach Ramasamy a good deal in Ceylon, and we send him back to India with his pockets well lined, but I fear we have not yet taught him the method of making a thoroughly good hedge round his compound. We are, in fact, deplorably behind in hedge culture and the natives in this, as in most other things, are quite satisfied to do as their forefathers did, and will not advance a step.

But to return to the physic-nut plant: it is held in much repute by the natives, both for its purgative and healing qualities. From one to four of the seeds is a dose for an adult, and the milky juice of the plant is applied to wounds a[illegible]cuts with the best effect. In the West Indies, the leaves pounded up were invariably used as a sort of poultice, and were very efficacious in cleansing and healing foul and obstinate ulcers. It is a native of tropical America, but has been introduced into nearly all tropical countries.

With regard to the croton oil tree, you [illegible]n speak with more confidence than I can as to its suitableness for shade, as also in reference to its value in a commercial point of view; and should you think it w[illegible] your while to put "C. D." right, you are welcome to make what use y[illegible] think proper of these notes.—Yours truly,

A. WHYTE.

The Indian Agriculturist.

CALCUTTA, SEPTEMBER 1, 1881.

MAIZE.

THIS cereal is second only in importance to rice. It is grown largely throughout the American continent, from Canada in the north, to Patagonia in the south: throughout the islands of the Pacific, in the West India Islands, in Australia, throughout the whole of Africa, in Spain, Portugal, Southern France, Italy, Hungary, Turkey, Greece, Asia Minor, Persia, Central Asia, India, China, and the islands of the Indian Ocean. To use the words of the author of "Tropical Agriculture," "no grain could secure such favors from all parts of the world, except from its intrinsic value. Its flexibility of organization makes it easy of adaptation to climate and soil. Though it perfers moist and rich soils with strong heats, there are varieties of it which can be raised in tropical climates at a height of more than 9,000 feet above the level of the sea. The warmest regions of the Torrid Zone produce maize in abundance where three crops can be taken in a season, while the short summers of Canada have a variety suited to them. This cannot be said of rice which requires great heat and cannot endure a climate of a high latitude."

Two analyses by Professor Emil Wolff give the composition of maize :—

	No. I.	No. II.
Water	... 14·1	9·0
Ash	... 2·1	1·22
Albumenoids ...	... 10·0	10·00
Carbo-hydrates ...	... 68·0	71·40
Crude fibre ...	... 5·5	3·40
Fats, &c. ...	... 7·9	4·98

The following table gives the ash constituents of the grain :—

Potash	28·37
Soda	1·74
Chloride of soda	trace
Lime	0·57
Magnesia	13·60
Oxide of iron	0·47
Phosphoric acid	53·69
Sulphuric acid	trace.
Silica	1·55

Maize is little if at all inferior to wheat in nutritious *qualities*, and "the ingredients concentrated by Nature in a grain of corn are all essential to a highly nutritious food. The g uten and mucilage contain nitrogen, an element essential to the formation

of fibrous muscle, nervous matter and brain. The oil is nearly formed fat, easily convertible into animal oils by a slight change of composition. Starch is also convertible into fat, and into the carbonaceous substances of the body, and during its slow combustion in the circulation gives out a portion of the heat of animal bodies; while in its altered state it goes to form a part of the living frame. From the phosphates are derived the substance of bone as well as the saline matter of brain nerves, and other solid and fluid parts of the body. The salts of iron go to the blood, and these constitute an essential portion of it, enabling it by successive alterations of its degree of oxidation during the circulation through lungs, arteries, extreme vessels and veins, to transport oxygen to every part of the body. Indian corn therefore contains all the elements for the perfect development and support of the bodies of animals. . . . . . Indian corn is one of the most important and healthful articles of human food that a beneficient Providence has bestowed on man, and to its high nutritive value is due in a large degree, the strength and vigour of the race of men who laid the foundation of the great American Republic."

The uses of Indian corn are numerous. It serves as food for nearly one-third of the human race. As a fodder for cattle, horses, sheep, swine, and poultry it is invaluable. The dried cobs and stalks serve as fuel, and in South America a kind of beer is largely distilled from the corn.

In Germany, Austria, and Hungary, a very superior kind of paper is made from the leaves and sheaths of the cob, and it is to be hoped that the day is not far distant when English capital will be forthcoming with a view to establishing this industry in India. "Maize paper" has none of the brittleness peculiar to ordinary straw paper. Maize paper appears to be the most unexceptionable of all the papers *not* made from rags. Not only is it remarkably tough, but it is devoid of all the silicious matter which proves so embarrassing in ordinary straw paper causing great brittleness when folding and rapidly destroying the face of printers' type. The extreme toughness of the paper makes it particularly eligible for Bank-note paper, and for the purpose of envelopes. The color is somewhat yellowish, but it is easily bleached."

In India, maize is a summer or *kharif* crop. Where irrigation is available it is sown in May or the end of April, but otherwise not until the monsoon sets in. After the first showers of rain, the ground is ploughed up, the surface of the soil being scarified by a native plough. Manure insufficient in quality and quantity is ploughed into the soil, and the seed sown in parallel rows about one foot apart. A heavy beam of wood called a *swaga* drawn by two bullocks is passed over the field to close the furrows, and the seed is left to its own devices. As soon as the plant has attained a height of about five or six inches above ground, the field is hand-hoed; this operation being repeated twice or thrice. About the beginning of October the crop is cut, and large sheaves are heaped up all over the field, after standing for a week or ten days the cobs are broken off, the stalk and the grain *shelled*. The native method of shelling is truly barbarous; three, or four men sit round a heap of the cobs and beat the heap with short heavy sticks, an immense amount of grain is thereby lost and damaged. The average yield seldom exceeds 25 to 30 maunds per acre. The amount of seed sown does not fall short of 25lbs. per acre.

In Algeria the mean yield on unirrigated land is 20 cwt. per hectare (2·471 acres) whereas in American maize cultivation has attained its highest development, an ordinary crop is 60 bushels and 100 bushels. or 75 maunds is not an uncommon yield. 130 bushels or 7,800lbs. per acre have been raised.

The New York State Agricultural Society require a yield of 80 bushels of corn to the acre to be entitled to a premium.

The results of two experiments on the Saidapet Model Farm are herewith given.

No. I.

MAIZE EARLY AMERICAN.

General nature of soil ...	Sandy loam.
Area of land sown	2·83 acres.
Cultivation of soil before sowing	Twice ploughed, harrowed and ridged, and again ridged over manure.
Kind and quantity of manure used	42 loads of farm-yard dung.
Pounds of seed sown... ...	18lbs.
Date of sowing	21st September.
Cultivation during growth of crop	Twice hand-hoed.
Rainfall and number of wet days recorded during growth of crop	31 wet days, 24·00 inches.
Date when harvested ...	29th December.
Number of cobs	7,890.
Weight of straw when dry ...	5,824 pounds.

The foregoing it must be remembered is the produce of only half the ground, as the maize was sown in lines alternately with lines of cotton.

The weight of manure is not given, but allowing 20 maunds per load, it would be a little over 10 tons per acre.

No. II.

MAIZE "YELLOW FLINT."

General nature of soil ...	Sandy loam.
Area of land sown	1½ acre.
Cultivation of land before sowing	Ploughed, harrowed, and ridged.
Pounds of seed sown ...	19 pounds.
Date of sowing	25th September.
Cultivation during growth of crop	Twice hand-hoed.
Rainfall and number of wet days recorded during growth of crop	31 wet days, 24·00 inches.
Date when crop was harvested ...	5th January 1876.
Number of cobs	4,050.

The remarks made with reference to the area of land actually cropped apply equally to both experiments.

It is impossible to enumerate the different kinds of Indian corn grown in various countries; though two hundred varieties were shown at the London exhibition of 1862.

Professor Symmonds enumerates seventeen varieties grown in North America. "They may be distinguished by the number of rows or grains on the cob, and the size, colour, shape, &c., of the kernels." He evidently gives the first place to "Golden Sioux" or "Northern flint corn" having a large cob with twelve rows of moderate sized grains very oily. This is regarded as one of the best varieties for fattening animals or for human food. By skilful tillage 130 bushels have been raised to the acre weighing 9,216lbs. in the year; when dry, 75lbs. of ear gave a bushel of corn shelled. The soil best suited is a light sandy loam, clay is not good. The following is an extract from a letter from a gentleman, a planter in Natal, on the subject of maize cultivation.

"The kind of maize we prefer out here is that known as the "American Horse-toothy Mealy." With proper cultivation we can easily raise as much as 70 to 75 bushels per acre, and the meal produced is excellent food for both man and beast. We go in for deep ploughing and liberal manuring. The rows of corn are struck out 4'-6" to 5' apart, and the plants 12" to 15" apart in the rows. As soon as the plants appear above ground, say 6 or 7 inches, we give them a top dressing of ashes and lime or superphosphate,* heaping a little earth round each plant, and converting as it were the surface of the field into so many small hillocks. We then run a horse hoe between the rows keeping the land free from weeds, and the same time preventing the soil from caking or hardening. We do this about two or three times. In about 10 weeks the crop shows sign of maturing, and is generally off the ground in about 90 to 100 days from date of first sowing.

With regard to maize cultivation, Professor Symmonds gives the following hints :—

"After thorough preparation of the soil by deep and subsoil ploughing, and the addition of such amendments as analysis may prove to be necessary, the corn should be planted out at slight depths in *hills* 4 feet apart in every direction, which will admit of more thorough cultivation in both directions than if planted in rows. I cannot but suggest that in the final preparation of the soil before planting, it could be better to run the subsoil plough at a full depth in sticking out the rows; this having been done in both directions, will leave the intersections visible for the planting of the corn. From the peculiarity of this plough the soil will be left in a more divided condition than if turned over by the surface plough alone. In these intersections the corn may be planted. When 3 inches high, the lifting subsoil plough which will affect the soil at the surface for two feet on each side of this line of travel, should be run in one direction half way between the rows of hills, thus disintegrating the soil in the centre to the full depth, disturbing it at the surface to the very plants, gradually lessening as it approaches them, so

* NOTE.—In the last report on Rabi Operations, Cawnpore Farm, full information is given as to cost and mode of preparation of superphosphate.

that none of the young roots are abraded by its action. It will now be seen that immediately under the corn is a deep disintegration readily accessible to the roots, while the space between the hills is thoroughly pulverised and deepened as it recedes from the hills, so that the roots will not be inclined to travel surface-ways. At the proper time for a second ploughing, the lifting subsoil plough may be run in the opposite direction half way between the rows, thus rendering the soil pulverulent to a great depth at a later stage of the growth. The after cultivation may be conducted by the universal cultivator set the whole width of 4 feet, or so near it, as not to disturb the plants, and to such depth as will keep the entire surface free from weeds and open for the admission of the atmosphere. The running of this cultivator once in each direction will be found to be more efficient than the ordinary use of the hoe, and at the same time securing flat cultivation.

"At the first application of the cultivator, or lifting plough, stimulating manures may be applied to each hill with safety, and we have known many instances where 100 bushels of shelled corn per acre have been produced by the application of two ounces of improved superphosphate of lime to each hill, at the first hoeing or first cultivation. The result seems to be larger when stimulants are thus applied, than when placed in the soil before planting. Indeed when guano or any other stimulating manure is used, it should be at the first disturbance of the soil after the corn is above ground, rather than before the planting of the seed. Some growers prefer to plant the corn in hills as already named running a *Universal Cultivator*, with the two rear share-teeth reversed, between the rows, when the corn is three inches high. This throws a light furrow from each row, in which special manure may be applied ; a small subsoil plough should then be run with the flat side towards the corn, the wings of the plough removed, so that the lifting action of the nose will only be applied to the soil. This should be repeated on each side of the row so as to disturb the soil to a depth of ten inches before the roots are sufficiently grown to be abraded, and this loosening will thoroughly mix the manure with the soil. The rear teeth of the cultivator may then be reversed and run again between the rows so as to replace this narrow furrow, leaving the soil flat. In place of a second hoeing at the usual time, the horse-hoe may be run in the opposite direction, clearing the ground of weeds and leaving the soil clean and pulverulent."

The high yield and general excellence of American maize may be ascribed to :—

I. Careful selection of seed.

II. Judicious and complete preparation of the soil previous to planting the corn.

III. Deep ploughing and careful after cultivation, such as elimination of weeds, &c.

IV. Liberal manuring with organic manure followed by top dressings of mineral manure.

In Indian agriculture these conditions are conspicuous by their entire absence.

Selection of seed. Obviously the best method is to select the best and healthiest plants in the field, and from those plants take the largest and best filled cobs, two or three years' careful seclection with even the most *degenerate* country-seed would result in a quality (provided all other conditions be maintained) bearing four, five, and six cobs to each plant.

Preservation of seed. The natives of this country do not attempt to keep their maize seed in store more than one year, and during this time it is kept *on* the cobs, and the cobs covered with ashes in earthen air-tight vessels—to prevent insects and ants attacking the grain, the mouths and covers of the vessels should be smeared over with carbolic acid.

Mr. Robertson, Madras Agricultural Department, suggests that "to prevent crows and squirrels, &c., destroying the seed, tar it before sowing. Take 1½ pint of water, 1/12 pint of tar mix together and when cool, pour the solution over the seed. After dusting sand, ashes, or sawdust, to prevent the seed adhering together, the grain is ready for sowing."

Ploughing and cultivation. The best plough for India is the Kaisar, and the changes which have been rung on it by different patentees in various parts of the country. The Kaisar, the Ryot, the Kashtkar, &c., are all modifications of M. M. Ransomes Sims and Head, primitive and Egyptian ploughs costing in England about £1-10. The patentees have, however, modified their inventions to suit the requirements of the ryot and his cattle, they give a deep tilth with a light draught and are very effective, tearing out weeds, roots, &c., with great ease. This form of plough varies in cost from Rs. 5-5 to Rs. 9. Five or six ploughings with this implement is equal in effect to twenty grubbings with the best native plough.

Constant and repeated weeding is required for maize. Maize should get at least 20 tons of farm-yard manure per acre supplemented by about 2½ to 3 cwt of mineral manure applied as a top dressing after the first hoeing and previous to ridging up with a ridging plough. A ridging plough with double mould board on the principle of the "Kaisar" can be made up for Rs. 9.

Good bone dust manure costs about Rs. 7-5 per maund, varying of course with the price of sulphuric acid, which in Upper India is seldom less than 8 annas a pint. A mixture which has been found to answer remarkably well consisting of wood ashes, bone dust (calcined bones) and common salt in the ratios of 6-3-1 respectively, is much cheaper (about Rs. 4 per maund) though not so powerful a fertilizer as if composed solely of bone dust. The bones are calcined then pounded, and afterwards treated with sulphuric acid and hot water ; wood ashes and salt are then added and the substance fit for use. About two ounces of the manure to each plant will produce excellent results, four, five, and even six cobs to each shoot.

With careful cultivation and judicious treatment, the Indian species would soon exhibit the excellence of the American maize or South African mealy.

The cost of cultivation and produce per acre, would, in the hands of an intelligent cultivator, approximate close to the following figures :—

Cost of Cultivation.

	Rs.	As.	P.
Government Revenue	1	0	0
Seed 20lbs.	0	8	0
Manure 20 tons	12	4	0
Ploughing, ridging, weeding, and after cultivation ...	10	0	0
Harvesting crop	10	0	0
Mineral manure 8 maunds @ Rs. 4 per maund ...	12	0	0
	45	12	0

Value of produce.

Grains 60 maunds at Re. 1-5	90	0	0
Straw fodder 120 maunds at Re. 0·25 per maund ...	40	0	0
	130	0	0
Balance in favor of cultivator 130 minus 46= ...	84	0	0

Attempts have been made to introduce the American varieties into this country, and not without success : though it could be as well to bear in mind that one or two years of rational cultivation would soon bring the native maize in point of excellence up to the finest imported species. One of the greatest mistakes made and *the* rock on which most agricultural experiments in this country have split, has been the attempt to introduce and force upon the natives, foreign species at the expense of the indigenous staple.

Mr. Fuller's experiments with fodder crops at Cawnpore have shown that the sorghum only requires careful cultivation to equal, if not surpass the once far-famed *Teosinte* or *Reana Luxurians* according to Mr. Fuller, reana can not hold its own with "sorghum."

When these foreign species are introduced and distributed to intelligent natives, it is seldom that precise and accurate directions are given as to the method of cultivation, or if instructions are given no native would for one instant dream of carrying them out, the consequence being that with shallow cultivation and deficient manuring the highly organised species degenerates at once, and the much talked of *Valaiti Tukhm* is found on developing into a full grown plant to yield a produce little superior to, if as good as the ordinary country staple, and the native never dreaming or caring to admit even that the fault was *his*, for the future, discredits the imported seed, and "will have none of it." Every Indian staple, maize, rice, wheat, sorghum, sugar, and cotton, one and all under a system of rational cultivation, can be rendered capable of the highest development, and that in a relatively short space of time. Let the new Department of Agriculture bear this in mind, using its best endeavours to attain this end, and an agricultural reform of great importance will then have been effected.

25th July 1881.

WHEAT IN THE CENTRAL PROVINCES.

THE Central Provinces Government more liberal than that of the Berars, offer land free for three years, and after that term at a nominal rental on the sole condition that the holding is brought under cultivation and villages established. Cotton would flourish in all these parts, but if we turn to the item of wheat, the result would be very satisfactory indeed. Samples from Hârda (a subdivision of the great Hoshungabad district) examined by experts in London, proved among the best qualities in six hundred samples sent from all parts of the world.

There is no very heavy jungle except at the foot of the hills, so the land picked out would be in scrub and grass near a station of the G.I.P. Railway, and the cultivation of 400 acres would stand in something like the following expenditure and results :—

	Rs.	A.	P.
Clearance of whatever jungle exists, scrub ...	600	0	0
Purchase of 10-pair bulls @ Rs. 40 per pair ...	400	0	0
Ploughing, gear, &c.	100	0	0
Feed and keep of 10-pair bulls, while 4 months at work	450	0	0
Keep of cattle 8 months, 2 men @ Rs. 5 per month each	80	0	0
Purchase of 300 maunds seed wheat @ 2 per maund	[illegible]00	0	0
Expenses, sowing, harvesting, &c.	500	0	0
Management @ Rs 50 per month	600	0	0
Contingent and incidental expenses, chowkidars, &c.	270	0	0
Total expenditure, Rs. ...	3,600	0	0
Outturn of wheat at the rate of 12 maunds per acre from 400 acres 4,800 maunds sold at factory @ Rs. 2 per maund	9,600	0	0
Balance Profit, Rs. ...	6,000	0	0

Here we have a profit of Rs. 6,000 on an outlay of Rs. 3,600. We have left quite out of consideration the wheat straw greedily devoured by cattle and sold at a most remunerative rate. Now since the vital, &c., &c., (as per MS. sent formerly).

Now since the vital question of finding employment for Baboos on this side of India, and Brahmins on the other has been settled by placing at their disposal all posts in the gift of the Government of India and their subordinates; and encouraging them to aspire to most of the pet emoluments however lofty, perhaps this Government will be gracious enough to condescend to inquire how the ever-increasing Anglo-Indian and Eurasian races are to earn a bare subsistence, especially as the ground has been cut away from under their feet both by the State and Railway Companies. Sooner or later this burning question must be attended to, and it behoves the authorities to brace themselves up and face the matter before it assumes more threatening and complex proportions. And since the training ships about to be established, and the regiments that must be organised, cannot absorb all the material available, it would be just as well for Government to inquire whether a grand scheme of colonisation is not feasible in these and other suitable parts of India for these races, with State help, and this is not too much to expect seeing the Central Provinces Government are every day assisting new native settlers with money for stocking purposes and their own support.

With such a chief as Mr. Buck in the resuscitated Department of Agriculture, the scientific as well as practical fosterer of every branch of husbandry, is it too much to expect that some such scheme will be organised, and so solve a great difficulty, held a patient and most deserving people as well as aggrandize the State.

REH.

"AGRICULTURIST" wrote asking for information about *reh*. We have pleasure in placing before him and our readers the gist of the result obtained by a committee appointed to investigate the subject, and which has been courteously placed at our disposal by a correspondent.

AGRICULTURIST is informed that the committee met at Aligarh in 1878 for investigating questions connected with the deterioration of land under the influence of *reh*, recommended Government to place the scientific investigation of *reh* phenomena, under a special officer, on which Mr. Wilson, C.E., of the Irrigation Department, was specially selected by Colonel Brownlow, the Chief Engineer, P. W. D., and he joined the Agricultural Department in the month of August 1878.

Last year Mr. Wilson lost no opportunity of adopting systematic measures to purify the land now sterilized by *reh* in the *usar* plains in the Awa Estate, district Agra. He planted out 64 acres with trees at the cost of Rs. 2,092, on five different systems, which are as follows :—

"(I.) Holes were dug 3' deep, 3' wide at top, and 2' wide at bottom, and then refilled with the soil that had been taken out of them. Good soil was added to some of the beds.

"(II.) Holes were dug of the same size as in (I.), and the soil was inverted, the earth excavated from one hole being thrown into the next. Good soil was added to some of the beds.

"(III.) Holes were dug 2' wide and 2' deep, and the soil inverted.

"(IV.) Channels were dug 1' deep, by 1' 6" broad at the top and 9" broad at the bottom, and the soil made into a ridge on one side. Part of the ground was ploughed before the channels were dug. Seeds were sown on the ridge.

"(V.) The ground was first ploughed with one of Ransome and Sims' B. F. O. ploughs, and then prepared in a series of ridges 6" high and furrows 6" deep. The ridges were 10 apart."

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"Of the plans described above, the last three have completely failed; no seeds having germinated, except in a few patches * * * * *. Of the beds prepared on the first plan about 5 per cent., and of those made on the second plan about 15 per cent., now contain plants. The latter is the system recommended by Mr. Greig in his note on the Purdilnagar *usar* plantation in the Aligarh district. * *

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"In February 185 shisham trees were planted 40' apart in the Awagarh plantation. The trees were one year old and 5' to 7' in height. About 80 per cent. of them appear to be doing well. They are watered by means of pipes 3" in diameter and 18" long, fixed vertically about 6" from the trees. * * * * * * * * * * * * * *

"The failure of the *kikar* sowing last July should, I think, be attributed entirely to the scanty rainfall. Owing to the accumulation of saline matter in it *usar* soil is very impervious to water, and the light rain of July to September did not penetrate to any depth below the surface; the plants, consequently got very little moisture. Some of the plants which came up from the seed first sown in June, and had the full benefit of the rains have done well, but they are generally in the lower parts of the ground where the water remained longest. I feel certain that had the average quantity of rain fallen, the plantations would have proved a success.

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"A number of plots of *usar* were prepared and treated with artificial manures in the manner suggested by M. Ville. Wheat was sown in six, and peas in the remaining five. Owing to the scanty rainfall and the hardness of the soil, it was necessary to irrigate the ground with canal water before it could be properly prepared. The canal was closed till late in the season, so that the plots were not sown till near the end of November. The ground was ploughed with Ransome and Sims' B. F. O. plough, and once with a country plough before sowing. The seed germinated poorly, but about equally, in all the plots, but the plants made no progress; their leaves turned yellow and most of them died. A few plants scattered over the plots are still living, but are less than 6" high. Half of each plot was irrigated once in January. Other plots prepared in the same way treated with stable manure and indigo refuse and sown with wheat and peas have also failed to produce a crop.

"In order to find the best manure for *kikar (Acacia Arabica)*, a piece of cultivated ground on the borders of an *usar* plain was taken up. Stable manure and indigo refuse have proved decidedly more effective than M. Ville's artificial manures.

"I may mention that I did not anticipate much benefit from the application of mineral manure to *reh* soil, which already contains an excess of saline matter, but tried it to make the experiment more complete.

"Various experiments have been and are being tried in order to remove the *reh*.

"(I.) *Surface drainage.*—A plot of land previously ploughed with Ransome and Sims' B. F. O. plough was prepared in a series of ri[illegible] and furrows * *, the ridges being 10' apart, and the height from bottom of furrow to top of ridge 1'. In another place of land small channels were dug * * * * * * *, the earth excavated being used to raise the ground between the channels.

"It was hoped that the rain would wash the salt out of the ridges into the furrows and channels. There certainly appears to be more *reh* in the furrows than in the ridges, but the latter are not yet clean enough for [illegible]. Indigo [illegible] were sown on the ridges during the rains; a few seeds germinated, but the plants died before they were 6" high. The ridges were then manured with mineral

manures, farmyard manure (10 and 21 tons to the acre), and indigo refuse (10 tons to the acre); wheat and barley were sown, but the plants that appeared very soon died.

"(II.) *Scraping the reh off the surface.*—A piece of ground that was treated in this way before the rains, had decidedly less efflorescence in January than the surrounding land. * * * * * * * *

"(III.) *Sub-soil drainage.*—Under this head two experiments are in progress:—

(a.) By means of pipes, on the system so largely adopted in clay lands in England. For this purpose 4,000 two-inch pipes with collars have recently been given to the department by Mr. MacDonald of Aligarh.

(b.) By opening up the surface soil, so as to allow the rain-water that falls on it, or the canal water that is used to flood it, to penetrate to the more porous subsoil."

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"A provincial *reh* map is being prepared, showing the area of *usar* in each village, whether efflorescent or not, which should be very useful in dealing with the general question of *reh* and its causes."

The effects, which the subsoil drainage systems have on the physical properties of the soil, have been fully treated by Mr. Hume in his "Agricultural Reform" (pages from 85 to 88) of which it is believed AGRICULTURIST has a copy.

We offer no apology for making such a lengthy extract from Mr. Wilson's Report on *reh* experiments, because we believe it contains the fullest and the most valuable information available regarding the experiments which are now in progress, with *reh*, and it will give a clear idea of the experiments to AGRICULTURIST and the public who are misinformed with him. It will also shew that the Department of Agriculture is aware of its duty and is working in the right direction, without the pointing out of AGRICULTURIST. Although the result of the trials have had but little success, yet the patience and thoroughness with which Mr. Wilson is carrying out his investigations, are sufficient guarantee that success will surely crown his efforts to find some means for removing *reh* from the *usar* plains of the N.-W. P. AGRICULTURIST is also informed that the Assistant Superintendent of the Cawnpore Experimental Farm, instituted some experiments to reclaim *reh* infected lands in the village of Shahpur on the banks of the Ganges Canal in the Rawalpur Estates.

EDITORIAL NOTES.

IT the year 1788 there were only 29 sheep in Australia; at the present time there are no fewer than 62,000,000.

THE amount realized by the City Municipality (Poona) by the sale of night-soil manure, for the past month (June) was Rs. 1,019-2-4.

THE estimated number of cows in the United States is 12,000,000. The product in butter, cheese, and milk, including what is used on the farms, is estimated at $400,300,000.

THE toad destroys from twenty to thirty insects in an hour, and the mole is continually destroying grubs, larvæ, palmer worms, and insects injurious to agriculture; no trace of vegetation is ever found in its stomach.

IF, as is often the case, it is desired to apply a fertilizer that will enrich the land for a number of years, it is necessary to select one that is not all immediately available for plant-food. In this case barn manure would be better than quick acting commercial fertilizers.

AN American farmer says that a gill of gas tar mixed in a pail of whitewash, and applied with a brush to the houses and roosts of poultry will destroy or drive away any lice that may infest them. This is easily tried and has the merit of doing good, whether in the direction intended or not.

INDIANA reports of the bee industry for 1879 (the latest given) show 145,827 colonies, yielding 1,107,627 pounds of honey, or 8·18 pounds per colony. The season was regarded as yielding only half the average annual produce. Lake stands at the head of all the counties, with 59,984 pounds of honey.

THE new Agricultural Department should take notice that a certain bee-fly, belonging to the family of the *bombyliidæ*, is, in its larval state, exceedingly partial to locust eggs, and this useful appetite, according to researches made in America by Professor Riley, may turn out to be a certain remedy against the perpetuation of a plague of locusts.

THE Macoupin county (Ill.) *Enquirer* of April 1, contains a report of the wheat crop in every township in the county. The acreage is reported at ten per cent. increase over the preceding crop, but the severe weather of the past week is supposed to have caused a damage equal to 15 to 25 per cent. The outlook is not regarded so favorable to farmers as was the case at the same time last year.

THE past year will be memorable for the enormous efforts of America, which sent to the United Kingdom 10,400,000 qrs. of whet and 3,930,500 sacks of flour, besides a large supply of Indian corn. The cost to the United Kingdom of its wheat and flour imports from all quarters was about £40,000,000 sterling, for which sum rather over 12,000,000 qrs. of wheat and 4,000,000 sacks of flour were obtained.

WE learn from several agricultural journals that by watering plants with water in which sulphate of iron has been dissolved, most extraordinary results may be obtained; beans for instance will grow to double their size, and acquire a much better taste; the same is the case with pears and other fruit. Water kept in a tub with a quantity of old nails in it may also be used for watering with good effect.

PEOPLE whose efforts to maintain the "balance of vice" lead them, like Charles Lamb and Mr. Labouchere, to smoke, will notice with interest that the Spanish Government has decided to abolish the State monopoly of tobacco in Manilla and the whole Philippine Archipelago. The Madrid statesmen expect that this reform will attract foreign capital; and if it improves the Manilla cheroot up to the old standard, smokers will rejoice. The prospects of the Indian industry, however, may possibly suffer.

THE *Madras Standard* tells us that it is proposed to start a fourth cotton mill in Madras, and offers an opinion that there is room for two or three more. There can be no doubt of this. Besides the quantity of twist which Madras exports, there are no fewer than 247,877 private looms for cotton cloth in the presidency, the owners of which will never use hand-made twist, when the machine-made article is placed within their reach, the latter article being much more regular as to count—an important matter in the manufacture of cloth.

WHILE cordially approving of the appointment of Mr. Buck to the new Agricultural Department, we must be permitted to hope that he will not be confined to his desk. Too much office work is required in India and for Mr. Buck to be tied to his desk would be a fatal mistake. His talents would be quite thrown away at such work, and we trust arrangements may be made, whereby he may be able to move about the country as much as possible. The appointment of a thoroughly competent Registrar to the office ought to relieve Mr. Buck from office details, and give him time for work which would be of much greater service to the department.

WE believe that the Maharajah, in consultation with his Minister has had in consideration a scheme for the introduction of an Agricultural Department in connection with the Government of Mysore. Such a scheme cannot but recommend itself to all well-wishers of the country, and there should be no delay in carrying it into effect. Mysore is pre-eminently an *agricultural* country, and all the resources of the province in this direction should be carefully developed. The country has suffered fearfully from famine, and we are now threatened with a scarcity again, and it is high time measures were taken in hand to check the ravages of the giant monster by looking after the agriculture and irrigation of the province, which we take to be the only effectual remedies.

THE subject of ostrich farming is causing some interest in the Mauritius, this industry having been introduced by a wealthy landed proprietor, Mr. Chery Lienard, who imported several pairs of birds from Arabia and the Cape. These ostriches have already hatched broods; and as there is plenty of barren land on the coast of the island, it is probable that, before many years pass ostrich farming will be an established industry in Mauritius. The Cape papers are eagerly searched

by the Creole and French colonists for items in regard to the rearing and sale of ostriches, &c., and a translation in French, from a Natal paper, has just been published in the *Cernéen*, the leading French journal of the colony, reporting the sale of some pairs of these birds at from 50 to 87½ guineas per pair.

GOLD and cinchona are so completely engrossing the attention of planters on the Nilgiris, and in the Wynaad, that coffee is lost sight of. The fall in price in the home market of this commodity has not helped to raise the hopes of coffee planters. New ventures are not heard of now, and extensions are few and far between. Indeed estates are being offered for sale at prices which, a few years back, would have been reckoned less than half their value, without finding purchasers. A similar depression following a fall in price that has not been since reached, occurred in 1867-68. Some of the best coffee on the hills then sold for Rs. 540 a ton. We have therefore no reason yet to despair as prices have not got so low. It is noticeable that some fine coffee properties have not *yet* blossomed, and those that have blossomed, carry a very poor crop. Our remarks apply to the Southern district particularly.

THE best results are anticipated from a small parcel of seeds of a new East African India-rubber plant which Dr. Kirk, of Zanzibar has collected during a journey from Dar-es-Salaam and sent to India. So successful has been the cultivation of South American rubber-bearing plants in India, that any efforts to increase the variety of trees producing this valuable material deserves recognition. Dr. Kirk says that the particular plant of which he procured the seeds occurs in great abundance along the road towards Nyassa. An important observation made by him is that the supply seems to be but little affected, except in the immediate neighbourhood of villages, by the reckless mode of tapping employed by the natives when collecting the material. Dr. Kirk adds that in many parts a native many still collect three pounds of rubber in a day. With careful cultivation and proper modes of collecting the produce, this plant ought to prove an invaluable addition to Indian commercial products.

THERE is one thing about the Cotton Mills of India which we are surprised has not struck the minds of shareholders, and it is the comparatively small size of factories in India. At home 200,000 spindles is not an unusual number for a factory, whereas here we have a much small number. For instance the mills in and around Calcutta have the following spindles :—

Bowreah	42,800
Bengal	30,276
Goosery	26,402
Dunbar	21,000
Empress	20,000
Average spindles	28,095

This number is quite sufficient to pay ; in fact a mill with 10,000 would return a dividend, but if these mills had 100,000 spindles each, their dividends would be much more satisfactory, as a production of a lb. of twist would cost rather less when the larger number were at work. Management would cost less comparatively, and many other items would be relatively cheaper.

IT has been determined to reduce the charges for water for dry crops, under the M. I. C. Co. Canal, owing to the failure of rain in the neighbourhood. The crops sown are in danger of perishing, but the ryots are so dilatory that without some strong incentive they will probably wait till the mischief is done, before they stir. In the famine years, it was found necessary to make great concessions to them, but too late. This year they are promised the water at eight annas an acre, or a quarter of the usual charge. This is perhaps a step in the right direction, but we do not anticipate much increase in the use of canal water until payment is made compulsory. We should ascertain carefully the limits of a district in which canal water is available, and then make the payment of a canal rate compulsory. A much lighter charge per acre that obtaining would suffice, when all had to pay. The idea of a compulsory charge is not harsh, as in a little consideration, it will be seen that where water was generally used, famines would be practically impossible. Where a district is visited with famine, imperial taxation has to be raised to meet the difficulty, and it would be a much more sensible plan to raise this tax for the purpose of preventing famine. We know how dilatory the ryot is, and how unwilling he is to spend a penny, but when this failing of his leads to a famine, and its attendant horrors, there can be no objection to exerting a little pressure by way of prevention.

THE novel proposal (the *Times* learns from the *Scientific American*) has been made by an enterprising Frenchman to the trustees of the Mammoth Cave to rent a portion of the cave for raising edible Fungi. He has been cultivating mushrooms in the neighbourhood of New York, but complains of want of cellar space, and of the conditions of temperature and moisture as not uniform enough for the best results. The portion of the cave which he has in view is that known as Audubon's Avenue, the first passage to the right after entering the cave. It is about half a mile long, and contains little of special interest, unless it be the swarms of bats in the Great Bat Room. The rich deposits of bat guano that have accumulated there for centuries would no doubt prove serviceable, when mixed with other fertilisers, in growing the Fungi. The soil is at present very dry, but might easily be moistened to any desired degree. The idea of thus utilising caverns has long been a familiar one, and practically realised in France. One cave at Montrouge is said to have six or seven miles run of mushroom beds ; another, near Frepillon, sixteen miles ; a third, at Mery, over twenty-one miles. The special advantage of subterranean culture lies in the uniformity of temperature, which in the Mammoth Cave hardly varies from 56° Fahr. all the year round. Mushroom culture is found highly remunerative. It is thought choice mushrooms would find a ready market in Louisville, Cincinnati, and other western and southern cities, not to speak of more distant markets. The project in question is thought to be regarded favourably by the trustees.

HEAVY rain has fallen lately in the Central Provinces. In Sumbulpore 4·42 inches fell in one week ; in Raepore 4·27 inches ; in Warda 4·83 inches ; in Jubbulpore 4·4 inches, and in Bhundara 8·06 inches. The rice transplanting is making rapid progress, and other crops promise well. The weeding of the cotton crop goes on apace, although in some parts this crop has suffered through excessive moisture. In several districts the satisfactory prospect is having its effect on the prices of food-grains, which are now selling as follows in seers per rupee :—

	Rice.	*Wheat.*	*Jowar.*
Sumbulpore	47	...	...
Raepore	38	40	...
Chanda	14½	22½	32½
Mandla	20	31	30
Bhundara	16	23¾	27
Seoni	18	28	...
Khandwa	...	21	44
Hoshungabad	8	20	30
Jubbulpore	13	24	...

Public health continues good ; and as might be expected from the general prosperity of the district, the material condition of the people is satisfactory.

THERE can now be but little doubt that within a few years not only will the Australasian Colonies be able to supply their own sugar, but a considerable export trade will spring up along the shores of the Pacific. Some time since we drew attention to the fact that Fijan sugar was bringing almost as high a price in Melbourne as the best Mauritian produce. Indeed, we have Mauritian testimony to the adaptability of Fiji to sugar-growing ; for the Director of the Port Louis Botanical Gardens, when visiting the group, was struck with the conviction that Fiji might be the aboriginal home of the cane, which he found covering extensive areas with a luxuriant growth. We learn that 45 tons of cane, giving two tons of sugar, are an average yield ; and, with these facts before us, we are not surprised to hear that the Colonial Sugar Company is commencing operations on a large scale, and has already despatched a steamer from Sydney laden with plant and carrying eighty mechanics and labourers engaged to erect a large mill on the banks of the Rewa River, some twelve miles from its mouth. A large area has already been planted with canes, and the machinery, manufactured in England, and weighing from 2,500 to 3,000 tons, is now being shipped out to the group. From 80,000*l.* to 100,000*l.* will be sunk in the company's works and floating stock, and when in full work the

mill will be capable of turning out some 350 tons of sugar per week. As far as sugar is concerned, Fiji should soon merit the title of the "Mauritius of the South Pacific;" but the Australian Colonies are fast increasing their area of land under cane. The Executive Council of South Australia has already allotted to applicants 100,000 acres of land in the Northern Territory, on the Adelaide and Daly Rivers, and between Port Darwin and Byron Harbour, and a number of enterprising young colonists are turning their attention in this direction.

A SINGULAR discovery has been made by accident in connection with some experiments upon cotton seed, which may have a widely extended influence upon agricultural operations. With a view to ascertain the situation of the oil-cells in the cotton seed, Professor Thomas Taylor, the microscopist was requested to make an investigation, and he found that one row of these cells constitutes a protection to the germinating point. The Professor resolved further to ascertain how far these defences protected the embryo from agents usually destructive of all organic life. In using sulphuric acid, he found that one result was completely to remove the adherent cotton, so leaving the brown shell of the seed clean, without being visibly affected. Some of the seed that had been thus treated was sown, and, to the surprise of every one, it came up at least five days earlier than the seed in its natural state. Several experiments were subsequently made, which confirmed the fact that the treatment with sulphuric acid stimulated the vitality of the seed. The gain of five or six days' start, in the avoidance of early frosts, or in the raising of early cotton, for which premiums are offered in some of the Southern States, cannot be over-estimated. Another advantage is that, owing to the cotton hitherto adherent to the seed, the sowing has had to be broadcast, which has been very wasteful. Now the clean seed can be sown by means of a drill, with the result of producing a regularity of growth which will tend greatly to facilitate the subsequent cultivation. The Americans are shrewd enough to apply this treatment with sulphuric acid to other seeds slow of germination. And we cannot but think that our English agriculturists will take advantage of this suggestion. If we have no seeds, like the palm, which take three years to sprout, at any rate there are frequently seasons when the power to hasten a natural operation will be an immense advantage.

THE seventh, part of Mr. Phillips Bevan's *Statistical Atlas*, just published by Messrs. Johnston, of Edinburgh and London, is devoted to the agriculture of the United Kingdom. It will probably surprise most persons to find that in England and Wales, where the *grande culture* is supposed to reign almost supreme, upwards of 346,000 out of the total of 473,638 holdings are of 50 acres each or under. The farms above 1,000 acres appear to number 506. In Scotland out of 80,101 holdings 55,280 are of 50 acres or under, and 79 only exceed 1,000.

THAT there is a decline in the production of wheat in England is only too apparent from the most recent returns. The following statements from the *Economist* show the outturn per acre to have fallen from 29·3 bushels in 1849-58 to 25·6 in 1869-78: "It is noticeable, in connection with this subject, that there has been of late years a decline in the yield of wheat in this country, which is the more remarkable, as during the same period there has been a contraction in the acreage under that crop. Presumably now, the better land is being retained for this purpose, and what is less fit for the growth of wheat is being employed in other ways. Hence an increase per acre, not a decline, might reasonably have been looked for. The figures as to the growth of wheat which we derive from the statement by Mr. Caird, and which are confirmed by other and equally unimpeachable testimony, are as follows :—

ESTIMATED PRODUCE OF WHEAT PER ACRE IN ENGLAND.

1849-58 ...	...	...	...	29·3	bushels.
1859-68 ...	...	...	...	29·1	"
1869-78 ...	...	...	...	25·6	"

This may be compared with a similar estimate of the growth of wheat in France, which appeared a short time since in the *Journal des Economistes* of Paris :—

ESTIMATED PRODUCE OF WHEAT PER ACRE IN FRANCE.

1815-35 ...	...	...	...	13 0	bushels.
1836-55 ...	...	...	...	15·0	"
1856-76 ...	...	...	...	16·4	"

The yield in France is still greatly below that of England, but it is remarkable that the movement should be upwards in the one case, and downwards in the other. A decline in the character of our agriculture is not a pleasant thing to contemplate, but we fear it is the probable explanation." Is this caused by the greater poverty of the farmers preventing them from cultivating their lands so thoroughly, or nourishing them so generously as they were wont to do? Whatever may be the cause, the result is clear, and while we are still a long way ahead of France and other European nations, it must not be forgotten that while our outturn is steadily decreasing, theirs is as steadily rising, and it may be only a question of time when we shall be absolutely behind other nations.

THE first administrators of the Punjab had the reputation of being the most able and interesting writers of reports in India; the works of their successors should be dedicated to the goddess of the Dunciad, "laborious, heavy, busy, bald, and blind." The revenue report of the Irrigation Department of that province for the year 1879-80 is no exception to this rule. Dulness is slow, and the report bears no date, the Chief Engineer possibly objecting to furnish evidence against himself, but the resolution upon it was written last March, almost a year after the period reviewed. The Chief Engineer attributes a decrease in the area irrigated to "the alteration in the land revenue settlement, which has induced people to try whether they can do without irrigation now that they only pay the owner's rates when they take the water." It was certainly a hardship when the owners had to pay for water whether they took it or not. And this is still the case to a great extent in the Punjab, where we see that eight lakhs of rupees were credited to canals as "increased land revenue," which will have to be paid as well by those who reject the water as by those who take it. As long as this is the case all irrigation accounts are deceptive. It cannot be said that the department *made* so much during the year, but that it realised so much in the way of taxation. We might as well talk of the profits of the Road Cess Department as of those of the Canal Department, where the rates are compulsory "Before the new settlement," says the Government resolution on the report, "the people were forced by the high rate of the land revenue assessment to take water, the land was over-cropped, swamping resulted from excessive irrigation, and the health of the people suffered." And yet the resolution expresses a hope that the irrigation of the abandoned area "will be renewed in due time." This suggests the question, what is the due time for over-cropping and swamping the land, and for injuring the health of the people. What is wanted in the Punjab irrigation system is the removal of the charge for irrigation in the land settlement, this amount being added to the rates, and the latter made really voluntary. The cultivators would not then have to pay for water whether they took it or not, and the temptation to saturate the country into a malaria bed would be diminished. We would also know, what we cannot know, whether irrigation in the Punjab really pays, apart from compulsory taxation.

OFFICIAL PAPERS.

TREATMENT OF FOOT AND MOUTH DISEASE IN HORNED CATTLE.

FROM A. MACKENZIE, Esq., Secretary to the Government of Bengal, to all Commissioners of Divisions (except Bhagulpore),—Circular No. 1T, dated Darjeeling, the 15th July, 1881.

IN continuation of the Circular from the Revenue (Miscellaneous) Department of this Office, No. 4, dated the 15th May 1880, I am directed to forward, for your information, the accompanying copy of an endorsement from the Commissioner of Bhagulport, and of the enclosed report, giving particulars of the successful treatment, according to Mr. Stirling's method, by the Assistant Manager, Raj Durbhunga, of foot and mouth disease in horned cattle at Khurruckpore in the Monghyr district, and to request that the report may be circulated as widely as possible within your division.

*** No. 2279B, dated 28th June 1881.**

2. I am at the same time to ask whether you could not prevail upon some of the tea-planters or carrying companies in the Darjeeling district, where cattle-disease is always prevalent, to try Mr. Stirling's method of treatment. The Lieutenant-Governor is, I am to say, willing to sanction an expenditure of Rs. 200 if you could get some reliable persons to try the experiment. The Rev. Mr. Wilson might, I am to suggest, be asked to try it.

To Commissioner, Rajshahye and Cooch Behar Division only.

No. 2279R, dated Bhagulpore, the 28th June 1881. Memo. by G. N. BARLOW, ESQ., Commissioner of the Bhagulpore Division.

Copy forwarded to the Secretary to the Government of Bengal (Medical and Municipal Department), with reference to his No. 588 of the 29th ultimo.

From Baboo CHUNDER SIKHAR BOSE, Assistant Manager, Raj Durbhunga, to the Magistrate of Monghyr,—No. 685, dated Khurruckpore, the 16th June 1881.

With reference to your memorandum No. 268G, dated 14th instant, forwarding copies of correspondence noted on the margin, I have the honour to furnish as under, the information called for therein.

Officiating Secretary to Government of Bengal, to Commissioner, No. 588, dated 29th May 1881.
Commissioner's No. 2021R, dated 8th June 1881, to address of Collector of Monghyr.

(1) Thirty-one cows and bullocks were treated this year, from December 1880 to 18th February 1881, and all of them were cured with the medicines prescribed by Mr. Warren Stirling.

(2.) In all cases the sore between the claws was found to be sympathetic, as no instance was found in which the sore appeared in the feet unless there was the affection of the mouth.

(3) The disease appeared to be infectious. Immediately on the animal becoming affected, the affected beast appeared listless and disinclined to take food. Its head generally drooped, and frothy saliva flowed from the mouth.

(4) The sores on the feet in a few cases remained for about a week, even after the mouth had been healed.

(5.) The following medicines were used—

For the mouth—

Honey (brought from bazaar)	2 lbs.
Muriatic acid (supplied from the Durbhunga Raj dispensary at Khurruckpore ...	2½ oz.

mixed well in an earthen vessel (in want of a glass one) with a wooden rod, and applied with a jute brush about a dessert-spoonful to the tongue three or four times a day. For the feet—

Socotrine aloes (or raw musabbar brought from the bazaar)	4 oz.
Alum (bought from the bazaar) ...	1½ "
Mowah wine (rectified spirit not being available here)	12 "
Water (common)	24 "

The above medicine for the feet was prepared and administered as prescribed by Mr. W. Stirling.

(6) The diet allowed to the beast affected with the soreness of the mouth was rice boiled down to a thick *congee*, with a little sugarcane goor mixed with it.

(7) Whenever medicine was given, the nozzle and legs were washed with pure water only, carbolic acid not being procurable here nor in the Raj dispensary.

(8) The time taken for curing the mouth disease took from 10 to 12 days, and that of the foot about a week longer. With fresh and rectified European medicine, perhaps the disease would be cured within a shorter period.

Memo, by G. M. CURRIE, ESQ., Officiating Magistrate,—No. 281G, dated Monghyr, the 21st June 1881.

Copy forwarded to the Commissioner of Circuit, Bhagulpore, with reference to his No. 2021R—93RR of 8th instant.

Note by MR. WARREN STIRLING, Tea Planter, concerning the treatment of foot and mouth disease in horned cattle.

For the mouth—

Honey	1 lb.
Muriatic acid	1½ oz.

Mix well in an earthenware or glass vessel with a wooden or glass rod. Apply with a wooden spatula about a dessert-spoonful to the tongue, leaving the animal to distribute it over the inside of the mouth by the champing motion that is sure to follow its application.

In ordinary cases this should be administered twice a day, but in very severe cases, or should the beast have been affected some days before notice had been taken, three or four times daily will be requisite.

For the feet—

Socotrine aloes	1½ oz.
Rectified spirits of wine	4 "
Alum	½ "
Water	8 "
or	
Calvert's carbolic acid	4 "
Sweet oil	20 "

Dissolve the aloes in the spirit, and the alum (after powdering) in the water, and mix. Apply twice a day between the claws for mild cases, and three or four times for severe or neglected ones.

Suggestions as to the treatment, food, &c., &c.

Immediately upon a beast's becoming affected (which may be easily known by daily inspection when grazing or when fed in the stockyard, the affected beast appearing listless and disinclined to feed, head generally drooping, and a slightly frothy saliva flowing from the mouth it should be isolated from the herd, and treated at once.

The disease being very infectious, a close watch should be kept upon the remaining cattle for some days after the infected beasts have been detected.

A separate attendant should be deputed to attend upon the sick cattle, and must on no account be permitted to go near the remainder of the herd. As it would be impossible for him to administer the medicine without some of the beast's saliva (the virus of infection) falling about his clothes, he should be made to change them whenever he may have occasion to leave the hospital, and he should always wash his hands in some disinfecting fluid (a weak solution of Calvert's carbolic acid is the best). Care should also be taken to keep dogs away from the hospital as they moving amongst the litter, &c., would be likely to carry the infection to the stockyard.

From the soreness of its mouth the beast, however, much inclined will be unable to eat anything but the smoothest gruel or something of that nature. The best thing to give in India until the mouth become somewhat healed, is rice boiled down to a thick *congee* with a little goor mixed with it. No salt should be given on any account.

Water should be supplied freely as the beasts appear to suffer much from thirst.

Whenever medicine is given, the nozzle and legs should be washed with a weak solution of carbolic acid—one part of acid to twenty of water.

Should aloes and spirits of wine not be easily procurable, the sore on the feet should be treated with a mixture of one part of carbolic, acid to five parts of sweet oil.

My experience leads me to believe that the sore between the claws is only sympathetic. Many cases occur, and some very severe ones, without any sores upon the feet; but in no instance does the sore appear on the feet unless accompanied with affection of the mouth. Moreover, the sores on the feet invariably disappear as the mouth heals.

After the disease his disappeared, all utensils, ropes, litter, &c, should be burnt on the site of the hospital, together with the materials of the shed or shut under which the cattle have been tethered, thus preventing infection, and also disinfecting the ground upon which the sick beasts have been stalled.

As everything used should be destroyed, only cheap vessels, such as common earthen pans, wooden buckets, &c., need be procured for hospital use.

RESOLUTION ON THE ANNUAL REPORT OF THE ROYAL BOTANICAL GARDEN, CALCUTTA, FOR 1880-81.

READ—The annual Report of the Royal Botanical Garden, Calcutta, for 1880 81.

Considerable progress was made during the year in the work of laying out the grounds, especially in the eastern part of the garden. An important improvement was also carried out by the excavation of a drainage channel along the northern boundary of the garden, which benefits not only the garden itself, but also the villages and fields outside, and has been adopted by the Public Works Department as part of a scheme for draining the grounds of the Sibpore Engineering College. The soil obtained in excavating this drain was utilized in raising the level of a large portion of the garden. Along part of the western boundary a similar drain, on a smaller scale, has been dug; but it requires to be extended, both for the protection of the garden, and in order to furnish material for raising the grounds where they are still swampy and unsightly. As it is very desirable that the improvements in the garden, which have been in progress for some years past, should be completed as quickly as possible, the Superintendent has since the close of the year, been allowed a supplementary grant to push on the work in the western part of the garden where much remains to be done.

2. Other improvements have been made during the year, such as the planting of new groups of trees, the re-laying of roads, and the erection of a glazed propagating-house, and and additional plan-shed. Dr. King further proposes to erect a steam-pump, similar to that in the Zoological Gardens, in order to keep the water in the garden tanks at a high level all the year round. To utilise the pump fully it will be necessary to connect the tanks by under ground pipes, and the Public Works Department are now preparing an estimate of the cost of the connections and of a suitable engine. As the boundary of the garden was in parts ill-defined. Dr. King has, in communication with the Magistrate of Howrah, caused a number of substantial stone pillars to be erected round the land boundary.

3. As noticed in previous reports, Dr. King does not think that the cultivation of *rhea* is likely to prove a commercial success in Bengal. The prizes offered for an efficient machine for cleaning the fibre, have hitherto failed to create much interest in the subject, and it is unlikely that zemindars and ryots will underake the cultivation of the plant, until there is a cheap and effective means of bringing it into a marketable condition.

4. During the year under review, Dr. King, in compliance with the wishes of Government, deputed the Curator of the garden to examine the grasses that grow on the banks of the Adjai and Damooda, as well as those on the Brahmaputra between Chilmari and Goalundo, with a view to test their capability of yielding a paper-fibre. On the banks of all the three rivers the prevailing grasses consists of the three species of *Saccharum*, known in the vernacular as *kashee*, *sara*, and *khuree*. Each of these grasses has a stout, hard stem, which is quite unsuitable for paper-making, and the cost of collection and freight of the leaves and the leaf sheaths, which are the only parts that can be utilized, would, it appears, be so high as to prevent their transport to Europe from being commercially successful. Further trials have been made with some of the wiry grasses from the Orissa coast as well as with the *Baobab* and *Malachra capitata*, but the result is not hopeful. Dr. King recommends that attention should be given to the utilisation of the plantain which so far as the manufacture of paper is concerned, promises to be the best of the fibre-producing plants in India. The

Lieutenant-Governor has already expressed his readiness to assist any mercantile firm or private persons wishing to try experiments with the plantain in the Chittagong Hill Tracts or elsewhere in Bengal, by supplying them with wild plantain stems free of cost at the outset of the experiment and afterwards at reasonable rates.

5. Of the economic plants, the *Ceara* rubber continues to grow vigorously and to give promise of success. *Para* rubber and the Madagascar rubber have entirely failed. The other exotic rubbers are very large trees or climbers, and though, as Dr. King states, the collection of rubber from them in their native forests when they have grown to maturity may be profitable, the cost of planting and protection for several years, until they come to maturity will probably prevent their cultivation in this country from becoming a success. Of the other economic plants, the mahogany and *guango* or rain-tree, appear to be the only exotic trees which grow well in Bengal, and for which there is a demand.

6. Very valuable contributions were received in the herbarium during the year from the Royal Garden at Kew, and from officers and gentlemen both in India and other countries. Among the chief contributors were Dr. Aitchison; Mr. C. B. Clarke, of the Educational Service, Dr. Brandis, Inspector-General of Forests; Mr. Gamble, Conservator of Forests, Bengal; Dr. Wood, Superintendent of Vaccination, Darjeeling; Mr. Peppe of the Opium Department; Mr. Levinge, Secretary to Government in the Public Works Department; Colonel Beddome of the Madras Forest Department; Mr. Fisher, Professor in the School of Forestry at Dehra Doon; Mr. Lebeuf, a French Botanist, and Colonel Collet. The present herbarium is much too small for the collection to be properly arranged and exhibited, and is in other respects unsuited for the purpose for which it is used. Before the next rains set in the garden will, the Lieutenant-Governor hopes, be provided with a new herbarium on the general model of the one at Kew. Some modifications of the plan of the building at Kew will be necessary in order to adapt it to the Indian climate.

7. The interchange of plants and seeds went on actively during the year. Forty Wardian cases and 134 open boxes, containing altogether 8,305 plants, were received from different parts of the world. Sixty-five Wardian cases and 280 boxes of plants, besides many plants potted and packed in other ways, were issued, the aggregate of plants distributed being 17,270. One thousand two hundred and fifty-six packets of seeds were received, and 3,224 packets were issued. The chief donors of plants and seeds were Sir J. D. Hooker of the Royal Garden, Kew; Sir George McLeay; Dr. Treub, Director of the Botanic Garden, Java; Dr. Trimen, Director of the Botanic Garden, Ceylon; Mr. Duthie, Superintendent of the Botanic Garden, Saharunpore; Dr. Regel of the Imperial Garden, St. Petersburg; the Directors of the Botanic Gardens of Melbourne, George Town, Demerara, and Mauritius; the Secretaries of the Agricultural and Horticultural Societies of Calcutta and Madras; the Superintendents of the Public Gardens at Rangoon, Bangalore, and the Eden Gardens, Calcutta; Colonel Cadell, V.C., and Mr. E. H. Man, of the Andaman Islands.

8. The death of Mr. Scott, Curator of the Herbarium, referred to in the Government Resolution of the 21st August 1880, occurred during the year under review, and considerable difficulty was found in procuring a competent successor. Mr. Brace, the gentleman appointed by the Secretary of State to succeed Mr. Scott, took charge of his duties at the beginning of June last.

9. The chief improvement carried out in the Lloyd Botanical Garden at Darjeeling during the year was the erection of a handsome conservatory, which will afford accommodation for the growth of many plants hitherto unknown in the Eastern Himalayas. A house for the exhibition of plants for sale is also about to be erected. The nurseries are well stocked with plants, and a considerable number were distributed in the past year to the Forest Department, and both gratuitously and by sale to the public.

10. The thanks of Government are due to Dr. King and his staff for their efficient management of their charge.

SILK IN THE PUNJAB.

From W. M. Young, Esq., Secretary to Government, Punjab, to the Secretary to the Financial Commissioner, Punjab, No. 760, dated Lahore, 12th July 1881.

I am desired to acknowledge the receipt of your No. 653, of 28th June submitting, for the information of Government, a report on the exhibition of silk cocoons held at Madhopore on May 2nd.

2. This was the first joint exhibition held for the rearers of silkworms in the Kangra and Gurdaspur districts, and under the rules which were laid down on the subject last year. The Lieutenant-Governor observes with pleasure that the exhibition was a great success, but in comparing the numbers of exhibitors with those of last year it is necessary to take into account the two separate exhibitions held at Gurdaspur and Nurpur. The number of exhibitors in the two districts in 1880 was 343, and the number in the present year was 447, showing an increase of almost exactly one-third. But for the fact that all the intending exhibitors were not acquainted with the rule that it was necessary for them to register their names as *bonâ fide* breeders, the number would no doubt have been still larger, and it may be hoped that there will now be a steady increase from year to year until the industry, at present in its infancy, really attains considerable proportions.

8. The cocoons from imported seed are said by the manager of Messrs. Listers' filature to have been as fine as any in the world. This is an extremely satisfactory result, and one that the Lieutenant-Governor hopes will be maintained. It is to be regretted that the country seed should have become generally diseased, but his Honor does not think that it is necessary to take any special steps in this matter, as proposed by the Financial Commissioner and the Commissioner. From the facts stated by the Deputy Commissioner that very few country cocoons were exhibited this year, and that Messrs. Lister gratuitously distributed foreign seed to all breeders who agree to sell the produce to them, it appears certain that the foreign seed will supersede the country seed without any effort being made in this behalf. It is not likely that this moths and worms of the two classes are allowed to mix, but unless the is the case, the infection cannot spread.

4. The return attached to the Deputy Commissioner's report shows that the produce of 2 maunds 26¼ seers of seed was 347 maunds, 2 seers of cocoons. The rough outturn of silk is put at 80½ maunds, but at the rate used by the Deputy Commissioner, *viz.*, 10.41 seers of silk per maund of cocoons, the amount would appear to be 90 maunds 12 seers. This seems to be a satisfactory result, but it is not possible to compare the figures with those of previous years, as the former statistics of one or the other of the districts are always incomplete in some particular. The Lieutenant-Governor trusts that this information will be carefully recorded in the future, and an effort should be made to gauge roughly the proportion which the cocoons exhibited bear to the whole number produced in the two districts.

5. The development of mulberry plantations during the past year has been satisfactory. The Irrigation Department has been addressed as suggested by the Financial Commissioner, and requested to plant mulberry trees as far as possible on the banks of the Bari Doab canal and its main distributaries in the Gurdaspur district.

6. With reference to the proposal made by the Deputy Commissioner that the prizes offered by Government should be limited to the same amount as those offered in cash by Messrs. Lister, the Lieutenant-Governor agrees with the view of Colonel MacMahon and the Financial Commissioner for the reason given. The contribution to prizes made by the Kangra district was almost exactly in the proportion of the number of Kangra exhibitors to the whole.

7. The success of the exhibition was due in a large degree to the efforts of the Deputy Commissioner and of the gentlemen associated with him in its management, and the Lieutenant-Governor desires that his acknowledgments for their services in connection with it may be conveyed to them.

EXHIBITION OF SILK COCOONS.

From Colonel C. A. McMahon, Commissioner and Superintendent, Amritsar division, to the Secretary to Financial Commissioner, Punjab,—No. 1717, dated Dalhousie, 7th June 1881.

I have the honor to submit in original report No. 172, of the 31st May, from the Deputy Commissioner, Gurdaspur, on the exhibition of cocoons, held at Madhopur on the 2nd of May.

Exhibition of silk cocoons.

2. The exhibition appears to have been a very successful one, and the steady rise in the number of exhibitors, from 98 in 1876, to 447 in 1881, indicates, I trust, "that the silk industry has taken firm root in the district."

3. It is a gratifying fact that 131 of the exhibitors were zemindars. The work of rearing silkworms seems so suited for women and children, and it occupies their attention for so short a portion of the year, that I trust it will become more and more attractive to the agricultural classes of the sub-mountain districts.

4. It will be interesting to learn the result of Messrs. Lister and Co's experiment of hatching the eggs of the silkworm during the rainy season; and the Deputy Commissioner will be asked to notice this point in his future reports. I should think there is every hope of the ultimate success of the experiment, if it is persevered in for a sufficient time, and is combined with the selection of autumn laid eggs from year to year.

5. The country cocoons exhibited, appear to have been scanty in number and poor in quality. The reason assigned is that the country worms have become diseased owing to the importation of diseased eggs by the late Mr. Halsey. If this be so, it seems to me a question whether what remains of the country stock should not be bought up and destroyed. If this is not done, I should fear that the newly imported foreign stock will sooner or later become infected.

6. I do not concur with the Deputy Commissioner's suggestion, that in future the liberal contributions towards prizes, made by the District Committee, should be withheld, unless Messrs. Lister and Co. agree to contribute a sum equal to that paid by the Committee.

7. An English private firm must have large demands on their resources on the first establishment of a new enterprise in India; and I observe that, in addition to their contribution of Rs. 300 to the Prize Fund, Messrs. Lister and Co. also "awarded four handsome silver medals" which were "highly appreciated by the recipients."

8. If Messrs. Lister and Co. agree to raise their annual contribution well and good, but if they do not agree to do so, the District Committee could hardly expend the money at their disposal in a better way than by continuing to give an impetus to the silk industry of their district. It seems to me a promising enterprise and capable of great development. It would be a pity to throw a damper on its extension.

From Colonel F. J. Miller, Deputy Commissioner, Gurdaspur, to the Commissioner and Superintendent, Amritsar division,—No. 172, dated Gurdaspur, 31st May 1881.

I have the honor to report on the exhibition of cocoons held this year under the orders of Government, at Madhopur on the 2nd May 1881. Due notice had been given throughout this and the Kangra district, and lists of *bonâ fide* rearers were obtained from tahsildars, and copy submitted to Messrs. Lister and Co.

2. The Gurdaspur district Fund contributed Rs. 1,000, the Kangra district Rs. 300, and Messrs. Lister & Co. Rs. 300 for prizes. Messrs. Lister and Co also awarded 4 handsome silver medals, 2 for Kangra and 2 for Gurdaspur, to the exhibitor of the best cocoons by agriculturist and

professionals, and these medals were highly appreciated by the recipients; a large number of persons from all parts of the country assembled to witness the exhibition.

The following Committee awarded prizes—Mr. Moore, of the firm of Messrs. Lister and Co., who is a first-rate judge of the quality of cocoons; Mr. Chapman, Manager, Punjab Sugarworks; Lala Sanjhi Mal, Extra Assistant Commissioner; and the Deputy Commissioner, as President.

The prizes were awarded on the same principles and in the same way as last year; professionals and zemindars being separately classed, and cocoons reared from foreign and country seed being distinguished. Due regard was also had to the fact that the Kangra district only contributed Rs. 800, while Gurdaspur gave Rs. 1,000. The exhibition was held in the old Madhopur workshops, the cocoons being arranged in baskets in a large shed, the floor of which was nearly covered. A number of persons brought in cocoons, whose names had not been entered as *bonâ fide* rearers; those to whom the tahsildars, who were present, could certify, were admitted to the competition, and the other excluded; the reason being that in former years a *bonâ fide* rearer made over a number of cocoons to other parties who had not reared them, on the understanding that the prizes, if obtained, should be divided, and it was to prevent this that lists were prepared.

3. The examination of the cocoons occupied the greater part of the day, and it was quite dark before the last prize was given.

The subjoined table shows the result as compared with the previous years, and the result, I think, shows that the silk industry has taken firm root in the district.

1876.	1877.	1878.	1879.	1880.	1881.
98 exhibitors.	56 zemindars.	Not stated.	No exhibitions	63 zemindars.	124 zemindars.
	108 mixed people.		..	166 other professions.	323 mixed professions.
	164 exhibitors.			229 exhibitors.	447 exhibitors.

The last exhibition at which I was present, was that of 1878; when almost all the cocoons were from country seed. This year there were few of this description, the majority being from seed imported from Japan, France, and Italy.

4. The cocoons raised from the climatized Japan and foreign eggs were very good, and declared by Mr. Moore, the only expert present, to be equal to any he had ever seen. The country cocoons exhibited were, however, not of a very superior description; they were at the same kind as shown last year. The quantity was certainly much smaller; this is owing to a disease having infected the country worms for the last three or four years, and consequently very little seed was left in the district. This year also in a few places the worms have died. From inquires made by the agent of Messrs. Lister and Co., it appears that the disease was brought into the district by eggs imported by the late Dr. Halsey: these were hybridised with the country cocoons, which naturally spread the disease over the whole district; no remedy has yet been discovered, but it is said that the worms recovered by removal to a clear place.

5. The Rev. Mr Bearing sent out some from France to the Mission School, and some of the Christians of that mission exhibited as *bonâ fide* rearers. Mr. Keighley, manager of Messrs. Lister and Co., imported in large quantity, which was freely distributed to all requiring it.

He placed a portion of the buildings at my disposal for the accommodation of visitors and exhibitors, and the tahsildars arranged for food, &c. All the natives appeared much pleased and took a general interest in all the proceedings: next year Messrs. Lister and Co. hope to have seed available for distribution by 15th January, so that the worms may commence spring early in the season, and they intend to extend their mulberry plantations, not only at Gulpur but wherever land can be procured. They are about to build sheds at Gulpur and to make them over with a portion of the mulberry plantation to any person who will commence operations on the spot; their object being, of course, to obtain as many cocoons as they can, so as to keep the filature at work. The majority of the exhibitors sell their cocoons to the firm, and all who do so, of course prefer Madhopur as the place of exhibition, as it saves them a double journey. Those who reel their own silk prefer Gurdaspur, but I think Madhopur is the most convenient place, as regards accommodation, &c.

6. Only dead or dried cocoons were exhibited, a few of the tasser-silk cocoons were exhibited; but Messrs. Lister and Co. say it does not pay them to reel this silk, as the operation is troublesome and unremunerative. Messrs. Lister and Co. are about to try the experiment of hatching eggs of silkworm during the rains; they are taking all the seed to Dalhousie for the summer, and will bring down a certain quantity in July for distribution, and will give 4 silver medals for the best cocoons then produced; they seem confident about their success but the native professionals are not of the same opinion.

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8. The information regarding the necessity for feeding silkworms by night as well as by day was properly made known to the people. Zemindars take this silk culture up because their wives and children can work at it while they are in the fields, but the professionals make it their principal business, and are able to devote more time and attention to the worms, both at the breeding and spinning stage than a zemindar who comes home wearied by his out-door work can possibly do, and this is why professionals are most successful in sericulture.

9. I think for the future, Messrs. Lister & Co. ought certainly to contribute a sum equal to that given by the District Committee of this and the Kangra district for prizes, and I would propose next year to withhold the sanctioned amount unless they agree to this.

10. I beg to submit a statement showing the operations of the years in planting and developing mulberry trees.

11 Messrs. Moore, Chapman, and Lala Sanjhi Mal, Extra Assistant Commissioner, are entitled to my best thanks for all the trouble they took in selecting the best cocoons for prizes, no easy task where so many had to be inspected, I could give them but little assistance in this respect. Mr. Keighley, the manager of Messrs. Lister and Co's firm at Madhopur, was most kind and courteous to all natives and Europeans attending the exhibition, which was I consider a great success. Poor old Jafir, who was the first to introduce sericulture into this district, is dead, but his family continue the business, although owing to dispute it has fallen off.

REANA LUXURIANS.

FROM W. M. YOUNG, Esq., Secretary to Government Punjab, to the Joint-Secretary to Government, Punjab, Public Works Department Irrigation Branch, No. 777, dated Lahore, 16th July 1881.

I AM desired to acknowledge the receipt of your No. 2350, of 24th June last, submitting reports as to the cultivation of the *Reana luxurians* during the year 1880.

2. Although in some places the attempt to cultivate the crop proved a failure, and it cannot be said that it has yet been found to be a success in India, still in view of the results obtained at Gungatoli in the Delhi Division, and on the Upper Sutlej Canals, the Lieutenant-Governor is not willing that the experiment should be entirely abandoned. The yield per acre of the crop sown in the former case amounted to 691 maunds of fodder and 4½ maunds of seed, and in the latter to 737 maunds of fodder and 12½ maunds of seed. These results are much better than any reported at the Cawnpore Farm in the North-Western Provinces, and the Lieutenant-Governor would wish to see a systematic attempt made to grow the *Reana luxurians* for two or three years before the experiment is given up.

3. It does not appear certain that the officers conducting the experiments understand that the chief object of the crop is to obtain a plentiful supply of fodder, and it would seem that if the same procedure were followed in the case of each experiment, there would be reason to hope for good results in almost all cases. I am accordingly to request that the following instructions may be issued to the officers concerned, and that they may be directed to carry them out carefully. As it will be impossible for the orders to have effect from the present season, it will be necessary to postpone their adoption till 1882; from the results which may be obtained in that and the following year, it may be hoped that it will be possible for the Lieutenant-Governor to decide whether the experiment should be continued or not.

4. The *Reana luxurians* should be sown in the end of March or beginning of April, in ground which has been well prepared and manured, and which is capable of irrigation as may be required from time to time. The seed may either be planted in rows, each seed being placed at a distance of one yard from the others; or in a nursery, from which the young plants may be moved when 5 to 6 inches high, and planted out at intervals of one yard from each other. The crop should be watered as many times as may be necessary, and when the plants have attained a height of 4½ to 5½ feet, they should be cut down 2 or 3 times, as may seem best, to a height of 1 foot; after the 2nd or 3rd cutting they should be allowed to come to seed. An exact record should be kept of (1) the area sown; (2) the amount of, and quantity of seed used, and manure given to the land; (3) the number of times the land was ploughed and watered; and 4 the amount of fodder obtained at each cutting and the yield of grain. Neighbouring villagers and rural notables should be invited to come and see the crop, and the green fodder can be given to agriculturists to allow them to see if it is relished by their cattle. In reporting the results, the outturn of the actual area under the crop and the estimated outturn per acre should in all cases be stated.

5. It is true that the cultivation of the *Reana luxurians* is more costly and lengthy than that of *chari*, but under favorable conditions the yield is very much larger; and though it does not appear to be relished as a dry fodder, it would seem possible to provide a valuable store of green food. The Lieutenant-Governor would therefore wish to see the experiment as above indicated carried out for two years, in order that the real merits of the crop as a fodder one may be fairly tested.

AGRICULTURAL SHOW IN KATTIAWAR.

LETTER from Major HENRY LOWTHER NUTT, Assistant Political Agent in charge Jhalavad Praut, to Colonel L. C. BARTON, Political Agent, Kattiawar, Political Department, No. 763, dated Wadhwan Civil Station, 4th February 1881.

I HAVE the honor to state that an agricultural show and cattle fair were held in this place on the 10th, 11th, and 12th instant.

2. This is now the third time that a meeting of this description has taken place here, the two former ones having been held in 1872 and 1873.

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9. I attach an interesting report by Mr. Lamb, Inspecting Veterinary Surgeon of this presidency (who was specially deputed by

Government to attend the show) on the animals exhibited in Class I, *viz.* :—

Arab stallions	.... 3 exhibited	... 2 prizes.	
Katty do.	... 56 „	... 4 „	
„ mares	... 90 „	... 5 „	
„ geldings	... 1 „	... 1 „	11 mixed breed, 2 prizes.
„ colts	... 18 „	... 4 „	
„ fillies	... 14 „	... 0 „	
„ ponies	... 0 „	... 0 „	
Ponies of any other breed and Savars' horses	... 10 „	... 5 „	

10. Upwards of 250 animals were shown in this class, and it was highly satisfactory to see that the famous old indigenous breed of Kattiawari horses is not "on the wane," but likely, if treated judiciously, to maintain its original high repute, and yield many a valuable remount for our Native Cavalry in addition to furnishing the ordinary requirements of the Chiefs and others.

11. The Katty stallions which took the 2nd prize, and is described by Mr. Lamb as in some points even superior to the well-known "Redo," was discovered by me about a month ago in a village in this neighbourhood. He is a son of Redo's, is 5 years old, and is quite sound. He stands 14-2, is a bright dun with a dark list along the spine with bars on the forearms (the old Katty colour), and is a truly grand looking animal, full of fire and life, with good bone and substance. He was for sale, and I immediately purchased him for one of the States under my supervision.

12. The show of cattle in Class II. was exceptionally fine. Some very valuable bulls, cows, oxen, and buffaloes being exhibited by many of the Darbars, first prizes being taken by his Highness the Thakore Saheb of Bhavnagar, the Thakore Saheb of Palitana, the Thakore Saheb of Wadhwan, his Highness the Raj Saheb of Dhrangadra, and the Thakore Saheb of Morvi.

13. Class III., which included sheep and goats, was well represented.

14. The camels in Class IV. were much admired.

15. In Class V., which was for asses and mules, there was not a single mule shown, and only a few small asses which were undeserving of prizes. It is strange but true that there exists a strong feeling amongst the people in this part of the world against breeding mules. It is looked upon by some as disgraceful, by others as laughable, &c., &c., and when Class V. was discussed in meetings of the Working Committee, all seemed to dislike talking about either asses or mules. Any native gentleman would have regarded it as insulting to have been appointed judge of the class.

16. The show of poultry was fair. It is the first time that fowls have been exhibited here, and it was not to be expected that there would be anything very wonderful. Next year I hope it will be different.

17. The fruits, vegetables, and grain were excellent. It is very encouraging to observe how greatly the practice of growing certain wholesome English vegetables, which appear well suited to this climate and liked by the people, has increased of late years. No Darbar of any pretensions is now without its gardens in which are found cabbages, cauliflowers, nolkohl, breetroot, lettuce, &c., &c., and some very good collections of such vegetables were sent in from all quarters those from Bhavnagar being particularly fine.

18. The remaining class which included oil-seeds, fibres, cotton, tobacco grown in India, dyes, forage plants, and grasses, miscellaneous articles and machinery and implements, were one and all very fairly represented. It would have been more satisfactory if there had been a greater display of machinery, as many of the Chiefs are becoming keenly alive to the advantages to be derived from machinery in simple form, which economises hand labour or reduces expenditure. A few good pumps, for instance, would have been bought up at once if of moderate cost; but sellers in Bombay are backward in sending what they have up-country at the risk of no sale. An elaborate astronomical clock made by Joshi Shankleshwar of Ahmedabad, by direction of the Dhrangadra Darbar, was much admired.

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20. The ploughing matches, which took place in the early morning of the third day, were a great success, and were witnessed by thousands with much interest. A capital place was found for both workers and spectators. On the bank of a canal adjoining the show yard, the people gathered in vast crowds, seats being placed in a good position for Chiefs and English ladies. The plots to be ploughed—each plot measuring 8 gunthas, or 1/5 of an acre—were marked out with small flags, and each plough was placed in position in right-hand corner of its particular plot. When the gong sounded, the bullocks were yoked and all stood ready for action. At the next sounding all started of simultaneously, and continued ploughing for 30 minutes, the judges being present throughout to see that all was done correctly. At the third sounding of the gong all stopped immediately, the bullocks were unyoked, and the judges then commenced their work of judging, giving points for—

1st, amount of land ploughed.
2nd, depth of furrow
3rd, direction of furrow.

These matches created much excitement amongst the Patels and experienced ryots who were present in great numbers, having been given special leave by their respective Chiefs to attend the show and watch the proceedings; and it was a most exhilarating sight to see the skill and energy displayed by the ploughmen, the land when ploughed, bearing testimony to the fact that good work can be done by the ordinary native ploughs, provided they are drawn by strong bullocks and guided by intelligent, vigorous men.

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26. In conclusion I would beg leave to say that after many years' experience of these agricultural meetings and shows, I am convinced that, if carefully conducted, they are quite in accord with the feelings of the people, high and low. The interest shown was quite genuine; the exertions made were prompted by a healthy, natural liking for the cause generally; and no fear need be felt that agricultural progress in this part of Kattiawar will languish, if the subject is kept prominently forward in a popular form. By degrees these undertakings will assume a more practical shape, I most firmly believe; at the same time it is necessary to understand that the Indian people have vivid imaginations which would not be favourably impressed by the dull proceedings of an ordinary sale of cattle. The Chiefs would not care for such things, and at the present stage of affairs in Native States, we cannot afford to lose their assistance; for, as already stated, it has been principally owing to their hearty co-operation that the show, now reported on, has been enjoyed by so many.

Now that this Wadhwan agricultural meeting has been revived, it is to be hoped it will be continued annually. All who were present promised their future support; and as in due course of time intelligence spreads with reference to place and time of holding, it will become a recognised institution in this part of the country. Trusting that these proceedings may meet with approval.

SELECTIONS.

THE DEFECTS OF INDIAN AGRICULTURE.

NOW that the Government of India are devoting some attention to the subject of agriculture in India, and interest in the same is being also evinced by people at Home, it would not be out of place to call attention to some of the defects in our mode of agriculture. In a paper contributed by Mr. Gogendra Narayan of Kuch Behar to the National Indian Association Journal, he deals exhaustively with the subject, and offers suggestion for the remedy of the state of things now existing. Agriculture is the chief industry of India and that on which the Indians live. There is no other industry worth speaking of at present. A few mills have been established for the spinning of cotton, &c., but the number of operatives employed by them is but an infinitisimal portion of the population. Gold Mining is still in its infancy and may if it prove successfully, be one of our chief industries providing employment to a large number of people, but it is to be regretted that the movement at present interferes seriously with agricultural pursuits, and we hear complaints from Wynaad that the coffee industry is being neglected. Agriculture therefore being the sole industry, which is to maintain an average population of 212 persons to the square mile, the improvement of that industry ought to be prominent above all other considerations. In speaking of the people who form the agricultural community of India, the writer says, that they are poor in capital, generally uneducated, ignorant of the practice of other countries, and consequently without the knowledge of improvements which might well be adopted. It is next to impossible to advise them to do a thing in a different way to that which they have been accustomed to do. The ryot should be shown by experiments that a certain thing can be done in a certain way far superior in every respect to his own. The system of ploughing followed by the Indian ryot is far from perfect. The instrument itself, is very deficient in working, and the soil is merely stirred not ploughed. It is then left for a few days when the sun dries up the clods, after which they are broken with a wooden mallet. The weeds are collected, burnt, and the ash spread over the soil. In 98 cases out of 100, it is the sole manure applied to the land. When the land is ready the seeds are sown and left to Nature's care. The harvest time comes and the crop is cut down with a sickle, a very light instrument which does the work slowly. The sheaves are stacked round a tall tree, and when the weather is favorable they are taken out, laid on a firm circular piece of ground and trodden either by bullocks or men. There is always a great loss in this operation, as a considerable quantity of the grain sticks into the ground and it would not pay to dig it out. The winnowing process is also a very primitive one and the produce is at length ready for the market whither it is conveyed, whenever convenient and sold. The Indian ryot is quite oblivious of the evil result of the continuous growth of the same crop year after year. The idea never enters his head that the soil is apt to get exhausted, and requires to be nourished. Under the present exhausting system the land is being slowly deprived of the elements of plant food, and if it be not checked and some new system introduced, which will restore to the soil its exhausted fertility, the Indian soil must as a matter of course, become unfruitful. The exhaustion of the soil is one of the chief sources of Indian famines. This exhaustiveness of the Indian system of husbandry has been shown experimentally. In this presidency, in places where they used to grow fine tobacco some years ago, are quite barren now, and will not produce the crop. Tobacco is one of the most exhausting crops, and carbonate of potash is one of its chief elements of food; consequently when tobacco is grown year after year in the same land, of course, the land will lose this important element, some of the Madras tobacco soils have been analysed and found to be in want of carbonate of potash. In the North-West Provinces, it is said that wheat-land, which during Akbâr's time yielded 1,140lbs. to the acre, now only gives 840lbs. and the same description of land in some of the Eastern countries of England is made to yield 1,800lbs. The chief crops grown in India are rice, potatoes, tobacco, maize, wheat, barley, &c., apple, grape, and other articles of luxury are also grown. In Southern India tobacco is grown extensively, and there are also coffee plantation

chiefly belonging to English cultivators. Various experiments have been tried by the Madras Government on the growth of exotic tobacco. but they have as yet not been successful. The suggestions made for improving the agriculture of the country is as follow, and they merit the attention of the new department just established.

1. The establishment of Agricultural Societies for the general improvement of agriculture and the agriculturist. These institutions, must be in various districts, because of the variations in climate, soil, and produce, and they must co-operate with one another. These societies ought to start with breeding of stock, trials, and introduction of seeds and improved implements, encouraging agricultural education, introduction of local rotation of crops and holding of annual shows for agricultural produce. The Indian Government ought to help the societies by providing them with seeds from other countries, giving full consideration to any suggestion which the societies may make as to land tax, or any other thing concerning the ryot, extensive irrigation works, and less irrigation rates on forage crops, which will enable the cultivator to keep a certain number of stock, and consequently to procure manure for his land, elements of agricultural education to be taught on the village schools. Landlords ought to take more lively interest in their land and ought to spend more money on its improvement than they have hitherto done. They ought to introduce new implements, seeds, and improved breeds of stock. Forest conservancy is also a matter to which attention should be given in connection with improved agriculture. The moisture of the land will be thus reserved and the underwood could be used as fuel, thus utilising the dung for manuring purposes. Madras Government has been trying several experiments for the last ten or twelve years at the experimental farm at Saidapet and is doing some very important work, little appreciated by the ryots, because of his inability to do so. If the Native States follow the good example set by the Madras Government, a vast deal of knowledge will be imparted to the agricultural population, the salutary effects of which will soon be perceptible. Too much importance can not be placed on the necessity for improving our cattle by the introduction of a better class of breeding stock, of course, attention should be paid to the description of food given to them. The custom in force, says a contemporary is to allow these unfortunate animals to eat what ever may not happen to be of any value, and they are generally supposed to pick up their living as they can. Crops are never grown with a view to provide cattle food. At home this is an important item of a farmer's duty "to see to the providing of a plentiful supply of nourishing food for his cattle." It will be seen from the foregoing remarks, that the Indian cultivator has much to learn in regard to his occupation of tilling the soil, and it will be as much for the interest of the Government as of the ryot to initiate measures whereby the needed instruction can be given.—*Madras Athenæum.*

COCOANUT CULTIVATION.

Of late years very little attention is given to cocoanut cultivation in this city and its suburbs, though at one time—and this was not many years ago—owners of land, natives especially, emulated each other in forming large and well-stocked cocoanut plantations. Cocoanut cultivation is by no means an unremunerative business. In the northern and southern parts of Madras, from Royapooram to the village of Trivattoor and between St. Thome and Adyar and further south, cocoanut trees may be seen planted in admired confusion. It was once considered a grand thing for at moderately well-to-do Hindu, official or non-official, to possess a well stocked garden of cocoanut trees either at Washermanpettah, on the Trivatoor High-road and other places, and those who had no desire to enter into trade or public employ were content to be owners of small gardens on the produce of which they subsisted. But these things have now changed. To own a small plantation is considered somewhat *infra dig.*: to pass the matriculation examination, to enter the Government service, to be a subordinate in a public office, to be a prominent member of a reading or debating society are considered worthy the ambition of the members of the rising Hindu generation, while a very lucrative business is being gradually neglected. The effect of this indifference will not be felt now. Ten or twenty years hence when the plantations now in full working shall be no more, the want of the cocoanut tree will be felt, and then we may look forward to the revival of a branch of industry that is just now neglected.

Many years ago, when people were anxious to do something, whereby their names may be perpetuated, or when they wished to endow a public institution—be it educational, ecclesiastical, or charitable—they generally made over lands for the support of the institutions, and such lands were invariably planted with cocoanut trees, the revenues from which went to the support of the institution or charity. We see this especially in connection with Roman Catholic and Hindu endowments. The revenue from these plantations during certain seasons is fairly good and well able to support small charities. Some years ago when Lord Napier was Governor of Madras, he hit upon the idea of planting the grounds attached to the Gardens Refuge in St. Thome with cocoanut trees in the hope that revenue will in time be derived from this source for the support of the institution. A fine cocoanut tope has been formed alongside that useful institution but, strange to say, that although ten or more years have passed since the trees were planted, they have neither produced cocoanuts nor toddy. Few products of the vegetable world are adapted for so many useful and divers purposes for the convenience of man as the cocoanut tree. It may be mentioned that the Laccadive islands produce a very large supply of cocoanuts, and that the islanders barter the valuable produce of their trees for blue cloth, old guns, knives, &c., which they very much prize. The revenues of the Government are to a certain extent, dependent on the extension of cocoanut planting. Every cocoanut tree that produces toddy for the time is the property of the Government. The Abkarry Department takes charge of and marks the tree and the Abkarry contractor of the district or village is bound to draw toddy from the tree and pay the owner a stipulated rate for the juice he extracts. The toddy contract of a large city like Madras brings in some thousands of rupees a year and in some of the mofussil districts the revenue is much larger. The contractor undertakes to draw and sell toddy in so many shops in a village or taluq of the district which he has purchased, and he has to carry out the terms of his contract very rigidly, failing which he lays himself upon to severe penalties.

We have alluded to some of the advantages to be derived from the cultivation of the cocoanut and of the condition of some of the plantations in northern and southern parts of the town. It is evident that interest in this valuable branch of agricultural industry is on the wane. While the Government are giving attention to other matters connected with the agriculture, it may not be undesirable to give some little consideration to cocoanut plantations from which the public revenues derive a not insignificant portion of their income. The Abkarry Department will not, ten or fifteen years hence, be able in Madras to show such a large income from the toddy contract as is now done owing to the fact that cocoanut plantations do not receive the same attention from private person as they used to do. The Government of Ceylon, we observe, is giving some attention to this matter, and European planters have entered a field which was hitherto left altogether to Hindu enterprise. In Jaffna cocoanut cultivation a few years ago was considered very unremunerative and few European planters cared to venture in a speculation which they all along thought would not turn out well. But they have found out their mistake. One or two experiments lately tried have proved so successful that they have been encouraged to farther efforts, and plantations which two or three years ago would have been willingly sold for the value of the land are at present held for much higher prices. What has been achieved in Ceylon may be easily attained in Madras, and it is left to those who have the will and the means to make an effort and with the countenance of the Government, a valuable agricultural industry may be successfully worked.—*Madras Standard.*

AGRICULTURAL SPECULATIONS IN INDIA.

There appears to be some difference of opinion regarding the capabilities of Tripasore as an agricultural arena for Eurasian enterprise. A correspondent writing to us from Tripasore a short time ago, spoke of the difficulties attendant upon agricultural enterprise in that direction, and said, what we believe to be the fact, that any stranger attempting to cultivate land there would meet with the most vexatious and even ruinous opposition from the ryots and zemindars around. Mr. White, however, is of a different opinion, for he said at the meeting of the Eurasian and Anglo-Indian Association, last Friday evening, that "it was intended to divide the land of the Association at Tripasore into plots, and allow people of means to build cottages and open out farms, and by doing so they would become land-owners and *extirpate the zemindars.*" We rather think not. The zemindar is a person that will take a very great deal of extirpation indeed, and a good deal more than the Association can put upon him. It is, in fact, the zemindar who is the great obstructive of any kind of agricultural innovation in this country, and we have heard of two remarkable instances in which he conquered and routed English interlopers, though these were able to invest a considerable amount of capital in their adventures. In one case, a gentleman from Australia tried to start a stud on his own account. He took a lease of land, and he purchased mares and stallions and built all the necessary offices; but he could not carry out his speculation for the opposition of the natives around. They quarrelled, and he left India a sadder and a wiser man. In another case, an Englishman who had been much taken with Colonel Greenaway's little book on "Farming on the Indian Plains," invested some money in wet and dry land, bought bullocks, the best seeds, and farming implements, but only to lose all. From the very offset the zemindars, his neighbours, were opposed to the intrusion, and they quickly made it too hot for him to stay.

As the law stands, it would be simply waste of time and money to try to get the better of these obstructives by litigation. Before Englishmen, or Eurasians, can ever hope to enter into agricultural competition with the native on his own ground, the law would have to be changed, and in such a way as would upset all economies. Moreover, competition of the kind is on the face of it, impossible. The native will always undersell his more luxurious competitors. He is content to live on next to nothing—a handful of grain,—and to dwell in a hut of mud and leaves. He will work from sunrise to sunset to screw a few annas more out of the soil, and he is a member of a great family of rustics who are ten times more conservative in their opinions, and a hundred times more prejudiced in their views, than even is the English farmer himself. To fight such a man on his own ground, where he has the control of the local labor and of the tongues of the villagers, to say nothing of his caste influences to back him, is only to run one's head against a stone-wall. The only possible way of getting the better of zemindars and ryots would be for some one to farm upon an

immense scale, and with a vast amount of capital. But would the game be worth the candle even then? That is a question. The Anglo-Indian Association Colony, which is a colony on small scale, with insufficient capital, is, we fear, not likely to do much good at Tripasore or elsewhere. That is to say if the colony is to be self-supporting.

Of course, if a number of persons, each one with an assured income,—or "means," as Mr. White puts it,—associate together to live in a square, or a row, or a street, there is no reason why their adventure should not be as successful at Tripasore as it would be in Madras. But *cui bono*? Unless it is the very problematical extirpation of the zemindar. To make such a colony pay out of wet or dry cultivation while there were natives about, would, we think, be quite impracticable. And by this is meant rice and the ordinary crops of this part of India, but not market gardening, which is another thing altogether. It is very possible that if a small number of Eurasians were to take up a suitable piece of land, not too large, and were to work it industriously with the spade, just as Chinamen work their market gardens in the Flowery Land, the thing would pay; for they have Madras as a market, and the natives are themselves slothful and careless in their market-gardening; but the labor would be hard, and the profits inconsiderable to a Eurasian or Anglo-Indian, though they might appear sufficient to the parsimonious Chinaman or to the native of India. This is, however, the only prospect that we see of the poorer Eurasians being ever able to make anything out of the land as cultivators of it. Fruits and vegetables grown on the Chinese economical system is small terraced plots, and with plenty of manure and water, is the Eurasian cultivator's best chance, and if he were to add to this industry, with his wife's and children's assistance, the breeding of a decent kind of poultry,—something better than is commonly sold,—and the production of cleanly-fed pork, he might very probably earn something better than a mere livelihood. It is very doubtful, however, whether Eurasians will ever take kindly to a country life, and to rural occupations. They are for the most part born and bred in cities, and their ways are the ways of the city, not of the country.

Mr. White says that "our late Governor believed in the land scheme" but that was, we fancy, because our late Governor knew nothing of the opposition which the natives can always enter against European or Eurasian intruders. In the little book on Indian farming above referred to, nothing seems simpler than to rent so many hundreds of acres of good land from Government or a Rajah and at once begin to make two rupees from its produce where the native only makes one. But it is all theory, It pre-supposes that everything runs smoothly, that labor is cheerful and abundant, one's agricultural neighbours willing to open their arms to the stranger, the murrain a myth, and the seasons to be depended upon. We are reminded, by works of that kind, of those admirable prospectuses, the triumphs of the Promoter's Art, in which it is clearly shown that if so many tons of some metal or other are only raised from the mine, the profits to the shareholders will be just seventy-three per cent., but the raising of the metal is the one important thing that is taken for granted. If native human nature were what it was when Adam delved and Eve span, and if farming were, on the whole, as pleasant and profitable an occupation as it must have been before the ground was cursed and man ordained to till it in the sweat of his brow, the we should have a high opinion of speculative agriculture in this country, but, as it is, we can only recommend our Eurasian friends to have nothing to say to it whatever.—*Madras Times*.

TOO MANY IRONS IN THE FIRE.

THE mail which arrived from England yesterday, brought out the prospectus of the Bombay Agricultural and Manufacturing Company. The proposed capital is £250,000. This is a considerable sum, but the public just now take more kindly to companies with large, than to those with comparatively small capitals. A curious feature of this "Bombay" Company is that no Bombay man is on the direction. The Board consists of Alderman Hadley, of London; Mr. G. Clerihew of Mauritius; Mr Frost, of London; Mr. Lewinger, of London; Mr. Maccall, late of Shanghai; Mr. Pemberton of London; and Mr. Walker, of Oldham. Of these seven gentlemen, Mr. Alberman Hadley, the Chairman, is also Chairman of the Standard Bank of London, and Mr. Pemberton is a Director of that Bank. It might be worth while knowing whether the Bank has any immediate interest in the new Company. The Directors have "power to add" to their number, but at peresent they have not induced any Bombay man to join them. If Bombay were a mere village with no trade worth naming, and if she had never been the training school in commerce of some men who are now among the most enterprising merchants of the city of London, the establishment of a Bombay Agricultural and Manufacturing Company without the material and moral support of some good Bombay names, might pass unobserved; but as now constituted, the Board has no special claim on the confidence of people in India. Yet the programme is an ambitious one, and a vast amount of local experience will be needed to carry it through. The Company propose to buy an estate of 7,000 acres in the Kunnah Valley, eighteen miles from Challisgaum, on the Great Indian Peninsula Railway, and 218 miles from the city of Bombay. Beyond the fact that the estate "consists of about 7,000 acres of excellent land intersected by two rivers, affording facilities for irrigation," little is said about it. The vendor is the promoter of the Company. He has "fixed the price to be paid, and undertakes to pay all the preliminary expenses attending the establishment of the Company up to date of allotment, receiving from the Company a Commission equal to 1½ per cent. on the amount of the capital subscribed." Moreover he "has covenanted" to "pay the shareholders' interest quartely at the rate of 6 per cent. per annum on the amount paid on their shares for one year from the date of allotment thus giving time for the erection and completion of the dam and the cotton mill." The Directors claim to have acquired on "very favourable terms" the sole right and licence to use and sell the Automatic Jacquard Circular and Straight Bar Knitting Looms throughout the Presidency of Bombay except Scinde. For the vendor agrees to sell the estate, together with the right to use the said looms for £92,000, of which he wishes to take half in cash and the remainder in shares. The Directors propose to direct "special attention to the production of superior cotton, and the selection of seed for distribution among the growers." They intend to build, fit, and set to work a mill for £40,000, or 40s. per spindle, and to turn out 7, 8½, and 9lbs. shirtings. They contemplate cultivating about 1,500 acres with Liberian coffee, and they calculate upon getting 5,000 cwt of coffee from the 400 trees that they will plant per acre. They mention that "tobacco of very superior quality, which flourishes on the estate under native culture can be grown at a large profit." Oilseeds, too, are extensively grown, and the Directors have determined "to erect oil-crushing machinery on the most modern principles, and, besides pressing linseed, castorseed, rapeseed, ground-nut, gingelly, moringa, rape, mustard, and sunflower, to extract the oil from the cottonseeds resulting from the cotton mill. There is an enormous demand by the railways and the numerous mills of Bombay for lubricating oils. The tea and coffee plantations take all the cake, not exported, for manure at very remunerative prices." But this is not all for "wheat, maize, rice, millet, and other cereals thrive well on the estate, and can be extensively cultivated as "the estate being intersected by two rivers has especial advantages in this respect." Then "dams built across the rivers will not only irrigate the property largely increasing its value, but will also yield a considerable revenue by sales of surplus water to the owners of neighbouring estates and farms. During the rains the waters of these rivers are charged with a rich alluvial deposit, forming an invaluable fertilizer. The Cauvery Irrigation Works, after writing off 4½ per cent. for working expenses and interest on capital, yield an excess revenue of over 81 per cent per annum. They then give a list of seven Agricultural (chiefly Australasian) Land Companies that are realizing large profits, but they of course say nothing about the kindered undertakings that have been less successful every way. They wish to be more than a mere agricultural company, for they will not only grow, but they will also spin, and weave their own cotton, they will cultivate coffee, tobacco, and cereals, they will go largely into the oil-seed crushing business, and they will sell water. And these many and diverse branches of business each of which needs special training and experience, are to be directed from London by gentlemen, none of whom may have been in India. Seven thousand acres form a large estate in the "tight little island" of England, Wales, and Scotland, but it is a small affair in the Empire of India. If gold had been discovered, and the estate had been proved to be intersected not by two rivers but by two reefs of very promising quartz, then it might be worth a Company's while to give £92,000 for it. But the estate is innocent of reefs, and its capabilities in other directions are conjectural. Altogether, the scheme looks too vast and vague, and if the vendor of the estate gets the hard cash that he has asked for it, he should deem himself an uncommonly lucky follow.—*Madras Mail*.

THE LAND QUESTION IN THE DECCAN.

MR. WILLIAM WEDDDRBURN, of the Bombay Civil Service discusses the important question in an able and thoughtful article contributed to the June number of the London *Statesman*. He begins by pointing out that in solving the Agrarian Problem in the Deccan, there are three chief interests to be considered—the cultivator, the money-lender, and the State; and he rightly says that no settlement can be regarded as satisfactory unless it recognises and satisfies the just claims of all three. As things now stand, each of these interests in the Deccan is in distress and demand relief. Mr. Hope's Agriculturists' Relief Act has not solved the question as we have over and over again shewn in these columns, for the simple reason that the measure does not go to the root of the evil. The Act is nothing better than a paliative, and it does not recognize the real position of the Deccan ryot. It sanctions the confiscation of the property of the money-lender, without whom the cultivator cannot even live. The supporters of Mr. Hope's Act feel a secret satisfaction in seeing the village sowcar ruined as they look upon him as a veritable Shylock. But these men shut their eyes to the hard and incontestible fact that the money-lender is an inevitability. Sir John Strachey in the debate on the Deccan Agriculturists' Relief Bill observed:—" It would be a great misfortune and mistake to suppose that Government approved the idea of a crusade against the money-lenders. Money-lenders are obviously as necessary to the Indian Agriculturist as the seed which he sows, or as the rain which falls from heaven to water his fields. Agriculture without them would probably be impossible." Yet Mr. Hope's Act practically sanctioned a crusade agains the money-lenders. Mr. Wedderburn thus describes the miserable position of the village sowcar "At present his condition is a very deplorable one for when debtors are ruined, creditors must suffer, and during these recent

famine years his hard-earned savings have gone out in advances which will never be recovered. It must also be borne in mind that the small village money-lender has seldom capital of his own, he trades on capital borrowed from the big sowcars who have their banking firms in the large towns. He is now in a miserable position, the law giving him no protection against the latter, while it has created great difficulties in his way when he tries to recover his dues from the ryot. It thus happens that for the last two years [that is to say since the passing of Mr. Hope's Agriculturists' Relief Bill into law] Marwari money-lenders have been the principal inmates of our civil gaols." This state of affairs cannot be regarded as a satisfactory settlement of the Agrarian problem in the Deccan when it is borne in mind that the ryot cannot cultivate his lands without the money-lenders' help. On the other hand the ryot finds it difficult to meet the Government demand, and the holdings of many cultivators have been sold up for arrears of land revenue. Some remedy for this condition of things must be devised, and the question is what measures of administrative reform should be adopted?

This important question Mr. William Wedderburn seeks to answer in the article under notice. He goes to the very root of the matter when he says that the revenue system must be materially modified to suit the peculiar circumstances of the Deccan districts. This has been our opinion from the very beginning. Mr. Hope himself admits that "to our revenue system must in candour be ascribed some share in the indebtedness of the ryot," Sir Robert Egerton in the debate on Mr. Hope's Bill boldly said, "Too little attention had been paid to this cause which must, in a great degree have contributed to, if it did not entirely originate the difficulties of the Deccan ryot." Sir Roberts's views did not as might be expected find favour with the "Executive Legislature." Mr. Wedderburn states that when he first came to India twenty years ago, he was a great admirer of the Bombay Revenue system, and his opinion was strengthened by his being stationed in the Southern Mahratta country where a rich black soil and a sturdy class of yeoman proprietors supplied conditions very favourable to the success of the scheme. But when he saw the working of the system in Sind, he was convinced that it was not adapted to the circumstances of all parts of the presidency. Mr. Wedderburn continues. Again an unvarying cash assessment on each plot of ground is an arrangement unsuited to the conditions of the Indus Valley. The river is constantly changing its course, so that though in one year the alluvial mud may produce a crop of grain that would do credit to the Nile, the same tract may the next year and for all time to come be nothing but a sandy waste. Similar anomalies affecting both the value and the tenures of the land developed themselves when the system was applied to the forest gardens of Kanara and the reclaimed land on the stony ridges of Ratnagiri. A powerful centralised department is intolerant of local peculiarities, and the Survey Rules rigid and unyielding have proved a very bed of Procrustes on which with many groanings, the zemindar of Sind, the mulgar of Kanara, and the Khot of Ratnagiri have been stretched, each in his turn. It is this same vice of rigidity, this refusal to recognise local peculiarites which has marred the success of the system in dealing with the Deccan ryot. The special and unfortunate characteristic of the Deccan districts is the extreme uncertainty of any harvest. It has been stated on authority that the cultivator "hardly gets a full crop once in three years, for the land is mostly unirrigated, and the rainfall very precarious; while to secure a harvest the rain must not only be sufficient in quantity, but must fall at the right intervals, and be distributed in a particular way say, a minimum of one inch during each fortnight of the rainy season. In these unfavorable circumstances the ryot who has no accumulated capital, is unable to stand alone. Living from hand to mouth he cannot, without the help of the money-lender tide over the constantly recurring years of famine and scarcity. The land can be kept under cultivation only by the combined action of the ryot and the sowcar, a partnership between labour and capital. The cardinal error of the Survey as regards the Deccan districts is that it refuses to recognise these facts. It refuses to see the ryot as he really is. It places upon him the responsibility of punctual cash payments, a liability which he is quite unable to meet, while it refuses to the sowcar his just position in the rural economy, and forces him against his wish into an attitude of hostility. It is easy to trace the error from the very commencement. In the yearly survey reports we find sketched out a pleasing picture of rural prosperity. Government, the universal landlord content with a trifling quit rent securing to the ryot all the benefit of his improvement and enterprise. But in this Arcadian vision no place was assigned to the capitalist. From this paradise the sowcar was to be excluded and thrust into the background and regarded as the wily tempter seeking to betray innocence to its ruin. Such being the sentiment, it is easy to understand the indignation which was felt when, in the course of years the real state of the case forced itself on attention. The ryot was found too feeble to grasp the advantages offered to him, and the sowcar an unbidden guest alone seemed to profit by the bounty of Government." Hence the crusade against the money-lenders. The conclusion which Mr. Wedderburn draws from a careful study of the operations of the Bombay Revenue survey, is that in the case of the Deccan districts it has erred in two ways: (1) the cultivator has been burdened with a rigid liability of punctual cash payments, while (2), the money-lender has been ignored and allowed to drift into a false position. In this view every intelligent and unprejudiced person who has carefully studied the subject will concur. To remedy the evil arising from the rigidity of the revenue demand, Mr. Wedderburn recommends a cautious return to the old system of collection of the Government demand in kind. He says "I propose to offer to the ryot a *a permanent settlement in kind*—say one-sixteenth (one anna in the rupee) of the gross produce. But to encourage him to convert his dry land into wet, I would fix for each field a quit-rent in kind, say three-sixteenths of an average dry crop, which he might at any time elect to pay instead of the share of the actual gross produce. An arrangement of this kind will suit all classes. The ignorant and apathetic man would hand over his one anna share of the ordinary dry crop of bajri or jowari at harvest time, and would not be driven to the sowcar for cash to pay the assessment; while the enterprising man would dig a well, and elect to pay the quit-rent as soon as he found that the increased value of his sugar-cane or other garden crop made that alternative profitable to him." Under Mr. Wedderburn's scheme the Government share of the produce would be collected through zemindars or farmers of the land revenue such as existed under native rule. The zemindars would realise the share of the produce due to the State from the villages handed over to their charge, and pay a lump sum into the Government treasury.

This is Mr. Wedderburn's scheme for a Permanent Settlement for the Deccan. We have all along held that the inexorable tax-gatherer who makes no allowance for the variations of the seasons, and exacts his pound of flesh without caring whether the fields have yielded anything or nothing is the veritable Shylock, and not the money-lender, but for whose aid the land could not be cultivated at all. While strongly supporting Mr. Wedderburn's recommendation to adopt "the assessment of the land revenue to the variations of the seasons, we regret we cannot approve of his proposal to collect the Government demand in kind, and to entrust its collection to a class of middlemen to be created for the purpose. The suggestion that Government should take a fixed portion of the gross produce of the land, looks quite exceptionable on paper. But in judging as the merits of any scheme, we should not merely look at its theoretic excellence. Experience has amply shewn that the practical working of the system of collecting the assessment of this kind inflicts no end of hardship and oppression on the cultivators.

The collection of the assessment in kind affords opportunities of extortion of which it is difficult to form an adequate conception. If the system of administration could be made perfect, we would strongly support Mr. Wedderburn's proposal to collect the Government demand in kind. But the fulfilment of the condition we have laid down is impossible in a country like India, where the people are utterly powerless to protect themselves against persons dressed in brief authority. Mr. Wedderburn tells us that opportunities for oppression would not exist under the system proposed by him "as the demand from the ryot would be strictly limited and defined while the zemindar would exercise no official functions, though he could under the Regulation obtain aid from the revenue authorities in realising his just dues." Now who is to determine the outturn of the standing crop? This work would we think devolve upon the zemindars or farmers of the land revenue; and here immense opportunities for oppression and extortion would exist. Again under Mr. Wedderburn's scheme it would be necessary to arm the zemindars with power to recover their dues by a summary process. If such a power is given, it is sure to be abused. *A permanent settlement in kind is no permanent settlement at all.* The benefits of such a permanent settlement as Bengal enjoys should be extended to the Deccan, otherwise the introduction of a class of middlemen would be a curse instead of a blessing. The most important thing is to adapt the assessment of the land revenue to the variations of the season. If this were done, the ryots would not object to pay the Government demand in coin. Indeed he would we believe strongly oppose the proposal to revert to the old Maharatta practice of collecting the assessment in kind. The people would appreciate the moderation of the Government demand if it should be adapted to the variations of the season. We quite agree with Mr. Wedderburn that before any new system could be brought into working order in the Deccan, the ryot's existing debts should be settled. He must be made a freeman before he could make a fresh start in life with any hope of success.—*Hindoo Patriot.*

THE PLANTING INDUSTRY OF CEYLON.

AN inquiry into the causes that have produced the present depression in the coffee enterprise in Ceylon, would not be of much value, if it omitted to take account of leaf-disease. At the same time there is room for difference of opinion as to the degree in which the blight has contributed to the downward tendency. Leaf-disease, we may be quite sure, is charged with much that should with more justice be attributed to bad management. There cannot, however, be a doubt that, had this pest not made its appearance, fewer estates would have fallen into liquidation. The disease first showed itself in 1869 in Madulsima, in the extreme eastern division of the coffee districts. Next year it had spread to the western or Kandy side, but did not become very general till the following year. It is worthy of remark as bearing upon the connexion between short crops and leaf-disease, that 1870 was the year in which there was the largest export of plantation coffee and the greatest average outturn per acre; the export being nearly 990,000 cwts, and the average per acre 5·53 cwts. Owing to the larger area brought under cultivation, the export in several succeeding years, to wit, in 1874, 1875, 1876, 1877, was above 8 ,000

cwts, but the average per acre has never again reached 5 cwts, while in four years it has fallen below three. During the seven years previous to 1870, the outturn ranged from 4·10 cwts. per acre, in 1864, to 5·22 in 1869. These figures point to the injurious effect of leaf-disease on productiveness, a conclusion which will appear all the more certain when it is remembered that this diminution in outturn since the appearance of leaf-disease has taken place in spite of liberal manuring and a higher style of cultivation than was carried on previously. The planter has therefore good reason to conclude that his diminished returns are to a considerable extent due to the ravages of disease. Meanwhile, as Dr. Thwaites, late of the Botanical Gardens, Peradeniya, says in his report for 1874, it seems to be conclusively established "that judicious cultivation enables the coffee tree to produce a succession of profitable crops, notwithstanding it may suffer from periodical attacks of leaf-disease." This is well exemplified by the obvious fact that no where has the disease committed such havoc as in native plantations, where cultivation is almost entirely neglected. Previously to 1870 planters were divided into two opposite camps—the party that advocated manuring, and the party that opposed it. How long it might have been in the then state of things before a satisfactory solution should have been arrived at, it is not easy to say. The inroads of leaf-disease have led to the matter being speedily and practically settled in favour of high cultivation.

The effects of short crops and low prices might have been mitigated had planters been less exclusively dependent on the one product coffee. Having their eggs all in one basket, a mishap to it could not fail to be followed by serious consequences. Coffee must for many years to come prove the staple product, but had they been as fully alive ten years ago as they are now to the importance of cultivating other products, their losses on coffee would have been more than made up. But here again they had to pass through the school of adversity before they could be taught the potential wealth of resources that surrounded them. First to be mentioned among these new products, though not the most important, is Liberian coffee, which grows at elevations unsuitable to the Arabian species. At the end of 1877, there were, according to Ferguson's *Handbook* (from which the following figures are mainly derived), about 500 acres planted with Liberian coffee. There seems to be some difficulty in determining the area under cultivation at the end of 1880, the estimates varying from 4,000 acres to 7,000 or even 10,000 acres. Though not enjoying complete immunity from the attacks of leaf-disease, the growth and productiveness of the trees have not, so far, been affected by it. It remains to be seen whether this coffee will command a ready sale in the home market. London dealers are said not to appreciate it very highly, but it has been favourably received in America.

The cultivation of tea, though still in its infancy, is likely to become one of the most important industries in the island. Begun about the year 1867, at which time about 10 acres were planted, it made small progress till 1875 when the acreage was estimated at 1,080. Since then the increase has been more rapid, the area under tea at the close of last year being estimated at close upon 9,300 acres. As is the case with Liberian coffee, the increase of tea cultivation does not imply a reduction of the area under coffee, the soil and climate best suited for the one being more or less unsuited for the other. The rapid rise of this industry is seen from the exports for the past five years, as given in the Customs accounts :—

Year	lbs.	Value. Rs.
1876	757	1,907
1877	2,105	8,457
1878	19,607½	20,990
1879	95,969	85,229
1880	189,752	——

This does not represent the whole annual outturn, there being a large local consumption. The crop for the current season is estimated at about 500,000 lbs. The Ceylon planters are sanguine that they will be able to produce a finer tea than that of Northern India, and at a cheaper rate. In support of the latter consideration they adduce their superiority in the matter of cheap transport and labour, as well as in being nearer the commercial centre. As to quality, they appeal to their long list of awards at the Melbourne Exhibition, and to the comparative results of the analyses of Ceylon and Indian teas made by the Victorian Government analyst. Indian tea-planters need not grudge their southern brethren this consolation, considering the cold reception accorded to Ceylon teas in Mincing-lane. The colonists are more indignant than discouraged at their failure to conciliate the vested interests of the London brokers, upon whom they are at present inclined to turn their backs altogether, looking to Australia as the market for their teas.

A still younger industry than tea is cacao, which gives promise of being a valuable addition to the vegetable products of Ceylon. Demanding a lower elevation and more sunshine, it can be grown in situations where the Arabian coffee cannot. It is grown successfully in districts as widely apart as the Central Province, Galle on the South-West, and Trincomalee to the North-East; a fact which indicates the suitability of Ceylon for the plant. On many estates where climate and soil are suitable, cacaos are planted between the rows of coffee trees. This makes it difficult to judge precisely what progress has been made in extending their cultivation. At the end of 1877 only 500 acres were planted. At the end of last year this had increased to about 5,400 acres. Little has yet been exported, the demand for seed having nearly exhausted the indigenous supply. Ten cwts. were exported in 1878, 42 in 1879, and 191 in 1880. In the matter of spices, with which Bishop Heber's hymn has associated the name of Ceylon in the minds of the Sunday school-going youth at home, the island scarcely keeps up its reputation. It is estimated that about 30,000 acres are cultivated with cinnamon, but the area is hardly at all extending. It shows the fluctuations that occur within a short period in certain articles of produce, that though there are at the present moment prosperous coffee planters in the island who made their first step on the road to fortune through remunerative investments in cinnamon, its cultivation does not at present yield a profit sufficient to attract capital. Cardamoms have of late been profitably cultivated, but the area covered by them is not great, though increasing. In 1877 there were less than 200 acres : at the end of last year there were over 1,000 acres.

But of all the newer products now being cultivated in Ceylon, it is to cinchona that the planter most looks for the re-adjustment of the financial equilibrium so grievously disturbed of late years. It is hardly possible to obtain anything like accurate information as to the extent of this cultivation. There are considerable patches in different parts of the country devoted to cinchona alone; but almost all estates, especially the older ones, have trees planted along road-sides or in the midst of the coffee. In some instances, cinchonas are planted only in places where the coffee trees have died out but in other estates, almost the whole acreage has been planted with them in regular rows between the lines of coffee. Some of the species are grown at lower elevations than have usually been considered suitable. Thus they are said to grow in the Yatiyantota district on the western slope, at 500 feet; and at Kalutara, about 30 miles south of Colombo, nearly at the sea level. The number of cinchona plants growing in Ceylon at the beginning of this year is estimated in Ferguson's *Handbook* at from 50,000,000 to 100,000,000. *C. succuirubra* is the most numerous, being reckoned at more than one-half. The remainder consists of *C. officinalis*, and *C. calisaya*, with such varieties as *C. ledgeriana* and *C. pubescens*. Of course, the majority of these are very young, say, not more than three years of age, the cultivation not having increased at a very rapid rate till about 1877, when the depression in coffee forced planters to look about them for something to take its place. It will consequently take some five or six years before there will be any marked increase in the export of bark. By that time a serious fall in price may happen; and in any case, it can hardly be expected that prices will continue to maintain their present level after Ceylon, in common with other parts of the world, has begun to pour a largely increased supply into the home markets. But the Ceylon planters do not despair of a profit on the cultivation even, should prices fall to one-half or one-fourth of their present rates. The following is the official Custom's returns of the export of the cinchona bark for the past eleven years :—

		Value Rs.
1869 ...	28 oz. ...	50
1871 ...	80 packages ...	818
1872 ...	11,547 lbs. & 694 pkgs.	61,102
1873 ...	44,836 " ...	32,667
1874 ...	40,854 " ...	25,277
1875 ...	19,152 " ...	17,968
1876 ...	14,932 " & 1 pkg. ...	14,720
1877 ...	72,127 " & 1 " ...	88,783
1878 ...	186,797 " ...	1,71,292
1879 ...	507,368 " ...	5,19,986
1880 ...	1,161,989 " (say) ...	12,00,000

It is not expected that the rate of progress indicated by the figures of the past two years, will be kept up during the next three or four years there being reason to suspect that the hard time recently experienced led many planters to cut or bark their trees prematurely.—*Madras Mail.*

AN AGRICULTURIST'S TOUR IN BELLARY.

THE Government have published a valuable report by Mr. C. Benson, late Acting Superintendent of Government Farms, on tour that he made on the Bellary district last autumn. He says :—

"The tour was a short one, but afforded me an opportunity of extending my experience of South Indian farming to a set of conditions of which I had previously but little knowledge. This is, however only the third district in the presidency which I have as yet been allowed to visit, although I have been in the service of Government for nearly seven years. My first opportunity of personally gaining an insight into native farming was, not afforded me until I had been nearly five years in India, and thus my knowledge of the country was until recently very small. This tour is further only the fourth that any officer of the department has up to the present time been allowed to make in the plains and yet blame is often cast on them for not appreciating the good points of native farming, although their opportunities of becoming acquainted with these points have been few. Hearing and reading chiefly of the defects of the native system; and working out the conclusion to which official statistics point agriculturally my opinion of South Indian husbandry was not a flattering one, as I showed in a paper I laid before the Famine Commission. Further experience does not lead me to modify in any important particulars my previously expressed opinions, although I can now better appreciate the difficulties with which the ryot has to contend, and also the good point of

his practices as far as I have become acquainted with them. With a very extension of my experience, the conviction also grows upon me of the great difficulties of bringing home to the ryot information regarding the manner in which his practices can and should be altered. The two most important points on which reform is urgently required—the use of a better plough and the manufacture and use of manure,—are of such a nature as to render demonstration of the necessity for change of the greatest difficulty. Everything, as far as I can see, points to the advisability of energetic action on the lines mentioned in my Cuddapah tour report; but even with the greatest possible effort progress can only be slow. Unless Government are prepared to act energetically, and on a far reaching system in the matter, the hope of doing any good to the country at large must be very small, and it is scarcely worth while to carry on our work in a 'half-hearted and experimental' manner."

The Board of Revenue observe that "Mr. Benson's tour was confined to the month of August, when crops were on the ground, and it is therefore difficult to understand how he arrived at the conclusion that the agricultural operations of the district are carried on in a 'lazy and perfunctory manner,' or on what ground he basis his assertion that the system in Bellary 'is the most inefficient cultivation he has ever come across.' Subsequently, however, when describing the mode of cultivation more particularly, he practically retracts discharge, and shows that the operations are conducted in an intelligent and skilful manner. Mr. Benson appears to be puzzled to account for cholam and korra being the staple crops, and says; 'I am unable to suggest any reason why they should so exclusively occupy this position.' The Board says that the "reason why these cereals are more largely cultivated than other grains is that, being the staple food of the people, there is a large demand for them and it pays the ryot to grow them just as in England, it pays the farmer to grow wheat and barley. In regard to deep ploughing and the alleged prejudices of the ryots against this and other approved modes of farming, it is observed by the Board that the only way to overcome prejudice is to demonstrate practically that scientific farming pays; and a few model (not experimental) farms conducted on commercial principles established in the midst of the royts' holdings would produce a greater effect than a long series of lectures at the School of Agriculture. The Board consider that this practical test is what must be insisted upon as the first and most important step towards the improvement of agricultural in India." The Government say that they have perused the report with interest, and that it is a valuable contribution to the literature on the subject. They concur wit the Board in desiring that tours be undertaken as frequently as possible, and would be glad of any suggestions the Board may offer to that end.—*Madras Mail.*

SINGULAR EXPERIMENTS WITH SHEEP.

THE *Times'* Paris correspondent writing on Thursday says:—An invitation having been sent to me, I went to-day to Pouilly-le-Fort to see some very important experiments on the farm of M. Rossignol, a veterinary surgeon. Pouilly-le-Fort, which is a few miles from Melun, in the Department of Seine-et-Marne, is a large farm reached by one of the splendid roads, lined with limes and acacias, which intersect that flourishing department. Just now a harvest is expected there which is called "electoral," the peasants often being influenced in their votes by a good or bad harvest, voting, according as it turns out, for or against the Government. M. Pasteur, one of the scientific glories of France, made to-day experiments in connection with his latest researches on that malady dreaded by agriculturists, called "charbon," a sickness which rages more especially among sheep, the mortality of which produced by it is estimated in France at several million francs a year. Without entering into the details of M. Pasteur's theory, I must give a few wods of explanation, in order that the bearing of to-day's results may be understood. According to M. Paesteur's theory, then, this malady is communicated to animals, and more especially sheep, by infected grass. The grass, however, is only infected where animals that have died of the disease have been buried. In these spots worms, after having fed on the diseased carcases, rise through the pores and fissures of the soil to the surface, collect round the roots of plants, are swallowed by the animals, and thus communicate to them the deadly virus. M. Pasteur has collected these worms. He separated the virus they contain, subjected it to chemical action, and gave it a graduated virulence extending from the most harmless to the virulent state. He then set up the theory that by inoculating the virus at different progressive degrees, he might eventually inoculate the severest virus without the animals suffering any effect from it; in other words, that by inoculation the animals might be protected from "charbon." These theories, conceived in the laboratory, discussed before the Academy of Medicine, and being warmly combated, required to be tested by practical experiments, and the Agricultural Society of Melun requested M. Pasteur to make them in the Department of Seine-et-Marne. On the 5th of May M. Rossignol's farm and 60 sheep were placed at M. Pasteur's disposal. Ten of these sheep were left untouched in order that they might later on serve for comparison. Of the remaining 50, 25 were marked with a hole in their ears, and were inoculated, the first time on the 5th of May, and the second on the 17th. On the 31st of May none of the inoculated sheep had lost fat, or gaiety, or appetite. On the 31st of May the 50 sheep were taken without distinction and inoculated with the strongest virus. M. Pasteur predicted that to-day the 25 sheep not inoculated would be dead, and that the inoculated animals would show no symptoms of sickness. To-day, at half-past one, a number of spectators, among whom were M. de la Rochette, President of the Agricultural Society of Melun; M. Patinot, Prefect of the Department; M. Tisserand, Director of Agricultural Matters at the Ministry of Agriculture and Commerce; and several cavalry officers and veterinary surgeons came together to witness the results. Things turned out as M. Pasteur had foretold. At two o'clock twenty-three of the sheep which had not been inoculated were dead. At three o'clock died the 24th, and the 25th an hour later. The twenty-five inoculated animals were sound, and frolicked and gave signs of perfect health. Only one of the twenty-five inoculated animals was yesterday feverish, and the fever disappeared to-day. It was caused by the animal having designedly been inoculated with too strong a dose of the virus. At three it had gone, and the sheep was eating again. The twenty-five carcasses have been buried in a fixed spot, and on the infected grass which will grow over it, experiments are to be made with the inoculated and non-inoculated sheep. But the result is already certain, and the agricultural public now knew that an infallible preventative exists against the disease in question. This preventative is neither costly nor difficult, for a single man can inoculate 1,000 sheep in a day.—*Times*, 3rd June 1881.

THE PAPER MANUFACTURING INDUSTRY.

IT is stated by one of our contemporaries that the Government have suggested to the Madras Railway Company the desirability of charging special rates to merchants transmitting fibre for the manufacture of paper, so that facilities may be afforded for the growth of an industry that ought to receive every encouragement. The object with this order has been issued is a commendable one and may have the effect of encouraging the manufacture of paper. But the question is whether in the manufacture of paper in the mofussil or in the outskirts of the presidency town, the manufacturers use fibres, or whether they utilise waste paper and rags which have for years been the chief materials used in this country for making paper. There are two or three small factories, beyond the municipal limits, where paper of inferior quality used in making boards is manufactured. The quantity turned out is not very large, but is sufficient to meet the demands of the local trade. Paper know as country cartridge is also made and used in many of the public offices and private establishments for wrapping purposes, and at one time the masters of the petty pial schools in the town were pretty large consumers of country paper since they insisted on their pupils having "copy books" made of it. This was when the system of writing on cadjan was getting into disuse. But now that paper of English manufacture is so largely available and at such cheap rates, it can hardly be expected that the manufacturers of country paper will be induced to take a greater interest than they now do in an industry that, though it has a bright future before it, cannot be expected to make head way unless some enterprising European capitalists, with the necessary appliances, enter heart and soul into an undertaking that might prove remunerative.

About two years ago, the Government of India called upon the local Government to ascertain if paper was made from aloe fibre in the districts, and at what cost. The collectors of some of the southern districts were asked to supply the necessary information as it was known that aloes were largely available in parts of South Arcot, Tanjore, and Madura. It was ascertained from the tahsildars that the system adopted by the manufacturers was such that each quire of paper cost between Rs. 1-8 and Rs. 2, and that unless a very large quantity is made up, the cost could not be very much less. If a quire of country paper is to cost as much as a ream of paper imported from France, it is not likely to be in demand, and it will never pay the manufacturer. Some time ago a European gentleman, Mr. Routledge, applied to the Government for information on the growth of certain descriptions of fibres which he said could be largely uutilised in the making of paper, but whether that gentleman is likely to push his investigations further, or whether he has abandoned all intention of starting a paper mill in India, we are not in a position to state. That a well-managed paper mill in Southern India will obtain large support from the Government and private persons there can be no doubt. In Calcutta the Bally Paper Mills Company is a very successful undertaking, and the orders sent to the mills, we believe, are as much as can be supplied. The demand for paper in Bengal and the North-West Provinces is sufficient to keep the mills going, so that the company is unable to supply small orders sent from Southern India. A short time ago an attempt was made to establish a paper mill at Allahabad under the joint stock system. An influential Board of Directors was constituted to work the company which looked forward to substantial support in the north-west. The Bengal papers have not recently afforded information in connection with the enterprise, but if it has been started, it must be doing business by stealth, and will perhaps some day find it remunerative. A few months ago we recorded the fact that a paper mill was started by some of the Maharajahs in Central India. We believe Maharajah Scindiah has set up a paper mill, and like Maharajah Holkar who had started cotton mills and finds them paying schemes, hopes to make a good thing of it. In Southern India sufficient capital has lately been forthcoming to start gold mining, beer-brewing, stable-keeping, and other companies. These will, it is hoped, flourish and give their shareholders handsome returns. But we think that a paper mill, if set up and properly worked in a part of the presidency best adapted for it, will turn out a successful venture, and its projectors may take full advantage of the concession which the Government has decided that the Railway Company should afford in the conveyance of fibres for the manufacture of paper.—*Madras Standard.*

THE CULTIVATION OF LAND IN KAZEROON (WESTERN PERSIA).

ALL land in Kazeroon is private property. If the cultivation be undertaken by the landowner himself, he has to provide seed for an acre of one *gao* of cultivation (the *gao* representing the extent cultivable with one ox), *viz.*, 1,000 lbs. of wheat and 1,000 lbs. barley, and pay about 14 krans (the kran being equal to 11*d*.) for the labour of ploughing and sowing. He pays in kind 11 per cent. of the yield of his harvest to Government, and 20 per cent. to the reapers, who have to undertake all the duties appertaining to the collection of the harvest and the carriage into the stores of the landlord. The landowner also pays 2 to 4 per cent. for threshing or treading the corn. Other than a landowner undertaking a cultivation has to pay to the land-owner 9 per cent. in kind from the outturn of his harvest as rent for one *gao* of land, and 14 per cent. to the Government as tax; his other expenses are the same as those incurred by a landowner. Consul-General Ross states that the agriculturist of Kazeroon are of two classes, *viz.*, the "ryot-i-padishah" and the non-ryot, the former being always looked down upon by all classes, and subjected by Government to more oppression than the others. The ryot cultivator thus not only pays more taxes to Government, but has to pay his taxes in cash instead of in kind, and at 30 per cent. above market value. He is also obliged to give a certain quantity of straw to Government officials whenever required. A ryot, when a landowner, and cultivating his own grounds, has to pay 15½ per cent. on his harvest in cash, and at the above enhanced valuation. A poor ryot pays about 60 krans annually in cash to Government; and there is another class of ryots who are obliged to buy at 30 per cent. above market value, a certain portion of the produce received by Government as taxes. A wealthy ryot is entirely at the mercy of the authorities, a sum of about 1,000 krans being annually levied from him. The value of one *gao* of land is from 100 to 600 krans, according to the locality. To commence cultivation an outlay of about 15 tomains (the tomain being equivalent to 9*s*. 3*d*.) is necessary, and is distributed as follows:—One ox, 50 krans; seed, 60 krans; labour, about 14 krans; straw and cotton seeds, 16 krans; and sundries, 10 krans. It is also necessary for a ryot when undertaking four or more *gao* of cultivation, to maintain at least one donkey. The quantity of grain required for cultivating one *gao* of ground is about 2,000 lbs. In the case of "saifee" or summer cultivation, no distinction is made by Government between a ryot and a non-ryot; "saifee" sowings are always undertaken by proprietors of water and agriculturists conjointly, the proprietor providing the water and ground, and the agriculturist finding the seed, labour, implements, &c. Should the water owner, however, not be at landowner as well, any other landowner would be but too glad to permit his lands to be used for "saifee" cultivation gratis, inasmuch as the soil becomes enriched by manuring, which the "saifee" cultivation necessitates. The time taken for "saifee" sowing is about seven months, the following being cultivated—tobacco, water melon, marsh melon, vegetables, cotton, sesame seeds, lentils, rice, gram, &c. A tax of 20 per cent. *ad valorem*, on the outturn, is levied by Government, three-fifths of which is payable by the proprietor of the water, and two-fifths by the cultivator, and the balance is equally divided between the propritor and the cultivator. Rice and grain, however, form an exception, and are cultivated under the following conditions:—The agriculturist recoups himself for the quantity of seed supplied by him after harvest. He then has equal shares with the water owner, who alone pays Government taxes as follows:—If a ryot, he pays three-fifths of his share to Government; if a non-ryot, he pays only half, the agriculturist paying no tax on his share. In all cases it is thoroughly understood that the Government share of the produce is to be carried to Government store at the cultivator's expense. The approximate value of the produce on the spot is for wheat from 40 to 60 cents. per maund (the maund being equivalent to 30 lbs. avoirdupois); barley, from 25 to 30; gram, from 50 to 80; sesame, from 70 to 100; maithee, from 15 to 20; dhall, from 15 to 20; cotton, from 2½ to 3 krans; and rice, from 50 to 80 cents. The annual expenses of a ryot cultivator in Kazeroon, with a wife and two children, are 10 tomains per annum. The yield of wheat and barley is from ten fold to twelve fold in a good year, and three fold to four fold in a bad one; rice in a bad year, yields twenty fold, and in a very good year, sixty fold; cotton five fold in a bad year, and ten fold in a good year. Irrigation is generally conducted by means of kanats, and the water in all cases is allowed free passage across grounds, even though not belonging to the proprietor of the kanat; should the proprietor of a kanat not wish to undertake any "saifee" cultivation, he could still be made liable by Government to such taxes as may be due by the cultivator; no taxes whatever are levied on gardens in Kazeroon. In the cultivation of the poppy, which is largely grown, the proprietor provides the land seed, and the expenses of sowing the cultivation is then made over to the ryot, who undertakes all the labour necessary for the tending of the crop till the season of cultivation, when the proprietor pays for the labour of incision, about one kran per man per day, the outturn is then equally divided between the landowner and the ryots. The cultivation of opium is also untaxed. A good deal of water is wasted in Persia owing to the long distances it has very often to travel before reaching a land eligible for its security against raids, &c., and to damages constantly sustained by watercourses, which, owing to the social conditions of the country, it is very often beyond the reach of the ryot to travel out of the jurisdiction of his village to repair. There are also large tracts of fertile land which remain waste owing to their proximity to the main roads, as no village having cultivators on such spots can possibly prosper or enjoy the least immunity from the exacting demands of Government officials, and the thefts and robberies committed by the "Illiyat" tribes on their passage along the country thoroughfares.

AMERICAN CULTIVATION OF JUTE.

ATTENTION is being directed in America to the advantages of cultivating jute instead of importing it from India, whence 82,471 tons was taken to the United States in the year ending June 30th, 1880, the value being above five million dollars. The demand is, of course, not so much for paper manufacture as for textile fabrics and cordage. The South requires eighty million pounds of butts for bagging to cover her five million bales of cotton, as much more to sack her cotton seed, cake, meal, rice, and grain, while the great West and North, and California will probably require two hundred million pounds of the fibre for sacking grain and vegetables.

The *Paper World*, our contemporary published in Holyoke, says that California has been raising enough jute for several years, to furnish bagging for her other crops, and Louisiana and many other Southern States contain lands which are unquestionably admirably adapted for jute growing. In Louisiana the crop is considered a sure one, and can be raised as easily as corn. The yield of jute is estimated at from 2,000 to 4,000 pounds of fibre per acre, and the price of jute butts is from three to six cents. The plants are not molested by insects and worms, and, indeed, are said to be less subject to disaster and bad weather than any other crop raised in the South.

Professor Waterhouse, of Washington University, St. Louis, says:—"All that is now necessary to the certain success of the undertaking is the invention of a cheap and rapid means of disintegrating the fibre. In the preparation of the fibre, nothing but chemical or mechinal agencies can succesfully compete with the cheap manual labor of India, and convert the culture of jute in the United States into a great and prosperous industry."

Our contemporary tells us that "the few jute factories which have been established in the United States are doing a profitable business. They import the raw material from India. The import duties on jute and its manufacture are as follows:—Jute tow $20·00 per ton; gunny cloth 3 cents. per lb.; bags, composed wholly or in part of jute, 20 per cent. *ad valorem*; bagging, valued at 7 cents. or less per yard, 1½ cent. per lb.—over 7 cents. per yard, 2½ cents. per lb.; jute yarns 20 per cent. *ad valorem*; butts $6 per ton. On all other manufactures, in whole or in part of jute, 30 per cent. *ad valorem*. With such a premium on the domestic culture, of jute and with the certainty that it will yet be in enormous demand, there can be little doubt that American ingenuity will devise some process which will effect the cheap and rapid disintegration of the fibre mentioned by Professor Waterhouse.

ARTESIAN WELLS IN AUSTRALIA.

LATE correspondence in *The Australasian* on the subject of artesian wells shows how strong is the interest felt by all classes in this branch of water-supply. It is an interest that is increasing as time goes onwards, and it is natural that it should be so, for the future prosperity of Australia depends much upon the success which may attend attempts to improve by artificial means the water-supply, more especially in the less favoured districts. The occupation, for instance, of the Murray Valley, of the wide plains of Riverina, by settlers and farmers has brought our population face to face with this question. It may be said with some truth that even so early in our history it has been forced upon us by pressure of population, and, as this pressure increases, so will increase also the importance to be attached to the question of water-supply itself. Why the subjects of conservation of water, of artesian wells, of irrigation, should have lain so long dormant in a country where their successful development would evidently prove so highly beneficial is, perhaps, due to the fact that our population is mainly derived from stocks inhabiting countries where there is, indeed, perhaps too much water rather than too little. It may be said that we have to unlearn our instincts, and to acquire new ones. We have to acquire painfully and by degrees, through hard necessity the required experience and knowledge to enable us to make the most of our somewhat limited rainfall. We may learn much from the practice of other people, but we must ourselves study the conditions under which it will be necessary for us to apply that borrowed knowledge. If the agricultural and pastoral resources of the southern half of the Australian continent are to be fully utilised, and if our wide territories are to be made to support our growing population, it must be by fully utilising every drop of water that can be caught and saved of the somewhat scanty rainfall that comes to the share of this land. I propose now to discuss the question of water-supply only so far as it relates to artesian wells. In order to have something like a safe foundation to start from, it will be

necessary to clear the ground by inquiring what are the principles upon which the action of an artesian well depends. These principles seem to be very generally misunderstood, and it is essential to a proper understanding of the subject that they should be stated.

The action of an artesian well depends upon hydrostatic principle of a simple nature. Water is a body whose molecules are displaced by the slightest force. Acting under the influence of terrestrial gravitation, it has a tendency to find its level, that is to proceed from any given level to a lower level. Thus it not only flows from higher to lower positions along channels, water-courses, and rivers; but also through porous rock beds which crop out at the surface and extend to great depths into the earth's crust. These porous rock-beds may be imagined as an infinity of minute parallel tubes. The principle which has especial relation to artesian wells is that of the equilibrium of the same liquid in communicating vessels. Take, for instance, the case of a tube of the form of the letter U. If water is poured into one arm, it will rise in the other until its height is the same in each, or until it flows over the orifices. If now we were to insert a third tube between the two arms, the water would rise in it and sink in the other two until equilibrium was restored, and if this tube were shorter than the height at which the water stood in the other two, there would be an outflow from it, either continuously, if the supply were maintained, or until the equilibrium were restored.

We have here a statement of the laws on which the action of an artesian well depends. The strata penetrated by a artesian bore must, therefore, fulfil the following conditions :—(1). The water bearing stratum must crop out at the surface at a higher elevation than the orifice of the bore; (2), it must be contained between two impervious strata; (3) the strata must be either curved so as to form a basin, or the outflow must be so far impeded as to keep the water at an elevation higher than the orifice of the bore.

These are the simple principles upon which the action of artesian wells depend. Before speaking of those existing or possible in this country, it is further necessary to see broadly, but with some mental clearness, the physical features of the Australian continent, both superficial and subterraneous, as well of the past as of the present. The Australia which we see to-day is the result of unceasing operations of natural agents, carried on during the vast ages which lie behind the present. In inquiring how these operations have been carried out, it is necessary to commence with that which is, and to endeavour therefrom to reconstruct ideally that which was.

The Australian continent may be described as a great basin, having an opening southwards. The rim of the basin is indicated by the encircling coast range, which commences, say, in the western part of this colony, extends through New South Wales, Queensland, Northern and Western Australia, and terminates somewhere near the western end of the great Australian Bight. As compared with the area of the continent, this coast range is close to the margin. Between the points of commencement and ending there is no coast range, but merely isolated elevations of the older formations standing above the general surface. The most noteworthy feature is that this coast range represents the margin of an enormous basin of Palæozoic and Mesozoic rocks. The interior of this basin is so far filled in by Kainozoic and later formations, that it is only the higher inequalities of the older formations that now appear as isolated ranges, or even mere peaks, protruding through them.

That which has been called by Professor Dana the continental structure is well marked in Australia; that is, the higher coast range faces the larger ocean, and the lower coast range the lesser ocean. We can see this on the east and west coasts. Between the eastern and western coast ranges extends a wide and comparatively level expanse, which is but little raised above the level of the sea. The folded and compressed Palæozoic rocks of the eastern coast ranges, and the denuded granitic areas of Western Australia, which are now the surface, not only suggest enormous denudation, but also the "crumpling up" of the borders of a rigid continent between two sinking areas of the earth's crust. The folding of the lower Palæozoic rocks has been at right angles to the forces at work, and the folding being nearly meridional, those forces have acted from the area of the Pacific on the one hand, and the area of the Indian Ocean on the other. The "sketching out" of the Australian continent took place mainly during the Palæozoic ages. Immeasurably later, and probably towards the close of the Kainozoic time, when the Australian continent, as we now see it, began to come into existence, there were wide corrugations of the crust of the earth nearly at right angles to the earlier ones. These had the effect of tilting up the whole southern part of the continent on an east and west axis, of depressing the northern half, and they tended to, if not caused, the separation of New Guinea to the north, and Tasmania to the south.

In order to bring out prominently the features to which I desire to draw attention, as bearing upon the subject of artesian waters, I must refer to the geological evidence.

This evidence will be drawn partly from observations as to the present condition of Australia in its physical geography and geology, and partly from those records which have been placed upon the pages of the great stone book of Nature. The pages of this record are the strata of the earth's crust. The whole record itself may be likened to a history in three volumes, the Palæozoic, the Mesozoic, and the Kainozoic ages of geologic time. This record is very imperfect. Long chapters are lost, or only remain to us in fragments. The language in which it is written becomes more ancient and difficult to interpret as we search backward in the earlier records. The signs in which the language it written are only decipherable by the trained eye of the geologist; but the narrative, so far as it has been expounded, is on the whole, clear and consistent. I shall quote from the pages of this record, and I shall commence to do so at that part which may be likened to the middle chapter of the third volume, the Miocene period of Kainozoic time.

At the present time we observe that mountainous masses or ridges, or mere peaks, protrude through the Kainozoic, and more recent formations that level off the great extent enclosed by the circling coast range. It is certain that these elevated tracts of the older formations have not been ever wholly submerged since the Mesozoic age, and it is highly probable that the land surface has, indeed, been continuous—that is, it has existed as dry land—during part of that time itself. Without going so far back, it is sufficient to point out that the water-shed of the Murray basin has existed as land during the Kainozoic age, and I propose to take as my illustration the general course of geological events since the Miocene period.

At this time the land in the southern half of Australia stood much lower—was, in fact, depressed several hundred feet in reference to the sea level—than it now is. The line along which the sea beat round the then land is at the present time far—several hundred feet; in fact—above the present coast-line. A somewhat coarse limestone, filled with remains of a marine fauna, indicating a warmer climate than that we now have, gives us the approximate limits of land and sea then. It skirts the feet of the Gipps Land mountains; it appears at Mordialloc, Corio Bay, and Hamilton; and it fills in the lower part of the Murray Valley. Australia was, probably, at that time a continental island, but of slightly less extent to the south than now. The mountainous regions of the south-east were higher. A vast table-land extended round from Victoria to to the eastward, at an elevation of, perhaps, 2,000ft. to 3 000ft. above the sea level, dominated by still higher chains of mountains. At that far distant time not only was the temperature of the sea warmer than it now is along our southern coasts, but the climate of the land was warmer. The remains of the marine creatures tell us this as to the sea and the remains of plants which are preserved in the Miocene deposit tell us this of the land. If we desire to picture to ourselves the physical aspect of Australia in its southern portion—we must, in imagination restore back to the high grounds, to the hills and mountains, all the materials which now fill in the central basin and which overlie the beds of Miocene age, not only of the central basin, but also on the coast side of the Dividing Range. We may do this as regards the Riverina basin, taking it as an example. Riverina, taking that term in its widest sense, is that tract from which the drainage falls towards the Murray River, or which would do so were all the streams permanent. Its boundaries to, the westward must be taken as being the Palæozoic hill-country commencing at Cape Jervis and extending to the Barrier Ranges, west of the Darling River. Further to the northward, or rather to the north-east the Palæozoic formations do not, so far as I am aware, appear as surface rocks, the water-shed being of later Mesozoic or even Kainozoic age. To the east and south the rim of the basin is formed almost wholly of the older Palæozoic rocks.

The mental picture I arrive at of the Rivernia basin in the Miocene age, is that of a more or less hilly country, draining through its valleys to the southward by a great river. The sea at that time extended far within the Murray Valley. How far is not at present determinable, but sufficient is known to indicate that it may have been as far as about a line drawn from Mount Arapiles towards and beyond Wentworth. Into this sea the then representative of the present Murray would discharge its waters. Where were the sources of this river is uncertain, perhaps within the tropics.

To the south were islands, of which the Grampian Mountains were certainly one. To the south-east and east, as I have said, there was a mountainous tract, having a central plateau, with still higher chains of mountains. Numerous volcanoes poured out sheets of basaltic lava, and levelled off its upland valleys. The remains of the table land still exist in the high plains of Wonnangatta, Omeo, Maneroo, and probably New England. To the westward was also a hilly and, perhaps, insular country, now represented by the mountains of South Australia.

Following the depression of the continent, during which the Miocene beds were formed, there appears to have been a re-elevation of the land of wide extent. It spread out most probably to Tasmania, to New Guinea, and its eastern limits may have been marked by the Great Barrier Reef. Thence onwards until now there is evidence of continual oscillations of the land, but the maximum depression or re-elevations probably never much exceeded 1,000ft. above or below the present levels.

During the enormously long ages which have elapsed since that Miocene land existed, the streams flowing from the Coast Range and from the secondary ranges of the Australian interior have been unceasingly removing the denuded surface, excavating valleys, and transporting the resulting materials to lower levels. Thus they have greatly filled in the central basin—that is, filled in the sea bottom during periods of depression. During periods of re-elevation, materials were spread over the low-lying [illegible] whilst elsewhere channels were cut back into older deposit

Evidence of this may be seen everywhere in the Australian interior, in the mud plains, in the tortuous river channels, and in the isolated remains, of that widespread formation known to geo'ogists as the desert sandstone.

The results of these processes are that large tracts of still older formations have been denuded—in fact, planted off—down to the great granite masses that everywhere form, in fact, the foundation of the Australian continent. The surrounding water-sheds have been lowered and the central basin so far filled in, that wherever the streams can flow at all, they do so at a fall that can scarcely be more than, if even as much as, one foot to the mile.

My illustration is the Riverina basin, but my remarks will apply equally, with but slight local modifications, to the whole of the still greater basin of which it forms a part.—*Australasian.*

ARTESIAN WELLS.

It has come to be recognised on all sides that all that is necessary to render valuable a large part of Australia is a plentiful supply of water. And when the question is raised of the best method of supplying this all proposals come under one of two heads, the surface conservation of the rainfall, and artesian wells. The first of these methods is that which has hitherto chiefly been relied upon, but of late there has been a tendency to look more for the necessary supplies to the boring of artesian wells. The wells have this advantage over the dams, that they are less expensive to construct and cost nothing to keep in repair, while if the water rises to the surface, an abundant and permanent supply is secured independently of all conditions of rain or drought. It would have cost the town of Sale a very great outlay to obtain, and a continuous outlay to maintain, by means of a reservoir and pipes, a supply equal to that which it is now in possession of by merely sinking a well to a depth of 232ft.

When the question of sinking artesian wells is practically raised, the dependent question comes—in what positions can such wells be sunk with a reasonable prospect of obtaining water? A competent scientific authority has in two recent issues of *The Australasian* treated this question in an interesting and instructive paper. The question, fortunately, is one to the solution of which geological science can contribute important assistance. The conditions requisite for an artesian well in which a permanent supply of water will rise to the surface are uniform, and are easily stated. They are—first, an underlying impervious stratum in something like a basin-shapped depression, next a porous, absorbing stratum, charged with water taken in at the outcrop of the stratum at such an elevation as to be higher than the surface of the ground at the proposed well, and finally an impervious stratum superincumbent upon this, preventing the water from rising to the surface. Where such conditions exist, all that is necessary is to sink a bore through the upper impervious stratum so as to tap the saturated layer beneath and the imprisoned water, hitherto locked up under strong hydrostatic pressure, rushes freely to the surface. These are the general conditions; but to the special question whether they exist in any particular place it is often the case that geological science can only give an indefinite and uncertain answer. It can only do this because the whole of the conditions can hardly be perfectly known. All that science can generally affirm is that the known facts are favourable or unfavourable to the expectation of finding water, and that this or that place is presumably better situated than that other for a successful issue to an experiment.

In the meantime we have some general facts that are on the side of encouragement. It is now demonstrated that enormous quantities of the rain-waters of Australia are absorbed in the soil, and never find their way visibly to the sea. As the sea must, nevertheless, be their ultimate destination, we can only suppose that they are making their way by incessant subterranean filtration to our coast lines. There must be an immense number of points at which a deep bore would tap an over-charged stratum, from which the compressed water would read rise vertically to the surface rather than force its way against the resistance it has to encounter on its course to the sea. Every such a point represents a potential artesian well. For the discovery of those points we must look in a great measure to actual experiment. As we have said, our expectations that science can indicate these with accuracy are very limited. We must remember that science is seldom in possession of the required data for such an inference. Every bore that is put down for the purpose of discovering water is more than an individual experiment. It is also a source of valuable knowledge with regard to the geological formation of the country that may be useful for future guidance over large areas.

In some parts of Australia are to be found surface indications that give rise to a high degree of probability that deep springs might be found by boring, that would force the water to the surface. Take for instance, the remarkable mud springs on the Warrego and Paroo rivers, which evidently come from vast depths, quite uninfluenced by season changes, or fluctuations of rainfall, and which are also equally evidently forced up by great subterranean pressure. We can hardly avoid the belief that these prove the existence at a great depth of a stratum charged with water under great hydrostatic pressure, water which succeeds in making its way up to the surface through a few weak points in the overlying strata. What is wanted is an extensive testing of the country under proper scientific guidance. Many shafts will be sunk with no result, save the enlargement of our knowledge of the geological formation, which may be useful in other attempts. But some may be expected to pierce the enormous stores of water which the deep-lying soil of Australia must contain, slowly filtering to the sea. When these inexhaustible sources of supply have been largely tapped, the provision of Nature by which so vast a proportion of our rainfall is absorbed by the soil will be seen to be conducive to human convenience and utility instead of being as it has hitherto appeared, a cause of enormous and irremediable waste.—*Australasian.*

OPIUM CULTIVATION IN PERSIA.

OPIUM of the new crop is already coming into the market, and the yield, it is generally believed, will exceed by twenty-five per cent that of the largest known before. This increase is attributable to two causes, *viz.*, the healthy growth of the plant, and the greater extent of its cultivation. Some, however, firmly believe that the increase may be safely taken at 25 per cent. over that I have stated above. From the steadiness with which the production of Persian opium has increased during recent years, it would be no easy matter to mark the utmost limit of this dangerous rivalry with India, as the capabilities of Persia to grow the drug are unbounded; under existing conditions she may eventually increase her production to about twenty thousand chests. But this is not all. Above Ispahan there are hundreds of thousands of acres of land lying waste for want of water, and which is separated from the river Ahoo-Koran by a range of hills, of which the base at some points is only about four miles across. The scheme being found feasible Mohtamed-i-Dowleh, the Armenian, during his Governorship of Ispahan, about forty years ago, undertook to cut a passage for the waters of the river, when required to flow in the direction of the waste lands alluded to. The work was pushed on to some distance—I believe about three-quarters of a mile in the slow rise of the hill—after which a tunnel was to have been made, but the Mohtamed-i-Dowleh died, and operations came to a stop. Now, if this project be revived and carried through, it would certainly strengthen Persia by at least an additional fifteen thousand chests of opium, which would interfere most prejudicially with the opium revenues of India. To remedy this prospective evil, the British Government ought to forego its theory of free trade with regard to Hong-Kong by levying a heavy duty on opium, the import of other than Indian. If they did this, the price of Persian opium would decline in proportion to the amount of duty leviable in Hong-Kong, and would have the effect of damping the energies of the growers. They would also be driven to devote their labours more to the cultivation of food grain, which is year by year being more and more neglected, with the dire effect of adding to the ever-increasing distress of the general population. The increasing exclusion of grain cultivation has caused much anxiety to the Persian Government, which at one time threatened to destroy the poppy of any of the ryots that had exceeded the prescribed limit. But it has never been strong enough to carry its threats into execution. Until about fifteen years ago the local produce of grain in Yezd was sufficient for its consumption for seven months in the year, where as now, in consequence of the supersession of the poppy, the local supply only lasts about four months, and for the rest of the year Yezd is dependent on Fars, Kurman, Kashan, and Soltoonabad in Koordistan, for its staple food, in former years supplied by Fars alone. The levy of a heavy duty on Persian opium in Hong-Kong will not only maintain the opium revenues of India, but will also save Persia from self-inflicted famines. Properly speaking, Indian opium goes to Hong-Kong sad dled with a heavy duty already levied in India though by a different mode of collection. Hence it cannot be said that Hong-Kong is a free port to the Indian opium. Where, then, is the justice of allowing Persian opium, only slightly weighted by comparatively paltry charges, to compete with the Indian in the China market? Having written so far, I am reliably informed that in the midst of the gathering operation, the poppy has, in most parts of Fars and in some of those of Ispahan, been damaged by a specie of insects called "Ro" in these parts, which either feed on the leaves of the plant or eat their way through the head. Owing to this the greater part of advances made to growers for delivery of the drug this season will necessarily be deferred to the next.

The weather here just now is pretty warm, and a good deal of fever and diarrhœa prevail in consequence of the people in general indulging in sour fruit and sleeping in the open air. When they get ill, they ignore the sources of their malady and explain "What would become of us if our dietary precautions were neglected?" I am sure with such a good climate, aided by proper food and proper medical treatment in sickness, the percentage of mortality might be minimized to almost *nil*. Dr. Odling, attached to the Telegraph station here, does a great deal of good to those who go to him for advice. What a blessing it would be to Shiraz if there were a dozen Dr. Odlings.—*Times of India.*

THE SUGAR INDUSTRY IN MANILA.

OVER the signature of VERITAS, a correspondent of the *Diario de Manila* writes, under date of 1st May, as follows, regarding the local sugar industry in the Philippines:—

The Luzon Sugar Refinery is working under a privilege obtained by its proprietors for cleansing and refining sugar, and it has resulted in a good

business for its owners; but another object has been attained, which is not to be overlooked, owing to its transcendency and is as follows:—Since its foundation the most earnest endeavour has been made to convince the planters of the sugar-cane, that it would cost them the same for producing a very bad article, and of little acceptance as to produce a sound one, which would be in constant demand that the system of mixing honey with the sugar of the new crop is in every way ruinous; first and chiefly, because it gives a name well deserved to the Philippine sugar which is qualified as adulterated in the worst manner, and because the honey placed in contact with sugar of recent manufacture has the property of diminishing ten times its volume, crystalized as it might otherwise be with great facility.

The planters succeed in augmenting its volume, but at the same time incur the risk of prejudicing the quality, and it has been most evidently shown that while nobody buys the mixed goods, the pure sugar is always saleable. The *farderos* are those who up to the present have been the principal buyers of the goods which are sold as sugar, paying to the planters a price less remunerative; and they in their turn, by means of manipulation, in which by adulteration all sorts of malpractices are carried on, which are only known by them, have given as a result an article sent to the markets for consumption which occupies nearly the last place amongst raw sugars; while the fact is that the Philippine sugar is beyond dispute the best without exception in the world. This is not only a saying proved by competent judges, both by analysation and other means; it is accepted, beyond all discussion that the juice extracted from the sugar-cane of these islands has for richness no rival.

It is more to be wondered at when it became known that the cultivation of these soils is of the most primitive style; what would it be if they were better cared for?

Recent circumstances have been the cause of certain determinations taken by merchants, which induced the belief that the exporters (*farderos*) cannot continue their abuses as hitherto; on the contrary, they have either to behave in good faith or close their factories altogether, and thus put an end to a trade which has resulted in nothing but discredit to one of our principal sources of wealth.

The refinery which we have allude to above has contributed much towards placing our sugar in the place where it should be; the country may be congratulated upon possessing the element which has given such a satisfactory result.

NOTES ON GUMS, RESINS, AND WAXES.

BY C. G. WARNFORD LOCK.

THE following economic notes, from the journals of recent travellers seem worthy of reproduction in a collective form:—

SENEGAL GUM.—The product of acacias which grow in the neighbourhood of the Sahara. During the harmattan winds, the gum exudes from the bark of the trees in tears, and solidifies in the open air, the amount of exudation depending upon the force and duration of the wind. The production in 1871, was 3,161,906 kilo. (of 2·2lb.)

MPAFU.—A large tree yielding a sweet-scented gum-resin, much valued by the natives on the Victoria Nyanza.

Gum Arabic is produced by *Acacia gummifera (Mimosa gummifera, Acacia coronillæfolia, Mimosa coronilæfolia Sassa gummifera)*, a scarcely known plant of Morocco, occuring abundantly as a thorny bush in the lower region of south and west Morocco, according to the testimony of the natives who call the plant *alk tlah*. The gum does not seem to be collected in the western portion of its range in South Morocco, but in Demnet, whence it is carried to Mogador. Possibly it is only in the hotter and drier regions of the interior that the gum is produced in quantities to be worth gathering. At any rate, its gum is yielded only during the hot, parching months of July and August, and increases according to the hotness of the weather, and the sickly appearance of the tree being least after a wet winter and a mild summer.

Some accounts suppose the Moroccan Gum Arabic to be derived from *Acacia arabica*, which is found in Senegal, but all the inquiries made by Consul R. Drummond Hay, for Hooker and Ball, agree that this plant, the *alk awarwkal* of the Arabs, is not found in Sus, no such tree existing either north or south of the Atlas Mountains, its gum being brought from Soudan, and of inferior quality to that of *A. gummifera*. It is further stated that this latter species grows chiefly in the provinces of Blad Hamar, Rahamma, and Sus.

ELEMI.—This used to be brought in large cakes to Bembe (West Africa), and is said to be very abundant at not many days' journey.

JUTAHY-SECA.—A resin or gum which exudes from the bark of the jutahy tree of Brazil (*Hymenæa mirabilis*); universally employed for varnishing native pottery.

COPAL.—Red gum copal is almost entirely the product of the Mossulo country (Angola), though it exists farther north, as at Mangue Grande. Until 1858, it was a principal export from Ambris to America, but the war stopped it. According to native accounts, it is found below the surface of a highly ferruginous hard clay, at a depth of a few inches to two feet. It probably extends much deeper, but the natives are too lazy to look for it. It occurs in irregular flat masses up to several lbs. The natives only dig for it during and after the last and heaviest rains in March—May, and restrict the export to maintain the price. No trees and but little grass grows over the spots. The tree is said to be abundant in the woods adjoining the inner side of the wilderness in Usambara (East Africa), but does not extend farther inland.

A great staple of the district traversed by the newly-made road from Dar-es-Salaam, through the Wasamaro country, is gum copal, which is found in many parts. This fossil resin seems to exist, even in the richest diggings, only in patches, as though it were produced by isolated trees. The natives appear to work the country nowhere systematically; they sink test-holes, and, on finding traces of the resin, work that part thoroughly. In many places, test-holes have been made and the place abandoned as useless, although not far off a patch has been well worked. The fossil resin, now found underground usually in red sandy soil, is undoubtedly the produce of the same species of tree as still exists in these jungles, and which now yields an inferior sort of resin. The difference between the two products seems to arise from chemical or molecular change effected by time. The copal tree grows throughout the Usamaro country, and is by no means confined to the sea coast, but is even more abundant inland beyond the first coast ridge. It is not seen, however, where the old limestone formation of the interior makes its appearance.

CHIAN MASTIC.—The mastic country of Chois is usually flat and stony, with little hills intervening, and with rare streams. Rain is destructive of the harvest; frost is rare, but much to be feared. The resin is a product of *Pistachia lentiscus*. The principal villages engaged in the industry are Calimassia, Saint Georges (south of Anabato), Nenita, Mesta, and Kalamoti, besides which there are about a dozen of minor importance. The mastic occurs in white grains, varying in size from a pin's head to a pea. The shrubs yielding it are about the height of a man. It occurs also in Africa and Arabia, but always of inferior quality, though no satisfactory reason has yet been adduced for the fact. In July—August, a great number of incisions are made in the stems of the shrubs, and renewed three or four times. Repeated visits are then made to collect the resin which exudes. A shower of rain during this period produces disastrous results, by washing away the resin. There are four qualities of mastic:—(1.) Cake mastic is composed of large pieces, and is considered the best by connoisseurs; it is sold chiefly for use in the seraglios, all Turkish women chewing mastic; its price is 120 to 180 piastres, and even more, per oke of 1,300 grm. (2.) Mastic in large tears is worth 90 to 100 piastres ordinarily. (3.) Mastic in small tears or pearl is worth 70 to 85 piasters and is used industrially. (4.) Mastic mixed with fragments of leaves and sand is used to make so-called "mastic brandy," the well-known Turkish liqueur, called *raki*. It is made by digesting mastic in the brandy obtained from dry grapes re-distilling the product, and flavouring with aniseed and sugar. The best qualities of mastic are used in the Levant; Europe imports the inferior grades for making varnish.

CHIAN TURPENTINE.—Afforded by *Pistachia terebinthus*. That which exudes from the shrub is very white and aromatic, but the quantity is very limited.

INDIA-RUBBER (from *Ficus elastica*).—The collection of the rubber in Assam is conducted under rigid restrictions in the case of all trees growing in the timber reserves, but cannot be enforced on scattered trees. The Chardwar rubber plantation has an area of 80 square miles. The exports from Lakhimpur in 1871 were 360 2/3 tons, value £8,310. Immense forests of these trees existed on both banks of the Subansiri river, and on other streams, but the reckless treat ment they received from native lessees of the forests caused their ruin. In 1870, the leasing of these forests ceased, but there is now little or no rubber left in the plains of the Lakimpur district. The trees grows to heights of 15 to 85 feet, and its girth, when fit to be tapped, is 18 inches to 6 feet. A high yield for the first tapping of a tree is 35 to 40 lbs. of rubber. It is then allowed to remain untouched for three or four years, when another collection is made, but the yield is then much less. It is estimated that the forests of Cachar could yield upwards of 2,000 cwt of rubber annually. It is stated that the trees yield most during the rains.

Of the India-rubber, 2,000,000 lbs. are annually exported from Para (Brasil), chiefly derived from *Siphonia elastica*, but a few other species are admitted. The utmost yield from each tree is one gill. In the wet season, from February to July, the gum is weak and the tapping is stopped. The trees will grow on the *terra firma* when planted, but their seeds naturally lodge in lowland swamps. Trees properly planted and cared for yield well in fifteen years. Brazil is being gradually cleared of its rubber, gatherers now go to the Tocantins, Madeira, Purus, and Rio Negro, and will soon clear there also. Strauss's method of preparing rubber, instead of smoking, is to drop the milk into alum solution; it is stated to be superior, but is not adopted.

India-rubber plants grow on the slopes of the Cameroons mountains (West Africa), but the people do not yet know their value. India-rubber trees abound on the River Djour, in the province of Bahr-el-Ghazal. The natives of the Marutse-Mabunda empire, on the Upper Zambesi, trade in India-rubber with the tribes to the west.

The *Landolphia* vine is known from Pangani inland all the way to Handei (in Usambara, East Africa), and at Magila the rubber is made into balls for export.

The giant creeper, *Landolphia*, grows chiefly on trees near rivers and streams in Angola, and the Congo. Every part exudes a milky juice when cut or wounded, but this will not run into a vessel placed to catch it, as it dries so quickly as to form a ridge on the wound which stops its further flow. The blacks collect it by making long cuts in the bark with a knife, and as the milky juice gushes out, it is wiped off continually with the fingers, and smeared on their arms, shoulders, and breast, till a thick covering

is formed. This is peeled off their bodies and cut into small squares which are then said to be boiled in water. From Ambriz the trade in this rubber quickly spread south to the River Quanza, where considerable quantities are exported.

Within 20 miles of the coast from Liawa and the Lindi estuary (Masasi Rovuma, East Africa) the forest becomes almost entirely formed of India-rubber vines, affording an abundant supply of fine India-rubber, at present gathered only in a very desultory manner by the natives, who gash the plants, and collect the rubber as it issues in a liquid form, and dries hard after short exposure to the air. Rolled into orange-like balls, it is taken to Lindi, where what is worth 7 to 8 dols. fetches 2 dols. The width of the belt is 15 to 20 miles. On the Victoria Lake (Central Africa) are one or two kinds of trees which produce caoutchouc of good quality.

Dr. Kirk has just determined, with accuracy, the plant which yields the best East African India-rubber, and has obtained seeds of the species for introduction into India. It occurs in great abundance along the newly-made road from Dar-es-Salaam, in a west-south-westerly direction, for about 100 miles towards the interior of East Africa, through the Wasamaro country; it is apparently but little affected, except in the immediate neighbourhood of the villages, by the reckless mode of tapping employed. In many parts, a native can still collect 8lbs. of rubber daily. There are five species, but only one is considered worth tapping.

Rubbers and Guttas of Borneo and Sulu.—The Kadyans and their Murut neighbours collect a quantity of gutta-percha and India-rubber in the surrounding forests. The gums are afterwards manufactured into lumps or balls, and conveyed to Labuan for sale. The gutta is obtained from four or five species of the genus *Isonandra*, all large forest trees. The trees are felled and their bark is girdled or ringed at intervals of two feet, the milky juice or sap being caught in vessels formed of leaves or cocoanut shells. The crude juice is hardened into slabs or bricks by boiling, and is generally adulterated with 20 per cent. of scraped bark. Indeed, it is said that the Chinese traders, who buy up the gutta from the gatherers, would refuse the pure article in preference for that containing bark, to which the red colour is mainly due.

India-rubber in the north-west districts of Borneo is the produce of three species of climbers, known to the natives as *manoongan, manoongan putih*, and *manoongan manga*. Their stems have a length of from 52 to 100 feet, and a diameter rarely exceeding 6 in.; the bark is corrugated, and coloured grey or reddish-brown. The leaves are oblong, green, and glossy; the flowers are borne in axillary clusters, and are succeeded by yellow fruits, of the size of oranges, and containing seeds as large as beans, each enclosed in a section of apricot-coloured fruit. These fruits have a delicious flavour, and are much prized by the natives. The stems of the India-rubber creepers are also cut down to facilitate the collection of the creamy sap, which is afterwards coagulated into rough balls by the addition of nipa salt.

The fallen gutta trees lie about in all directions in the forest, and the rubber-yielding *Wilughbeias* are also gradually, but none the less surely, being exterminated by the collectors in Borneo, as throughout the other islands, and on the Peninsula, where they likewise abound.*

It was formerly thought that gutta-percha was the produce of only one species of (*Isonandra gutta*), but that obtained from the Lawas district is formed of the mingled saps of at least five species, the juices of a *Ficus*, and of one or two species of *Artocarpeæ*, being not unfrequently added as adulterants. The Bornean *gutta soosoo*, or India-rubber, again, is the mixed saps of three species of *Willughbeia*, with the milks of two or three other plants surreptitously introduced to increase the quantity.

The gutta trees are slow to attain maturity, and are difficult to propagate, except from seed. The *Wilughbeias*, on the other hand, grow rapidly and readily lend themselves to both vegetative and seminal methods of propagation; hence these are especially deserving of the attention of the Government of India, where they may reasonably be expected to thrive.

There are, doubtless, yet many thousand tons of rubber and gutta in the Bornean woods, but as the trees are killed by the collectors without any thought of replacing them, the source of supply must recede constantly farther from the markets, and prices will rise in consequence. The demand for India-rubber from Borneo is of quite recent growth, yet in many districts the supply is already practically exhausted.

In Assam, Java, and Australia, rubber is afforded by *Ficus elastica*, which is cultivated for the purpose. There are many milk-yielding species of *Ficus* in the Bornean forests which, with careful experiment, may possibly be made to contribute remunerative quantities. The Malayan representatives of the bread-fruit family also deserve examination, as an excellent India-rubber is derived from *Castilloa elastica*, a South American plant of this order.

LAC.—Secreted by an insect (*Coccus lacca*), on the branches and twigs of certain jungle trees, principally *Khusum* (*Schleichera trijuga*), *plas* (*Butea frondosa*), and *bier* (*Zizyphus jujuba*). The lac from the first is more esteemed than that from the others. To some extent, the lac is found occurring, so to speak, spontaneously, and is collected by forest tribes, and brought by them to the fairs and bazaars for sale. Where, however, there is a regular trade in stick-lac, propagation of the insect is steadily carried on by those who wish for a certain and abundant crop. This propagation is effected by tying small twigs, on which are crowded the eggs or larvæ of the insect, to the branches of the above-named species of trees. These larvæ are technically called seed. The larvæ, shortly after sowing, spread themselves over the branches, and, taking up position, secrete around themselves a hard crust of lac, which gradually spreads till it nearly completes the circle round the twig. At the proper season, the twigs are broken off, and on arrival at the factory, are passed between rollers, which admit of any degree of approximation. The lac is thus crushed off, and is separated from the woody portion by screening. It is next placed in large tubs, half full of water, and is washed by coolies, who, standing in the tubs, and holding on to a bar above by their hands, stamp and pivot about on the heels and toes, until, after a succession of changes, the resulting liquor comes off clear. The lac having been dried, is placed in long cylindrical bags of cotton cloth of medium texture, and about 10ft. long and 2 in. in diameter. These bags when filled, are taken to an apratment where there are a number of open charcoal furnaces. An operator grasps one end of the bag in his left hand, and slowly revolves it in front of the fire; at the same time, an assistant, seated at the other end of the bag, twists it in the opposite direction. The roasting soon melts the lac in the bag, and the twisting causes it to exude, and drop into troughs placed below which are often only the leaves of *Agave americana*. When a sufficient quantity in a molten condition is ready in the trough, the operator takes it up in a wooden spoon, and places it on a wooden cylinder, some 8 to 10 inches in diameter, the upper-half of which is covered with brass—in some places the freshly-cut, smooth, cylindrical stem of the plantain is used for this purpose. The stand which supports the cylinder, gives it a sloping direction away from the operator. Another assistant generally a woman, now steps forward with a strip of *Agave* in her hands, and with a rapid and dexterous draw of this, the lac is spread at once into a sheet of uniform thickness, which covers the upper portion of the cylinder. The operator now cuts off the upper edge with a pair of scissors, and the sheet is lifted up by the assistant, who waves it about for a moment or two in the air till it becomes quite crisp. It is then held up to the light, and any impurities, technically "grit," are simply punched out of the brittle sheet by the finger. The sheets are laid one upon another, and, at the end of the day; the tale is taken, and the chief operator is paid accordingly, the assistants receiving fixed wages. The sheets are placed in packing-cases and when subjected to pressure, break into numerous fragments. In the fresh state, the finest quality has a rich golden lustre.

The dark-red liquor before referred to, as resulting from the washing is strained, in order to remove all portions of woody fibre and other foreign materials. It is then passed into large vats, where it is allowed to settle; the sediment is subjected to various washings and at last allowed to settle finally, the supernatant liquor being drawn off. The sediment, when of the proper consistency, is placed in presses, from which it is taken out in the form of hard, dark-purple cakes with the manufacturer's trade-mark impressed upon them. This constitutes what is known as lac-dye. The dye which is thus separated from the lac by washing is said to be the body of the insect—not a separate secretion.

It might appear that some mechanical arrangement would be more efficacious and economical for washing and separating the lac from the eye, but human labour is so cheap, that this is not the case. The daily pay of the women is 1d. to 1½d.; of the men, 1½d. to 2d. No evil effect on the feet of the stampers is to be observed. The great and sudden oscillations of price in the London market render this trade very risky, and the aniline dyes have well-nigh rung the knell of lac-dye in European industry.

In Assam, a small quantity is produced in the district of Darrang. In some districts, the insect is artificially reared on the *jhuri* tree (*Ficus cordifolia*).

INDIAN WHITE WAX.—This is produced by the female of the *Ceroplastes ceriferus*, an insect allied to the *Pela* of the Chinese, whose product is so largely used for making candles for the Buddhist temples. The Indian insect deposits its wax in small masses upon the twig and branches of several trees, but more particularly on the *arjun* [*Terminalia Arjuna*]; it does not appear to have ever been propagated, nor has the wild product been collected in quantity. Though an article of undoubted value, it would perhaps scarcely repay expenditure of European time and capital; but the natives might surely render its cultivation a very profitable undertaking. The wax is soluble, or nearly so in boiling alcohol, also in benzine and ether, but only very slightly in turpentine and carbonic disulphide (CS_2). Its composition is $C_{73}H_{26}O$. It is found at many widely distant points throughout Sirguja, and is abundant, and suitably situated for experimental cultivation, on the *arjun* trees growing upon the embankment of the Purulia lake.

THE GUM TRADE OF SOMALI LAND (EAST AFRICA).—The gum, or *habak* always sold in grades, bears the name of *ankobib*. On sifting, it is always found mixed with a small quantity of other sorts which make weight in the balance; these are the *habak cudde* and the *habak follala*. The incense, or *luban*; sold in grades, takes the name of *beiho*. The *saphi*, or "triage," is divided into three qualities. The 1st, *fasous*; the 2nd, *nagoua*: the 3rd, *medgigel*. The *saphi*, or "triage," is made into *doukans*, when the arrivals are not too great, by women and children, who are paid about 6d. a day.

The myrrh has but one quality, but it is necessary to be on the guard against the admixture of false myrrh, of the same colour, but

more powerful odour, which the Arabs call *addi*. It is easy to recognise this latter, which always appears oily.

The *maidi*, called in Europe *gum elemi*, is a kind of incense in large bleached tears. It presents the same grades as incense, and buyers aim especially at preserving the tears unbroken to heighten the value.

The *aleti*, or *mourcoud*, is a grey gum, with an exquisite odour recalling that of ambergris.

The *addi*, or false myrrh, whose odoriferous wool is mixed with the wood of *djirmeh*, has an odour when burnt closely resembling that of "seraglio pastilles."

The *fallah-fallah* is a resinous bark, which is burnt to give off a peculiar odour, under the name of *kabat droun*.

Statistics of the annual receipts of gums and incenses at the ports of the Medjourtine coast :—

	Bohars.
Bender Ziyada	250
Bender Gasem	1,200
Abou Regabe } Bender Baad }	900
Borah	300
Gandala	500
Bender Khor	1,000
Ras Orbe	250
Meraya	1,500
Guersa	200
Guesli	400
Bender Felik	700
Atloula	1,004
Total	8,200

The bohar is equal to 136 kilo., or, say 8,200 bohars are about 1,200 tons; this increases to 2,000 tons in a good year.

Myrrh reaches two places only—

Bender Gasem	30 Bohars.
Borah	3 „

Haffoun, in 1877, received 25 bohars.

Magnificent incense-trees, two to three feet in diameter, are found on the lofty mountains towards the north coast of Somali Land. Mareyeh, an important village, lying over 30 miles west of Cape Gardafui, has a large export of myrrh and incense.

Obeidh, the capital of Kordofan, is the centre of a large trade in gum, which is collected in the woods by the women and children, and taken to their villages, where it is disposed of to petty itinerant traders, for ultimate dispatch to Europe.

Moroccan Gum Ammoniacum (which must not be confounded with the Persian product of *Dorema Ammoniacum*, or *ushak*), is an object of commerce with Egypt and Arabia, where it is employed, as of old, in fumigating. The plant affording it is called *fashook* in Arabic, and has been hitherto referred to *Ferula orientalis*, or *F. tingitana*; but Ball and Hooker consider it decidedly an *Elæoselinum*, probably *E. humile*. Leared was told that this plant grows at a place two days from Mogador on the Morocco road; but Hooker and Ball were assured that it is found nowhere along that route, nor nearer to it than El Araiche, a place lying north of Morocco city, which is confirmed by information gathered, by R. Drummond Hay, to the effect that it occurs near Morocco, and chiefly around Tedla.

Gum Sandarch is a product of *Callitris quadrivalvis* (*Thuja articulata Frenela Fontanesii*) a tree indigenous to the mountains of North Africa, from the Atlantic to East Algeria, its eastern limit being undetermined. The resin, once a reputed medicine is collected by the Moors, and exported from Mogador to Europe, where it is used in varnish-making.

Euphorbium gum is produced by *Euphorbia resinifera*, a tree confined to the interior of Morocco. The juice flows from incisions made with a knife, and hardens and drops off in September, the produce being abundant only once in four years. The people who collect the gum tie cloths over their mouths and nostrils, to exclude the small dusty particles, which provoke intense sneezing. The gum once had a wide medicinal use, but the trade in it is now rapidly declining, and its consumption is restricted to veterinary practice, and as an ingredient in a marine paint?

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

THE usual Monthly General Meeting was held on Thursday, the 21st July.

W. H. Cogswell, Esq., President, in the Chair.

The Proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Members :—

Messrs. A. W. Huele, J. K. Weingartner, C. Hudson, the District Engineer of Jessore; the Manager of the Bungtint Tea Company; Baboos Bakal Doss Holdar and Amrita Naryan Acharjea Chowdry, and Captain W. H. M. Francklyn.

The names of the following Gentlemen were submitted for Membership :—

The Rev. Albert Williams, Serampore,—proposed by the Secretary, seconded by Mr. R. Blechynden.

Edward Dellus, Esq., Calcutta,—proposed by Mr. W. H. Cogswell seconded by Mr. J. G. Mengens.

W. MacNab, Esq., Tea Planter, Hatibanda, Nowgong,—proposed by Mr. G. L. Kemp, seconded by Mr. S. H. Robinson.

Augustus Bauermeister, Esq., Merchant, Saigon *viâ* Singapore,—proposed by the Secretary, seconded by Mr. H. A. Firth.

Manager of the Meleng Tea Estate, Assam,—proposed by Mr. A. B. Inglis, seconded by Mr. D. Cruickshank.

W. D. Pratt, Esq., District Superintendent of Police, Midnapore,—proposed by Mr. H. Cornell, seconded by Mr. W. A. C. Beadon.

Baboo Ramnarain Chatterjee, Calcutta,—proposed by Baboo P. C. Mittra, seconded by Baboo P. C. Ghose.

Rejoined.—Manager, New Gola Ghaut Company, Assam.

CONTRIBUTIONS.

1. Report on the Botanical Garden of South Australia for 1880. Presented by the Director, Dr. R. Schomburgh.
2. Memoirs of the Geological Survey of India, Vol. 18, Part 1. From the Director.
3. The Indian Forester, Vol. 7, No. 1. From the Editor.
4. Proceedings of the Asiatic Society of Bengal for May 1881. From the Society.
5. A seedling of *Amherstia nobilis*. From Major R. H. Fanshawe.
6. Seeds of *Musa Ensete*. From Dr. G. Schwenfurth.
7. Four kinds of Tobacco seeds. From the Director, Department of Agriculture, N.-W. P.

GARDEN.

The Superintendent's Monthly Report was read, of which the following are extracts :—

"Propagation work both ornamental and orchard is being pushed on vigorously. I would beg to suggest that for the clearance of stock that is accumulating a General reduction of 25 per cent. in price of all classes of plants be made to Members. I feel certain that it is practicable to reduce the same 50 and in some instances 75 per cent. after the rains; but to enable the Garden to do so, I would point out to Members that their co-operation is necessary in applying for their allowance of plants promptly. Plants propagated during the rains have to be kept confined in pots to meet indents from Members who in many instances fail to send for their allowance when due. The plants thus imprisoned for a long time in pots when they should be in the earth making growth and gathering strength naturally suffer and when deferred till after the following rainy season they must suffer from rot, earth-worms and the thousand other vicissitude of plant life. The delay in claiming allowance of plants also increases the work of the garden hands when they would under the conditions suggested be engaged in other work tending to the interests of Members.

If this suggestion is acted upon, and an increase in the number of Members thereby obtained, it will be possible, I have no doubt, to make further reductions in prices, and enable the Society to import plants under special arrangements, and supplied to Members at such easy terms that will do away with any monopoly that there may be.

I have known as much as one hundred rupees paid for a plant, which, under such circumstances as the Society could arrange, should not have cost more than ten rupees at the outside.

As the specimen coffee plants in the garden are now fruiting, parties, interested in their cultivation will have an opportunity of satisfying themselves by personal observation, that the Arabian is *the* plant for Bengal. The Arabian is bending with its load of berries. The Liberian is almost bare. This latter plant may be of good foliage and that is all that can be said of it, as respects Lower Bengal."

The suggestions in the above report were favorably received by the Meeting. It was also thought desirable to notify to Members, not desirous of receiving their annual supplies of vegetable and flower seeds, that they could obtain a double share of ornamental plants in place thereof.

In reference to the above notice about Coffee from Arabian stock, the Secretary alluded to a remark in a recent issue of the *Englishman*, that the crop is said to be a fair average one in the Chittagong Hill Tracts. He further drew attention to the opinion given by a Committee of the Society, so long ago as 1843, on coffee raised in that district. An attempt was made about that time to form a Joint Stock Company for the cultivation of the plant to that locality, but it was not carried out. In respect to coffee cultivation in Ceylon, a correspondent, in a recent issue of the *Gardener's Chronicle*, adds the following remarks in an account of that island and its capabilities :—

"Of Liberian Coffee, I need say but little. It is now being largely planted in the hotter parts of the island, and is a strong and rapid grower, suffering but little from leaf-disease. It ripens its fruit at irregular seasons, and requires less care in pruning and cultivation, it does not seem to be thought much of in the London market, though in America it sells well. From what I heard I doubt its ever taking the place of ordinary coffee, which, notwithstanding all losses, is still one of the most valuable crops that can be grown."

DEVELOPMENT AND IMPROVEMENT OF THE FUTURE WOOL TRADE OF INDIA BY THE INTRODUCTION OF LONG WOOLED SHEEP FROM SOUTH AMERICA.

The following communication from Captain J. F. Pogson on the above subject was next submitted :—

The people of Beelochistan and adjacent parts of Afghanistan, derive a very handsome and annual income from the sale of wool to British merchants resident at Kurrachee, the natural sea port of the Punjab and through it, of all Afghanistan.

The wool at present produced in the Punjab is of inferior quality, but if Rams and Ewes of superior breeds were to be introduced from a port of America, possessing a warm climate, improvement would at once take place and an opening and employment be secured for the [illegible] of Europeans.

I will show presently that the Punjab is destined to be a great wool-producing country, that is if the Home authorities do not extinguish the production by placing obstructions in the way of the European proprietor or gentleman sheep farmer.

The salt range of the Punjab is remarkable for possessing a breed of wild sheep, and it follows that where the wild sheep thrives, the proper breed of domesticated sheep will do the same, and further that the cross breed between the two will produce a hardy long wooled sheep of very considerable value to the sheep farmer. In the rains the various breeds (seven in number) of sheep the produce of imported stock, would be driven up to graze in suitable part of the salt range, and I presume the localities would be selected as farm stations in the winter, or after the rains the sheep would be sent to graze in the plains where shearing operations would take place, and the pressed and packed wool be sent down the Indus and Jhelum rivers to Mooltan, whence water carriage by steamers and cargo flats to Kurrachee would be available or, if preferred, the Indus Valley Railway could be resorted to.

To carry out the project, I would suggest the formation of a Joint Stock Company with sufficient capital to import 20 rams and 100 ewes of each of the seven breeds described beneath.

The Government of India as well as that of the Punjab, would, I think, feel disposed to encourage such an undertaking, and the former might sanction grants of grazing land being allotted to the Company on the most favorable terms.

With this introduction, I beg to invite the attention of the Council of the Agricultural Society of India to the extracts which are subjoined, and have been taken from the columns of the *Delhi Gazette* of the 8th August 1879, in which part of the journal kept by Mr. Paul, Civil Engineer, employed by Bogota Government was published.

Bogota, is the capital of the United States of Colombia, South America, and the difficulties of transit alluded to having been removed since 1878, the importation of sheep could be very easily carried out by private enterprise, having the sanction and support of the Home and Indian Governments.

Extracts from Journal—

"Tuesday, April 8th, 1873.—*Javoncillo to San Vicento.*

About wool. Owing to the difficulties and expense of transport the price of wool is very high, and therefore does not figure in the list of exports; but with the opening of a line of railway bringing the coast into quicker and cheaper communication with the interior, it would become one of the chief exports of the country, and in such an event Sogamoso would become an important centre for wool.

The following are some of the principal breeds of sheep of the country, *viz.*:—

Oveja (sheep) *de chircate.* Is small, the meat is bad, wool coarse but strong, is not subject to disease. Its fecundity is great, the fibre of the wool is about thirteen inches in length. It is very hardy, thrives in poor and exposed situations. The wool is used in the manufacture of mattresses, coarse blankets, &c. The price ranges between £5 and £8 per 100lbs. without being washed. This species is used principally for its wool.

Common sheep *Oveja comun.* The ordinary Spanish species, but fed on good pastures and in a temperate climate. Is large, meat savory, wool short but very fine, it is used in the manufacture of cloths for trousers, fine blankets, baize, and woollen stuffs generally for out-door and in-door wear. Its price varies from £2-11-4 to £4 per 100lbs. This species is reared principally for its meat.

Oveja Cari-pintoda, Black or speckled-headed. Is larger, and the quality of the meat better than the previous one, but its wool is not so fine. It *is* reared in the State of Bozaka.

Oveja Merina (Merino)—Was introduced into the country in 1825. It flourishes in the States of Boyaca Candinamarsca, and at Conception in Salitander. Though the original stock has been so mixed with other kinds of sheep still the fineness of the wool has not degenerated but nearly retains its original characteristics.

Oveja Dishley. Notwithstanding several crossings with inferior breeds this species has lost none of its original qualities; on the contrary the wool has become slighty finer and longer. The best breed is to be found in the neighbourhood of Tunja, Estate of Boyaca, which produces very beautiful, soft and fine wool, about a foot in length.

Oveja Nankin. Introduced into the country about the year 1869 from China. It is small, but is distinguished for its wonderful fecundity, the savouriness of its flesh; its wool resembling merino, colour bright yellow, soft, and quite equal to the indigenous species.

Oveja de Tierras Calientes. Very large, flesh delicious, fleece coarse and strong, staple from 6 to 8 inches in length. It abounds in the valley of the Magdalena, whence it can be easily and cheaply exported, and it can be raised on pastures quite unfitted for the rearing of cattle. Many millions of this discription of sheep could be raised on the Llanuras of Tobina, and on the banks of the Rivers Cesar and Magdalena. Some few Leicestershire sheep have been imported, and the result of their crossing with these indigenous to the country has been satisfactory.

Maize and sugarcane are now being weeded: the instrument wherewith the operation is performed is of the shape of an English hoe but larger, yet not quite so large as the *phaora* or *kodali* of India."

I have quoted the last paragraph to show that the soil and climate is somewhat akin to that of parts of India, and as the mangoe, guava, and plantain flourished, and ripen fruit, the imported breeds of sheep should thrive.

It would be easy to obtain seeds of the best description of grasses indigenous to Columbia, and their systematic cultivation and extension in the Punjab would very speedily convert large tracts of waste lands into valuable pasturages.

The natives of the Punjab perfectly understand sheep farming and goat breeding, hence trained men in numbers would be available as shepherds, and if Government annually imported 100 of the "*Bright yellow wooled*" breed of sheep for distribution, the "*Golden Fleece*" of the Punjab, when woven, would be highly prized by all classes and greatly enrich the native sheep farmers.

Letters were submitted—

1. From the Secretary, Government of Bengal, in continuation of former correspondence, on the subject of Manilla hemp, and intimating that some shoots thereof will be transferred for the Society's Garden on their receipt from the Andamans.
2. From Captain J. F. Pogson, suggestions as to the cultivation of *Sorghum saccharatum.*
3. From the Secretary, notice regarding cochineal.
4. From the same, remarks on sugarcane *quoad* its propagation from seed.
5. From the Secretary, Agricultural Society, Bijnour, a memorandum on the improvement of agriculture in the Bijnour district.

The above were transferred for the journal.

MINERALOGY.

Dr. Crown, who has just returned to Japan, reports that Corea is wonderfully rich in metals. He says that from Fusan to Genzanshin, or the Gold Mountain, a distance of 310 miles, the geological structure is not incompatible with the theory that the whole region is productive of the precious metal.

FORESTRY.

THE PROFIT OF CASUARIANA CULTIVATION.

I shall suppose that five or six acres of ground are available in the neighbourhood of the reader—it matters not where he may be—perhaps in Tripasore perhaps in Madras, or it may be in Salem. The land need not be very good, common waste land will do very well. I shall also presume that the reader does not care of risk much. Then let ten neighbours club together. If you read this article through you will see how, for a very trifling outlay, a large return may be obtained in three or four years. To begin from the very beginning. Purchase 12lbs. of casuariana seed from Madras. The cost will be Rs. 6. Sow it in 24 small beds 10 feet long and 5 wide. Sow on the surface and cover slightly with the fine soil and well-rooted manure; some cut straw being spread over the beds to protect the seedlings from the sun. Each bed will produce about 1,000 plants. It is calculated that the 24,000 plants will cost at the outside Rs. 48. To save the trouble and uncertainty of raising them from seed they can be purchased for Rs. 5 a thousand, *i. e.*, Rs. 120 for 24,000. Having got the plants transplant them on cloudy days. The land should be prepared to receive them in the following manner. Plough twice, harrow and ridge. Let the ridges be 2 feet apart. Plant the seedlings on *alternate* ridges and let each be 3 feet in front of the other. Thus each plant will have 12 square feet. Water immediately after transplanting. The cost of transplanting will not be more than 12 annas per thousand plants. The ridges between the lines of casuarianas should be sown with castor oil beans. These will soon germinate, and as they grow up will afford shade for the young casuarianas and the sale of beans ought to cover the expense of watering for the first year. Casuarianas should be planted from each other at the distance specified and then only will they grow upright, if too far apart the main stem is liable to fork and produce many side branches, thus considerably reducing the value of the tree. The trees will need to be watered only for the first year. It is estimated that under very unfavourable circumstances as much as Rs 100 per acre will be required for the first year. In preparing the following estimate, two rules have been observed, first to cultivate all outlay at the highest possible rate, and all income at the lowest. Land for casuariana cultivation may be had at Rs. 10 an acre. I shall put it down at Rs. 20 to be on the safe side.

A casuariana tree 4 years old will fetch as it stands not less than one rupee. I shall value it at 8 annas. The profit from the castor-oil beans are left out altogether. Here then is the cost of raising a plantation 6 acres in extent for four years.

	Rs.	A.	P.
24,000 plants at Rs. 5 per 1,000	120	0	0
Ploughing 6 acres at Rs. 3 per acre	18	0	0
Planting and first watering at as. 12 per 1,000 ...	18	0	0
400 cart loads of manure at 8 as. per cart	200	0	0
Watering for first year	600	0	0
Cost of watching and all sundries, say	444	0	0
Total ...	Rs. 1,400	0	0

Each acre will contain 3 630 plants—allowing 12 square feet for each. Supposing one-sixth dies away we have left 3 0 0 per acre.

	Rs.	A.	P.
Sale 3,000 x 6=18,000 plants at 8 as. each ...	9,000	0	0
Deduct gross expenditure	1,400	0	0
Net profit ...	7,600	0	0

or a return of 550 per cent.!

Now if ten persons shared expenses the risk of each would be Rs. 140 at the utmost, and the profit 760. If Rs. 140 be put by in a bank the most one will get in 4 years will be 20 or 25 Rs.—*The Kurasi n and Anglo-Indian Advocate.*

B.

THE CAMPHOR FORESTS OF SUMATRA.

The Chinese here are doing a good business in benzoin, gutta, rattans, and camphor, which are brought down in great quantities by the independent Battaks from their forest-clad mountain, and which are to this day mostly exported to Singapore, without there being any bother about customs export duties; buffalo hides, in which, however, the transactions are few, being the only article

subject to an export duty. The Battaks bring the three first-named valuable articles in plaited rattan baskets, which they carry slung from the extremities of a bamboo laid on the shoulder. As return freight, they bring away from this much salt and other necessaries. The appearance of the Battaks I saw here was not particularly pleasant, and they excited my antipathy, especially from the circumstance that actually, though to a limited extent, they are cannibals. The camphor of Baros is renowned throughout all Netherlands India, and has given its name (*Kapur Baros*) to all sorts of this article of trade. It distinguishes itself by its peculiar strength and a relatively trifling amount of volatility. Under similar conditions a given quantity of Baros camphor loses by evaporation only a fourth part of its weight, in the same time that as large a piece of Japan camphor wholly evaporates. Hence the former is an article in great demand, and brings high prices. Not unfrequently Baros camphor is sold at Singapore for 10,000 guilders per picul. Especially amongst the wealthy Chinese there it is greatly in demand for embalming the bodies of their relations whom they intend to send to China for burial in their native land. It is found in small crystallised pieces and thin layers amongst the fibres of the camphor wood, and is usually offered for sale in that condition, after removing the coarser woody articles and other foreign matter. Trees containing a very considerable quantity of this costly product are comparatively rare. Most of the camphor trees contain it in such a thinly distributed condition that it can be only extracted by boiling as is the case with the Japan description. The Battaks are very skilful in finding out trees abounding in camphor, and dislike the slow boiling process. They, too, desire greatly to earn as much money as they can in the shortest possible time, in order afterwards to enjoy a longer rest. In Sumatra, camphor wood is not only used for making the boxes by which many persons who have returned to Europe are recognised there, when travelling, as being from the East Indies, and according to which are determined the prices they have to pay at lodging-houses, &c., but also as timber. That people are not sparing with it is apparent from the fact that the great bridge over the Batang Taro river, now under construction, is wholly made of this wood. Although not particularly hard, it is of great use for building purposes, because many species of insects—the white ant being the most dreaded, which in these districts manage to destroy all other kinds of wood with wonderful rapidity—leave the camphor wood untouched. The smell of camphor is plainly perceptible in the chips which fall off on preparing the wood, and even in the leaves, though not very strong, when rubbed small.

It is a pity, however, that the natives living in the midst of this bountiful gift of Nature are using it up so carelessly, that, if they are not in time brought under control, an end will soon come to this productiveness. At present the dense forests of Battak Land still contain hundreds of thousands of camphor trees, but the Battak cuts away recklessly, without a thought of the future, and without planting fresh camphor trees. In the same way an end will soon come to the present large stock of gutta in the Sumatran forests. What is found most abundantly in these districts to the east of Baros and Singkel is the valuable benzoin, that fragrant gum which is utilised for incense and other scents. I saw astonishing quantities of it in the Chinese warehouses at Baros. In hundreds of cases this article is shipped to Singapore—that centre of the trade of the Far East. The benzoin is bought unprepared, from the Battaks, usually at 1·40 guilders per catty. The scent of this gum is very agreeable, and it is a pleasure to stay in the storehouses, where it is sorted and then carefully packed, after being plentifully sprinkled with water. Remarkably enough, the Battaks take great care that other benzoin trees shall rise up to replace those cut down; for in fact, they have nothing else to do than to burn the stumps and scatter the seeds in the ground. The planting of gutta and camphor trees appears to require more trouble and care—more, at least, than is compatible with human labour and duty in the opinion of the Battaks.

THE GARDEN.

THE importance of fruit as a means of obtaining an income, is not properly appreciated. We grow fruit for pleasure and as a curiosity, whereas few crops pay so well. In various parts of America, this crop is securing more attention, and in California, especially, it has assumed vast proportions.

ROSES.

Roses in Pots; their Summer Treatment.—These are often sadly mismanaged by amateurs during the summer and autumn months. They are as a rule kept too long under glass, the circumstance of their being in pots appearing to suggest to their owners that they should have the protection of glass also. Instead, however, of keeping them in the greenhouse after they have done flowering, they should be placed out of doors in the full light of the sun, but in such a position as that they will be protected from cold winds. If the pots can be plunged to the rims in coal ashes, with a depth of an inch and-a-half or two inches of the same material between the bottoms of the pots and the soil below, it will be better for the plants, and save much trouble in watering. Liquid manure should be applied twice or thrice a week, always in a clear state and weak, and never when the plants are very dry.

They should have plenty of room, so that light and air may circulate all round them. Don't prune them to any extent, as is very frequently done mistakenly by amateurs when the plants are turned out of doors, but let them finish the growth that may have been commenced under glass. It will be time enough to prune when they are to be placed in heat in winter time with the view of starting them into growth for flowering. In the month of September, however, they should be drawn from the plunging material, and every plant turned out of its pot with the object of ascertaining the condition of the roots and the drainage. They should be treated as they appear to require on examination. Should they be pot-bound, either shift them into larger pots in good compost, or shake them out of the old soil, and re-pot in the same sized pots, if it is undesirable to increase their size. Whether they are potted or not, let the condition of the drainage have especial attention; nothing is so certain to lead to ill-health and failure. Stagnation at the roots is the worst condition in which a rose can be placed. After potting they may be placed in the same position as before, only they need not be plunged—indeed, had better not be plunged—because there would then be less control over the watering, which is apt to be overdone after the rains of autumn become frequent. Pruning should not be done till the plants are to be started into growth for flowering, which may be any time during the winter, according to the convenience at command. They should be protected in cold frames after frost is anticipated, up till the time they are to be brought into heat.

Roses Mildewed.—This disease on roses is more than usually prevalent this year, no doubt owing to the weakening effects of the long and severe winter on such plants as have survived it. The present will altogether be a very unsatisfactory year for rosarians, but they must make the best of it. Various remedies may be applied; the best decidedly is flowers of sulphur dusted on to the affected leaves carefully, while the dew is on them in the morning or after they have been moistened with the syringe. A more cleanly and less objectionable way to apply sulphur is first to mix with every pound of it one-half pound soft soap. Thoroughly stir them together, and leave them in a tub or basin during the night, or for a few hours, when boiling water should be applied in such quantity as to reduce the mass to a liquid condition, so that the plants may be syringed with it. Use this liquour frequently, and your roses will soon regain a healty, clean appearance. There is a little more trouble entailed in the use of this compound than in the use of flowers of sulphur alone, but the result is as satisfactory, and the plants never present the appearance of having had the meal bags shaken over them; there is no sediment left worth speaking of by the syringing process.

Cuttings of Roses; how to treat them.—Those who have roses in pots, and who wish to increase them, may do so freely now. The facilities wanted are either a cold frame or a handlight placed in a somewhat shady place. The best cuttings are those with a heel to them, that is, such as are short joined, and of themselves also short, but taken off their full length along with the thickened connecting part in junction with the main branch from which they spring. The base when taken off should be carefully smoothed with a sharp knife, not so as to reduce it much, but merely to remove any portions on the surface and edges presenting rags or inequalities, the object being to obtain a thoroughly smooth surface, which is always most favourable to quick healing. The cutting need not be more than six inches long, and all the leaves may be cut off except the top one. The leading or growing point of the shoot should be cut away, leaving only firm wood. A bed of pure sand should be made in the frame, or handlight, four or five inches deep, overlaying a stratum of leaf mould and roughly broken loam of a fibrous, rich quality. Dibble the cuttings into the sand, leaving the upper bud and leaf only above the surface; make every cutting as firm as it can be made in sand as the work of dibbling proceeds, and place them rather thinly, that is, in rows about two inches apart and about an inch asunder, cutting from cutting in each row. Give a good soaking of water immediately after they are all dibbled in, to settle the sand about their collars; shut up the light close during the day, but leave a good chink of air on at night. Should the position in which the frame is placed be somewhat freely exposed to light, a little shade should be used during the bright hours of the day. If in a shady place, no shade will be required. If the cuttings are good strong ones, and the treatment carefully carried out, a fine batch may be ready for potting up about the middle or end of September; but they will require to be kept in a cold frame throughout the winter.—*N. B. Agriculturist.*

FERNS.

A HOBBY is a wholesome thing. It is probable that even crest, monogram, and postage-stamp collectors are happier than are their fellow-creatures who have no definite pursuit. The autograph hunter belongs to a higher order in the scale of humanity, for his accumulations are interesting to the biographer and the historian, and perhaps also to the student of character as well as to himself; but collecting autographs, unless all and sundry are welcomed and number be the object, cannot occupy any one's whole spare time. The antiquary of all collectors is generally considered to have the most absorbing pursuit, and his little weaknesses have been the theme of satirists. But the labours of a Grose and an Oldbuck are most useful, supplying as they do details for the ethnologist and the historian. The coin collector is another most useful species of hobby-rider for ancient history owes much to numismatology. But the study of antiquities of any sort is limited by the exhaustible nature of the field, and the fact that a discoverer often removes all he finds. But few can hope to make good collections and indeed the antiquary values the objects in his collection by their rarity, and were ancient implements and coins found in abundance they would cease to be prized. It is otherwise with the products of Nature. Their variety as well as their quantity is inexhaustible and although specimens of rare species are indeed cherished, a collection is valued greatly according to its completeness. Any one may take up the study of natural history, whether of the animate or inanimate creation, without fear of ever exhausting the subject, and sure of always finding something new to him. If he tires of one branch he can take up another; and indeed the study of one branch must often be incomplete without a good knowledge of others. Where would the practical geologist be if mineralogy were the only detail he had previously made himself acquainted with he; must have a certain knowledge also of zoology, conchology, and botany. The students or even the amateur of any branch of natural science must be a happier man, or woman, than any mere crest or stamp collector.

To the resident in India, who either lives in a jungly district or can make trips to the hills, botany or even mere plant collecting, is—entomology perhaps excepted—probably the branch of natural history which offers the greatest facilities for study, and if he has already turned his attention to it at home, he must at all events look with interest at the new forms of plant life which present themselves to his view in this warmer climate. He will not indeed find his dreams of tropical luxuriance everywhere realised, but even in the most dreary tracts of the drier parts of India he will, in almost every ravine or patch of jungle, find something new and of interest. The present writer well remembers his delight at finding, before he had been a year in the country in a dry part of Bundelcund where few striking flowering plants were visible, the magnificent climbing lily, *Gloriosa superba*, luxuriating in the arms of the *Baer* (*Zisiphus*) bush and the interest with which he afterwards found the same plant growing on open "downs" near Almora in the Himalayas, and again at 5,000 or 6,000 feet lower level, near the seashore in Akyab.

But botany is a wide word, and no one can hope to be really a botanist without years of special study, not only in the garden and the field, but at the desk and with forceps and knife in hand, and lens and microscope at eye. A successful collector he may no doubt become; for a good eye, perseverance and physical endurance, are the chief [illegible] for that degree of attainment, and he [illegible] soon qualify himself to the extent of being able to [illegible] natural [illegible] a big [illegible] that is

quite a different thing! Not that we have the slightest wish to discourage anyone from the serious study of botany. All that we are now concerned to do is to point out one branch of the science which may be taken up almost quite by itself, and in which the amateur may do much as well for its advancement as for his own benefit; for it is one too often despised and neglected by the scientific labourer. Pterdology or the scientific knowledge of ferns, is perhaps the division of botany which at once requires the least preliminary knowledge and the least labour for its pursuit, it gives the most pleasure in the collection of specimens, and yileds the most lasting enjoyment. Full many a flower loses its beauty directly it is plucked or at least after it is transferred to the drying press but ferns are independent of floral attractions; and they always, if carefully treated, retain their beauty of form and not seldom of color in the herbarium. A fern is a thing of beauty and a joy for ever, while even the *Gloriosa superba*, above praised for its beauty in life, is good in the herbarium only for reference. A fern is not seldom beautiful as a whole plant; while each separate frond if intelligently gathered is perfect in itself and satisfies the eye. The want of a flower does not strike one in looking at a fern; its beauty is complete without it, and the proof of this is that specimens in ladies' albums generally want even the fructification which completes the plant, and is so often necessasy for the identification of the species. The beauty of form and cutting alone is sufficient for the fair collector, who is thus however very unfair to her collection.

If, as has been said above, the resident of a hill station in India is favorably situated for the general study of plants, he is most peculiarly favored if he makes ferns his speciality. In the whole of the British isles there are not (speaking without book) forty distinct species of ferns *Filicets*, and in the circuit of twenty miles round Edinburgh within which botanical students generally collect, there are only about twenty six species. But within twenty miles of a Himalayan station one hundred good species can easily be got, besides numerous well recognised varieties. In one walk from Mussoorie, when not collecting, the present writer has observed 32 distinct species of ferns, in about an hour's time. The latest authority on the ferns of Northern India—plains and hills together—Mr. C. B. Clarke admits 363 species and recognized varieties; while another writer, Colonel Beddome, makes the number in Northern India 405, and in all India 632. Sixteen new species are included in Mr. Clarke's list, and this fact together with the great difference in the totals admitted by the two authors, shows what a wide field for research and study still exists. Mr. Clarke admits 142 species, as being found in the Himalaya westward of Nepal 257 for Nepal and the Himalayas to the east of it, and 247 from Assam to Chittagong, besides 47 species in the plains north of the Peninsula, and 38 of the whole are peculiar to Northern India. If areas be taken, the 47 species of the plains of Northern India seem poverty itself when compared with the 40 or so of the British islands. But how few Europeans in Indian know that there is even one fern in the plains. They would be astonished to be told that the so-called real Maiden Hair grows in perfection in the Entally and doubtless other suburbs in Calcutta, and that it may possibly even be found in their garden wells in much drier parts of India.—*Civil and Military Gazette.*

FLOWERS AND THEIR SIGNIFICANCE.

THE language of flowers presents a poetical beauty which has tended to preserve their ceremonial use from the remotest ages of antiquity. These adornments of Nature have been conspicuously associated with the rites of marriage and burial, with the commemoration of the dead, the rewards of victory and the celebration of many national feasts and sacrifices of several nations. No people in modern times, if we except the aborigines of the Pacific islands, has evinced a more ardent passion for floral display than the natives of India, particularly the Buddhists, whose enthusiasm has led them to cultivate extensive gardens exclusively for the requirements of their temples. The Persian element, too, show striking instances of veneration to flowers, it having been recorded that the significance of these emblems is largely associated with their worship. It is, however, a remarkable fact that people of every creed and tongue are more or less thus devoted, and in the poetry of every country can be gleaned abundant traces of flowers supplying the most superb imagery. Such embellishments are to be found illustrating some of the finest conceptions that have been handed down and hallowed by tradition. England boasts of her emblematic rose, Ireland of her Shamrock, and Scotland of her Thistle, all meant to bear an expressive significance the sacred character of which still as prominently prevails. But it is throughout classical history and poetry that we find most enjoyment on this subject. The Greeks and Romans like the Astecs dedicated particular flowers to individual deities. We know that the Narsissus belonged to the mighty goddesses; the poppy was also sacred to Ceres; Venus had her anemone; Hera, the lily; Artemis, the myrtle, and Sappho crowns the Muses with Pierian roses. As rewards for victory, the Romans certainly surpassed every nation in the number and variety of their chaplets, as no triumph seems to have been complete without a plentiful use of flowers, the *florum foliorumqus sparsio*, but though the Greeks were thus surpassed, they were not dead to the significance of flowers on such occasions, as we learn that Brasidas, when he was proclaimed the liberator of Greece, was publicly crowned with a crown of gold, but individually they decked him with *garlands*. It is hard to assign any year or period when the use of chaplets at meals or rather at the *symposia* was first introduced, but we learn that at Rome and Athens the flower-sellers and chaplet-makers had an extensive trade,—at the latter place a quarter of the market being devoted to them. At marriages the wreaths were composed of myrtle or verbena, and the flowers were plucked by the bride herself, as the purchase of flowers for the purpose was an ill omen. In modern times the myrtle for the bridal wreath has been displaced by Orange Blossom, the significance of which has puzzled some of our professed informants. The bridegroom's *coroner nuptialis* was generally formed of verbena while the doors of his house and the bridal couch were made gay with garlands. Customary as it is for us to place flowers on the graves of the departed, and bedeck their biers with wreaths, there is not that significance attached to the ceremony and its purpose that rested so vividly in the hearts of the ancients. From Anacreon, it would appear that the rose was thought to possess a peculiar virtue for the dead and the springing of this flower from the tomb of the dead was welcomed as an earnest of their happiness, and it was the universal wish that the tomb-stones of departed friends might be light to them, and that a perpetual [illegible]ngside of all kinds of sweet flowers might encircle their graves. Superstitious as these notions may appear to us, they suggest a sublimity which throws a charm around the ceremonial use of flowers.—*Deccan Herald.*

TEA.

OF course not only would tea be welcomed, but cotton goods, the demand for which beyond our frontier has grown with the increase of our own means of connection in India with the frontier.

THE price of brick tea on the Kumaun-Thibet frontier is not known with accuracy; but its price on the Kumaun frontier must be very much in excess of what Kumaun planters could supply it for. What the Thibetans at present consume is the "merest refuse," consisting of little else than the twigs and brushwood of the tea plant, and vastly inferior to the very sweepings of Indian tea godowns. The tea-planting industry of Kumaun would benefit largely by the opening out of a trade which would enable it to dispose of its coarser produce easily and cheaply. So heavily is Kumaun tea handicapped by the expense of transport to Calcutta, that the most profitable portion of the trade even now is that transacted in green teas with merchants from Central Asia, who purchase the tea at the factory and carry it away themselves, saving the planter the expense and trouble of packing. Kumaun planters are well aware of the advantages which a trade with Thibet would give them, and a former manager of the Kousani Tea Company actually manufactured brick tea, and endeavoured, but unsuccessfully, to get it into Thibet. Lastly, the Bhotias, in whose hands to Thibet trade lies, would derive great benefit from the substitution of a new article of commerce for borax, the price of which has fallen under American competition too low to afford substantial profits on its import.

WE hear a good deal just now about removing the tariff barriers to English commerce with France and other countries. It would be a lucky thing for tea enterprise in Northern India if the engineer, with or without the help of the soldier, could push his way beyond the border. There is, remarks the Government of the North-West Province in its report on frontier trade, a fine market for Indian tea in Thibet; but, unfortunately, the markets of that country are closed by the united efforts of the Chinese Government and the Thibet Lamas, who, having the monopoly of the wholesale and retail tea supply of the country, are naturally averse to the competition of a traffic in Indian tea which might be more difficult to engross. This strict monoply is described in a recent report by Mr. Baber, H.B.M.'s Consul at Chung Ching; his remarks which specially relate to the prospects of a tea trade between Assam and Thibet, apply no less pertinently in the case of Kumaun, and the result of the system which he describes is that during the year under report not only was no tea exported to Thibet from the N.-W. P., but Chinese tea was actually imported into native Garhwal by the Nilang Pass. "Tea," Mr. Baber writes, "is to the Thibetan more than a luxury; it is an absolute necessity," yet the Thibetans on our frontier are compelled to purchase tea of atrocious quality, the price of which has been swelled by a long and difficult transport from the eastern extremity of the country; while immediately across the frontier there are tea gardens whence they could be supplied with a better article, at a cheaper price, and with profit to the Kumaun tea planters as well as to the itinerant traders (Bhotias) through whose hands it would pass.

FROM a return published by the London Tea Brokers' Association, we learn that the amount of Indian tea delivered last year was 43,807,000lbs. Though the total entered for home consumption is not separated from the whole importation, we presume that the above quantity represents it, as the imports were two million pounds in excess. Presuming that we are correct in this surmise, the sum contributed by the Indian tea planters to the revenue of the United Kingdom comes to £1,095,175, and we think that the Indian Tea Districts Association in London should press this upon the notice of the Secretary of State, with the view of some portion of it, if not the whole, being set aside for the guaranteed interest on those lines of railway in process of projection in and towards the tea districts. The appropriation of this money (yearly

increasing) need but be made for a short period, for the lines necessary could all be made in one decade, and the immense benefit all concerned would derive from their completion is self-evident. With facilities for free immigration to Assam, Cachar, and Sylhet, a development of the natural resources of those districts would lead to a large increase in the revenue. There would also be great military and political advantages, for it is manifest that sooner or later our relations with the Court of Mandalay and also with the border tribes that owe nominal allegiance to King Theebaw, must be placed on some more satisfactory footing than they are on at present; and we have had within the last twenty years numerous instances of the disastrous results of neglecting to place those outlying provinces of the Empire in rapid communication with our military base. We presume the cost of the numerous expeditions undertaken against the N.-E. frontier tribes is duly pigeon-holed in the Foreign Office, and now that money is to be had on favorable terms, it might be interesting to compare this ugly item of expenditure with what a line or lines of rails would amount to. We are assured from London that Indian tea has now taken its place in public favor, and may reasonably look for a large increase in the duty thereon; and it is surely not too much to ask that this money, contributed by an enterprise that has been established in the teeth of opposition both in this country and at home, should be temporarily devoted to fostering it. If guaranteed interest at 3½ per cent. were made from this fund, in eight years a network of railway communication would be carried throughout the Assam Commissionership, that would treble the present revenue, and throw open the iron, coal, lime, and vegetable productions that now remain practically locked up. Letters that appeared in our columns last year indicate pretty well the outlets for a trade in piece-goods and other manufactures that safe and rapid communication would engender, and we think the Chamber of Commerce might well discuss the matter with a view of inducing the local Government to duly represent it at Westminster.

THE CABUL TEA TRADE.

FROM a report on the Peshawur tea trade with Cabul and Central Asian countries, it appears that from October 1880 to January 1881, 2,144 maunds of Indian tea and 7,910 maunds of China tea were exported from Peshawur. These figures include the whole of the tea exported over the frontier in the direction of Cabul and Bokhara. It has been ascertained that by far the greater proportion of the tea exported from Peshawur is consumed in Bokhara. From October 1880 to January 1881, Peshawur merchants have sent to Bokhara—

3,288	maunds	of green China tea.
2,069	do.	of black China tea.
602	do.	of green Almora tea.
198	do.	chura Almora tea.
262	do.	of Putta Almora tea.
13½	do.	of black Almora tea.
524	do.	of green Dehra Doon tea.
118	do.	of Putta Dehra Doon tea.
30	do.	of green Kangra tea.

In Bokhara Proper, green China tea is in great demand.

China Lonka is of three qualities—

No. 1 is bought in Peshawur at	Rs.	119	per md.
" is sold in Bokhara	"	147	"
No. 2 is bought in Peshawur	"	112	"
" is sold in Bokhara	"	145	"
No. 3 is bought in Peshawur	"	108-8	"
" is sold in Bokhara	"	136-8	"

There is a class of China tea known as "kazaz" which has been from time to time imported to Bokhara from Russia. Persons who have long resided in Bokhara say that this tea is bought in Russia at Rs. 40 per maund, and is sold in Bokhara at Rs. 76 per maund. The road is now closed to this trade, but these figures show how far Russian merchants can compete with the Indian trade.

Black China tea is not drunk to any great extent in Bokhara, but finds a market in Khokand. It sells in Peshawur at 6 annas per lb. Bokhara is the central mart. The Indian teas are exported thither, but for the most part are at once bought up by merchants from Samarkhand, Tashkend, Khokand, and other outlying places, and are consumed in those countries.

Of Indian teas, Lonka from Almora, Dehra Doon, and Kangra sell at Rs. 77 per maund; from the trade returns it appears that the price per maund in Peshawur is Rs. 60.

The merchants in Peshawur are of opinion that there is an increasing demand for Indian green teas. Some Indian black tea was sent by one merchant as an experiment to Bokhara, but the tea did not meet with approval; this may be due to the fact that the Indian black tea was of the 2nd and 3rd quality, the heavy price of the first quality rendering its export unprofitable.

The average journey to Bokhara takes from three to four months. Merchants bound for Bokhara do not seek for a market on the road. It entails trouble to unpack their goods; they start with the fixed intention of bringing back Bokhara silks and gold, and are sure of a certain profit.

The route from Cabul runs by Bamian, Saighan, Doaba, Heibak, Hasrat, Sultan, Khulm, Balkh, Kileffort, Karshie to Bokhara.

The market in Bokhara is most uncertain, and there is a singular want of concert among the exporting merchants. The market is frequently over stocked, and the smaller men come back with heavy losses. At the present time, out of eleven merchants who have traded to Bokhara with teas, seven declare that they can no longer trade with profit; that it is all a matter of luck.

The daily consumption of teas in Bokhara, including the outlying countries, is said to be 80 maunds; in Cabul 6 maunds; in Jellalabad 2 maunds; in Peshawur 5 maunds.

From this it will be seen that the consumption of tea in Cabul is insignificant as compared to that of Bokhara, and all merchants connected with tea agree in saying that Cabul will never afford a large market for the sale of teas.

From the books of Peshawur merchants it appears that from October 1880 to January 1881, 82 maunds of green China tea, and 36 maunds of black China tea have been sent to Cabul; and 296 maunds green Almora tea, 151 maunds green Dehra Doon tea, 7 maunds putta Dehra Doon tea, and 30 maunds green Kangra tea.

The greater part of the tea consumed in Cabul is exported thither by Cabul merchants.

China Lonka of the first quality is by far the most popular of teas, as it is the most expensive, and all classes in Bokhara will stint themselves in many of the necessaries of life to indulge in this luxury. A saying has almost past into a proverb in Bokhara that "a man drinks tea or dies," and it is clear that Bokhara and the neighbouring countries will always be a great and increasing market for teas.

TEA PRODUCTION IN JAPAN.

THE industrial resources of Japan have received considerable attention of late, and trade generally in that country appears to have developed to a noteworthy extent. In a report on the products of the island of Kin-Shin, Southern Japan, it is stated that the soil produces, with little attention bestowed upon it, two crops of cereals, while rice, tea, and tobacco seem to be indigenous. The production of tea for export to foreign markets in the island of Kin-Shin amounted, some five years ago to about 25,000 piculs annually (a picul is 133⅓ pounds). The low prices ruling in 1876 and since then, to a certain extent, discouraged the cultivation of tea on a large scale, and many plantations were neglected for more profitable pursuits, so that now though its cultivation is in more favour, the total production for the year 1880 is only estimated at some 20,000 piculs. Out of this quantity about 7,000 or 8 000 piculs, reach Hiogo and Yokham directly, which are large local markets, and where it is used for mixing with the tea of those districts. The principal tea-producing districts of the island are Chikugo, Hio, Bingo, and Ourishima adjoining and in the neighbourhood of Nagasaki. From Chikugo some 6,000 are exported, of which about 4,000 piculs go direct to Osaka for the Hiogo market. The balance of 2,000 piculs is shipped from Nagasaki, the greater portion to North China. The Chikugo teas are in many respects the most suitable for export to the United States, being similar in quality, &c., to the teas of the northern or middle part of Japan, which are known there; for this reason, too, they are very desirable for mixing, and the consequence is that the greater portion of the production finds its way to the larger ports for this purpose. The teas from Chikugo are usually shipped from Hakata, an unopened port in native junks to Osaka or Nagasaki. Adjoining the Chikugo district is that of Bingo, which produces about 3,000 piculs, the most of which is shipped in junks from an unopened port to Osaka. The Hiogo district produces some 6,000 piculs, which nearly all goes to the Nagasaki market. Ourishima produces about 2,500 piculs. Some of this is exported to Tien-Tsin, in China; the better qualities are the finest teas grown in Kin-Shin, but being of a very curly appearance, not unlike the green teas of China, they do not find a ready sale in the United States. In Canada, however, this leaf is more popular, and is exported thither in large quantities. With regard to the preparation of teas the process is, generally speaking very simple. The native women commence picking, the young leaves from the plant, which is an ever green, about the beginning of May. The leaves are then placed on mats and rolled for some time by hand, until they assume a curled-up appearance, and are then either dried in the sun or gently fired in iron pans till dried sufficiently to prevent them from spoiling. The teas are then packed in straw bales of about sixty catties each, and sent to market for sale. When purchased by the tea merchants, who have large buildings and arrangements for the purpose, the tea is subject to a careful firing in iron pans, with charcoal fires, for a

period of from one to two hours, during the whole of which time it is incessantly stirred by hand. This process takes out all the moisture from the leaf, causes it to be more compact and improves the colour. Immediately after picking, the leaves are placed on linen or other cloths above a vessel of hot water, and steamed for a short time. They are then very carefully rolled, while still moist, by hand, till they are well twisted, and then placed on large sheets of paper in wooden trays over charcoal fires until they are thoroughly dried, then packed in boxes of about fifty catties to the picul and sent down for sale. The process after reaching the tea merchant is exactly the same as described for poorer teas.—*The Grocer.*

THE *GLAMIS CASTLE* TEAS.

Owing to the statements published as to the bad quality of some Chinese teas brought here recently by the Torres Straits mail steamer *Glamis Castle*; the Attorney-General requested the Central Board of Health to look into the matter, and ascertain whether such teas were fit for human consumption. The board consequently obtained some samples which Mr. R. W. E. MacIvor, analytical chemist, who is a member of the Board, spent some time in examining. He found that such samples did not contain any mineral substances absolutely noxious, but that many kinds of foreign leaves and stems—that is to say, leaves and stems not of the tea plant—were comprised therein, and he pronounced the stuff to be unwholesome.

At a meeting of the Central Board of Health held on Monday afternoon (Drs. Youl, Clarke, and Hardy, and Mr. MacIvor being present), Mr. MacIvor's report was received, and it was resolved to communicate its tenour to the Law Department, and to recommend that the spurious teas be destroyed.

We have been favoured by Mr. Frederic Dunn, senior assistant to Mr. J. Cosmo Newbery, of the laboratory attached to the Industrial and Technological Museum, with the result of analyses of two samples of the Chinese teas, ex *Glamis Castle*, recently sold at auction by Messrs. Fraser & Co. It may be mentioned here that genuine tea on analysis gives the following results:—Ash, from 4 to 6 per cent.; soluble salts, between 3 and 4 per cent; extract, from 32 to over 50 per cent.; and theine, from 1½ to 2½ per cent. Both of the samples analysed by Mr. Dunn were from bulk lots. The first was from a lot sold at 3½*d.* per lb. in bond, and yielded the following percentages:—Ash, 6·25; soluble salts, 2·45; extract, 27·00; theine, 0·56. The second sample, which was from a lot that realised 4*d.* per lb. in bond, gave the following results:—Ash, 6·60 per cent; soluble salts, 2·48; extract, 24·00; theine, 0·75. Mr. Dunn further informs us that it was very difficult to find a perfect and genuine tea leaf in the samples; and that the stuff consisted for the most part of decayed, exhausted, or foreign (other than tea) leaves, foreign stems, tea sweepings held together in little nodules by starch paste, and pieces of bark, husk, and nutshells. All this rubbish was faced with plumbago to give it a black appearance; and was totally unfit for dietary purposes. The preceding figures show that, except in the matter of ash, the *Glamis Castle* samples were very deficient in the constituents of which genuine tea is composed. Probably the high percentage of ash is attributable to the presence of the tea-sweepings or dust.

Messrs. Dalgety, Blackwood & Co., send us the following report:—

"6 Hanover-street, Fitzroy, June 13, 1881.

"Gentlemen,—I have the honor to submit to you the following report on the four samples of tea sent to me for analysis.

"The three samples of black tea Nos. 1, 2, and 3, yielded by incineration normal quantities of ashes, namely:—No. 1, 5·6; No. 2, 5·3, and No. 3, 5·5. Therefore, the common adulterants, such as alumina, chromate of lead, sulphate of copper, cyanide of potasium, gypsum, lime, and magnesia were not indicated. Neither could I detect any of them by the application of chemical tests or by the microscope.

"The sample No. 4, on the other hand, left 22 per cent. of ashes. From this result it is evident that 16·6 per cent. of spurious substances are present, which I found to consist of clay, tumeric, and Prussian blue.

"I am also determining the amount of theine in each sample, and shall hand in my report without delay,—I am gentleman, yours faithfully,

"JOHN KRUSE, Analytical Chemist.

"Messrs. Dalgety, Blackwood & Co., Melbourne."

Accompanying Mr. Kruses report was the following memorandum:—

"The Nos. 1 to 3 refer to the samples of teas mentioned in the press and in Parliament as being objectionable, but on being analysed they prove to be free from adulteration, and not at all injurious to health. The No. 4 is the sample of 180 quarter-chests tea purchased on the 20th ultimo by a gentleman who has made himself prominent in bringing this matter before the public, the analysis, on the other hand, showing that tea is not only adulterated, but deleterious to health."

Attention was called to the recent public sales of damaged teas by Mr. Anderson in the Legislative Assembly on Tuesday, and some further information was given by the Attorney-General as to the action of the Law Department. Mr. Vale hoped that members would not be over-sanguine as to the results of the steps he had already taken. Samples had been obtained both of the tea referred to last week by Mr. Bowman and of the shipment mentioned in the *Argus* of Monday, and if it was in the power of the department to cause the destruction of unwholesome teas that would be done. Mr. Bowman availed himself of the opportunity to answer the question put to him by a correspondent of the *Argus*, as to what he had done with 180 quarter chests tea he bought on May 26. The hon. member said that if it was the gunpowder tea that was alluded to, he did not complete the sale, but passed the purchase on to another buyer. The price was 8½*d.* a pound in bond. Gunpowder was artificially coloured with Prussian blue and gypsum, and allowed to be sold in London, where there was an adulteration act in force. The hon. member mentioned the name of the firm by whom the *Glamis Castle* tea was imported and also some of the buyers. Mr. Francis pointed that it was unfair to speak of any firm as importers of tea of this kind, because cargoes were oftener sent here to be sold on commission than imported by firms on their own account. As a matter of fact the teas received by the *Glamis Castle*, and the same may be said generally of shipments of tea, were not "imported" by any Melbourne firm, but were sent here as a speculation by shippers in China. In addition to the facts mentioned in the House, we learn that the Central Board of Health on Tuesday caused some samples of tea imported in the *Ocean*, in Cleves bond, to be examined. It was decided that the tea is unwholesome and ought to be destroyed. Steps have been taken to stop the sale of this compound, as well as that of the consignment ex *Glamis Castle*. With regard to the portion of the *Ocean's* cargo purchased by Mr. Bowman, we learn that an analysis made by Mr. MacIvor, for the Central Board of Health, shows that the tea is greatly adulterated. It is faced with Prussian blue, and is full of iron filings, earth and other foreign substances.—*Australasian.*

COFFEE.

INOCULATION PROCESS WITH CARBOLIC ACID.

(*Concluded from page 244.*)

DOTELOYA ESTATE.

Operations on a few trees only.

OBSERVATIONS on the fruiting of healthy pin-spots. On treated coffee trees, none fruited; most dried up and turned brown. Untreated coffee trees—83 per cent. fruited.

Results examined by Messrs. James Blackett and John Drummond and testified by James Blackett.

12th December 1880.

Bellongalla Estate.

Operations on one acre. Observations on the fruiting of healthy pin-spots specially marked for observation. On treated area—87 per cent. did not fruit, most dried up, 13 per cent. had thrown out a few isolated spores. On the adjoining untreated area—all the pin-spots had fruited, additional pins-pots and already developed spore patches had formed.

General Observations:—Progress of disease on treated area decidedly checked; progress of disease on untreated area at the end of ten days about 300 per cent.

Results examined and testified by Alex. Thom.

28th December 1880.

Extract from letter to myself:—"I certainly think the trees which have been inoculated are freer of leaf-disease, either in the pin-spot or red rust stage, than the adjoining untreated area, but so far I cannot say that the inoculation of carbolic acid has *eradicated* the disease."

W. D. GIBBON.

5th January 1881.

Moragalla Estate.

Observations on the fruiting of pin-spots:—No effect of treatment observed on old shuck trees, nearly all pin-spots fruiting. On the main area treated, not one of the pin-spots fruited, spots turning brown.

Results examined and testified by Mr. Geo. Sloan Paxton.

29th December 1880.

Fairieland Estate.

Observations on healthy, specially marked pin-spots. Treated area—In no *single* instance had any of the pin-spots thrown out any spores. The pin-spots themselves had turned brown and were pronounced (and in this all were guided by Dr. Thwaites' decision) to have been injuriously acted upon.

Untreated adjoining area—In *nearly every* instance had the pin-spots on this area thrown out spores, a few only had not done so.

Results examined by Dr. Thwaites (late Superintendent, Botanical Gardens), Messrs. Anderson, Dewar, and Pyper, and testified by

J. LEWTHWAITE DEWAR
and GORDON PYPER.

13th January 1881.

Rosencoath Estate.

Observations on pinspots; treated area—22 per cent. of pin-spots fruited the rest did not.

Untreated area—76 per cent. fruited.

Result examined by Messrs. Anderson, Dewar, and Pyper, and testified by

J. LEWTHWAITE DEWAR
and GORDON PYPER.

18th January 1881.

Sufficient evidence being now collected to establish that the checking of the progress of the disease as evidenced by the non-fruiting and the dying off of the pin-spots, in the treated area, was due to the treatment and not to accidental natural causes, comparative minute observation on adjoining untreated area, except broad comparison as to the prevalence and state of disease and general appearance of the coffee, was considered by me not further necessary.

Pallekel y Estate.

Observations on healthy, specially marked pin-spots out of 183 pin-spots, only 11 had thrown out a few isolated spores which looked pale and unhealthy. Nearly the whole of the pin-spots had been affected and had turned brown.

Results examined by Messrs. Vollar, von Kriegsheim, and Gibbs, and testified by Mr. H. J. Vollar.

14th January 1881.

Peradenia Estate.

Inoculation followed upon the 4th day by vaporization. Observation on healthy pin-spots and bright orange coloured rust patches. "No single pin-spot" on the marked leaves had thrown out spores, large majority showed a brown patch in centre, and were to all appearance dead. Bright spore patches had turned brown and most spores grey, a few only retained orange tinge.

Results examined and testified by Mr. G. Ross.

15th January 1881.

Following I give now in the first instance the history, almost up to date, of the area that had been treated early in January last, on Pallekelly and Peradenia estates, by the process I have finally recommended, viz.:—

THE VAPORIZATION PROCESS.

With carbolic acid temporarily absorbed and bound by a dry powder.

Pallekelly Estate.

As it was here for the first time, that I tried the above process, I selected for the operation as heavily a diseased field as I could find, paying particular attention to obtain for the experiment healthy and vigorous fungus, so as to eliminate all danger of wrong conclusions. The field was heavily diseased. The disease was at its height, and in the centre were about 20 shuck trees in a bare patch, the foliage of which was at the time simply one mass of fruiting fungus, and which would come under the classification of chronically diseased trees.

I.

Observations made on the 8th day after treatment. Out of 104 marked pin-spots that presented every appearance of health and vigour before treatment, only one spot had thrown out an unhealthy looking isolated spore. The rest in nearly every instance had turned brownish and appear to be dying off. Bright orange spores and spore patches: 30 per cent. of these have been injuriously affected, the spores having lost all colour and patches have blackened. 21 per cent. are fading; the rest of the spores still maintain a bright tinge but patches by blackening in most cases. From the general appearance of the field, a decided check of the progress of the disease is discernible. Results examined by Messrs. Vollar, von Kriegsheim, and Gibbs, and testified by Mr. H. J. Vollar.

14th January 1881.

II.

"At Mr. Schrottky's request, I have gone carefully over the field of coffee treated under his direction, a month ago, by vaporization and which had two applications. The last was three weeks ago.

"To what I reported at the time about the result of the treatment, I can now add that I see no bad results. The coffee is throwing out new wood, which looks perfectly healthy, not even the tenderest bud having been injured by the vaporisation. The field was heavily diseased at the time of application, and certainly looks much better now: though I cannot say that the disease has been eradicated.

"I can see no unusual fall of leaf, and comparing it now with the adjoining coffee untreated, its general appearance is decidedly better."

H. J. VOLLAR.

5th February 1881.

III.

"From what I have seen of the experiments, I fully agree with what has been said (the above) by Mr. Vollar." This addition authorized by Mr. R. B. Tytler.

IV.

"I have much pleasure in stating that on close examination of the field that was treated by your process of 'vaporization,' some three months ago, I find that it compares very favourably with the adjoining untreated coffee. On the latter, leaf-disease is again showing up, while on the treated area it was difficult to find a leaf diseased."

H. J. VOLLAR.

9th April 1881.

N. B.—This part of the estate was suffering to some extent from a fresh attack in March, while I was in India. There is no indication of the treated field having suffered to any appreciable extent.

E. C. S.

V.—"The field treated in January and with a couple of subsequent applications has kept remarkably free from disease. With the exception of one tree, now badly diseased, the field is almost entirely free of disease. The shuck trees that were in January full of disease have been keeping and are still without disease."

H. J. VOLLAR.

31st May 1881.

Peradeniya Estate.

Here as well I selected fields that suffered from the disease in a pronounced and vigorous form, and I rejected several fields proposed by Mr. G. Ross, as I did not consider them sufficiently diseased to enable us to judge correctly of the results. In fact, we had some difficulty here in finding a field sufficiently diseased for the purpose.

I.

A four acre field first inoculated, then vaporized, in the usual way.

Observations made on healthy pin-spots and bright orange-coloured spore-patches:—Not a single pin-spot fruited. The spore-patches had almost all died. The patch had turned brown and the orange spore grey. A few only still showed a faint orange tint.

A one acre field; only vaporized but with three applications within ten days, one of unusual strength.

Results much the same as above. No pin-pots had fruited, and spore-patches nearly all died. "I [Mr. G. Ross] am of opinion that the disease has been checked on the treated area, and this opinion is strengthened by comparing it with untreated coffee elsewhere on the estate.

Results examined and testified by

15th January 1881. G. ROSS.

II.

II.—"I have carefully watched the *four acres* of coffee on this estate which were treated by both inoculation and vaporization according to Mr. Schrottky's system, and under his direction. In addition to what I reported at the time the results were examined, I now state that as far as I can see no injury whatever has been done to the coffee on this area. Nor is leaf-disease present to any appreciable extent. The attack, however, is apparently passing away all over the estate.

"The one acre referred to by Mr. Mackenzie situated some distance from the field referred above, received an overdose. This was done at Mr. Schrottky's request with a view of gaining experience of how far the chemical could be used with safety to the trees. A very heavy dose (applied through Week's patent sulphurator) and two doses of usual strength (a handful to a tree) applied all within ten days were followed by a fall of leaf greater in the so-treated area than in the surrounding untreated coffee. I think the damage is confined to this, as the trees are now making new wood.

"On the margin of this patch, there were at the time of treatment, some trees very heavily laden with rust, and Mr. Schrottky remarked that he did not expect much impression could be made on these. It was from one of them that Mr. Mackenzie carried away the branch which he sent to Colombo."

7th February 1881. G. ROSS.

III.

The management of this estate changed and the next manager writes:—"In reply to your request to report on the coffee, on which you experimented, I can only state, that it is certainly looking very well and does not appear to have suffered at all from the application of your treatment. There is apparently very little leaf-disease on any portion of this estate."

6th June 1881. T. O. HUXLEY.

Results of my own inspection is very much to the same effect. There is however, palpable evidence that of what little disease there is generally, there is appreciably less on the treated than on the untreated area. The one acre field looks well, but the four acre field looks, I think, remarkably well.—E. C. S.

OPERATIONS ON A LARGE SCALE.

A few observations made of the immediate result of the application will perhaps be acceptable. But here we are looking now for a broad, general benefit, which I think, there can be no further doubt, will ultimately result, if my instructions are carried out and the treatment persevered in.

I.

Gangapitiya Estate, 150 *Acres*.

About ten days after application: "I examined some of the leave that had a bad attack on them (before treatment) and it appeared, as if the lime and carbolic was killing or eating up the fungus, and left the diseased patch with the same appearance, as if the leaf-disease insect had been feeding and sucking out the spores. But some seem still to have escaped." Extract from estate reports to Messrs. Whittall & Co. by

30th April 1881. L. B. VON DONOP.

II.

"I met Mr. Schrottky this morning at Gungapitiya, and we examined together the result of the treatment here. He considers them most satisfactory, and *so far* as the experiment has gone, I most certainly agree with him.

"In exposed places such as along roads and ridges trees were found very badly effected, but this it appears is caused by the powder [or rather its vapour,—E. C. S.] being blown away from there, as inside for every twelve leaves affected, only one could a living fungus be found. The rest of the leaves had a black spot, where the fungus had been established. On those where the disease had only commenced, a dried-up pale yellow mark was observable but in both cases (which I consider most important), the leaves appeared healthy and performing their functions." Extract from a letter to Messrs. Whittall & Co., by

L. B. VON DONOP.

31st May 1881.

From my observations I came to the conclusion that this estate has passed through a pretty severe (as evidenced by the large number of dead pin-spots throughout the estate) attack of leaf-disease during this month, but which had failed to develope itself, except in places where the treatment could reasonably be said to be able to exert little or no influence. Two applications were given. E. C. S.

Pallekelly Estate, 100 *Acres*.

"Undernoted is what I have to say on the 100 acres treated with the carbolic lime. The field had its first application on 18th April (2nd on 19th May.) Then leaf-disease was not very noticeable, only on a few patches was it bad.

"Looking at it to-day, these patches have decidedly improved and comparing the field with untreated coffee, the comparison is most satisfactory as regards the effects of the treatment.

"The leaf-disease found on the treated portion was only a few isolated spores on a tree here and there, whereas on the untreated portion the diseased leaves are covered with spore patches (16 leaves with isolated spores were picked from the treated area in six minutes, whereas in the same time 76 leaves—badly diseased—were got from the untreated coffee.)

"*P. S.*—The calculation worked out is about one and one-third spore-patches on the treated, to 40 spore-patches on the untreated."

31st May 1881. H. J. VOLLAR.

I am, Sirs, your most obedient servant,

EUGENE C. SCHROTTKY,

Technical and Agricultural Chemist,
Author of
"The Principles of Rational Agriculture,"
"Bombay Waters and the Albuminoid of Ammonia Test,"
"Man, Plant, and Soil and their Co-relations,"
"The Chemistry of Indigo Manufacture,"
"The Red Spider,"
and late Editor of the *Indian Agriculturist*.

Colombo, 7th June 1881.

A PLANTER writes:—"W. got 18 months ago 'Liberian coffee' seed, and it all came to be ordinary coffee, or did not germinate at all, and for the latter he was supplied with about 60,000 more about a year ago. In consequence of it all coming like this, he has lost a clearing for a year, and——who bought plants has also lost about 30 acres. And this seed got from those supposed to be noted planters and a fine men. I suspected for a long time, but for months I was

not looking after the place, and I have only now resumed management, and in doing so I told all I thought, and wrote to all the people who had bought plants, and my answer is the same: 'Plants no use, undoubtedly common coffee.'" This is certainly a very hard case; but if the seed was imported, it may turn out not to be ordinary *Coffea Arabica*, even though no larger. One Ceylon planter who visited Liberia told us he saw coffee from the size of a pea (St. Thomé coffee) up to the largest Liberian. Our correspondent's may turn out after all to be a new West African variety. Wait a little longer.

COFFEE IN COORG.

OUR correspondent writes from Mercara under date 1st August: "There is a very fair prospect of securing a good average crop of coffee this season, as far as my estimate goes, there is upon the trees or rather in the country now from ten to twelve thousand tons. This, is as you are aware, with having no statistics to base the fact upon a good deal of guess work, but reckoning the estimate formed in July 1880, at five thousand tons, it is as nearly exact as possible. The coffee crop in Coorg for 1880 was undoubtedly a failure all over the country. The blossoming was good, the season was good, but from some unknown cause, the berries never matured—they dropped off the trees in July and August. In no instance did a planter's crop come up to this first estimate. In many cases it was a third, and in some only a fourth of what was promised by the blossom, owing to the berries ripening very quickly on being prepared and dried and sent down to the coast for cleaning, &c., an excellent outturn was obtained; 84½ bushels of parchment coffee making the ton which is reckoned to be as good as it well can be in 1879 the outturn was 91½. The beans were only moderately large, but were of good color—of a uniform light blue; and the prices, realised in the London market ranged from 74s. to 124s. per cwt. The early showers from bringing out the coffee blossom fell this year first on some estates fifteen miles from Mercara down the Mangalore ghât on the 19th of March, from thence the showers took a more northerly direction, and finally on the 2nd of April the rain had been pretty well scattered over all the country. The showers in March were more intensely local than can be recollected for many years; estates bordering upon each other with only a belt of jungle dividing them; the one might have two inches of rain, whilst the other only a light sprinking. The following day this would be reversed for strange as it may seem there is a peculiar dispensation providing that thunderstorms seldom discharge themselves on the same ground that has been previously rained upon. It has unfortunately happened this year that more than one estate was deprived of rain until the beginning of May, which was too late to do good, the consequence being a total failure—and this coming upon last year's bad success, was doubly hard to bear. I think there can be nothing more disappointing or tantalising for a man than to be helplessly waiting for that shower which never comes, whilst day after day the surrounding estates are well watered, and he alone is isolated. Up to the end of July the season for coffee has been especially favorable, light showers and sunshine in June and July have given the trees exceptional vigor and growth, and the berries can be compared in size to those of last year on the 15th of September. Leaf-rot has shewn up in patches, but otherwise everything is well forward and the young supplies very vigorous. In South Coorg, with a lower altitude, a hotter climate, and a third of the rain-fall July was an unfavorable month, the country became parched and much crop was lost for want of succulence so that the estimates of June, I regret to hear, have been reduced considerably: the supplies have died and some new clearing wholly wasted, whilst the borer has made considerable havoc upon many promising places. There is no scarcity of labour, for owing to the want of rain in the low country, the coolies (or as many as are wanted) came in early to be employed upon the coffee estates. The remainder will come in at the close of this month, so that on the whole, this year's coffee prospects are not unfavourable.—*Madras Standard.*

COFFEE PLANTING IN JAVA.

EXTRACT from a Java letter to a correspondent in Ceylon, kindly placed at our service:—Leaf-disease does not do any harm at—estate this year. I have not seen one leaf diseased, but at other estates I hear they are not totally exempt from it, but it has no great influence on the crop. I have 4,000 piculs this year from 970,000 trees bearing fruit. The whole plantation when in full bearing, will be 2,070,000 trees." Our correspondent writes:—"The cost laid down in Samarang of the 4,000 piculs will be about Rs. 11 per picul." The picul is 133⅓ lbs., so that, nominally, this means coffee delivered at the shipping port for about 18s. per cwts! This certainly beats anything ever done in Ceylon, but we must remember the system of serfage which prevails in Java. It is a most convenient system from the point of view of the planter, and the native is also well off materially; but of course, one would rather be the free planter than the bondsman labourer, and indeed, would rather be the free, if lazy and sometimes hungry Sinhalese, than the apprenticed well-fed even if well-worked Javanese. The yield of crop reported above is nothing wonderful, say that the 970,000 trees are equal to 1,000 acres in Ceylon, it would amount to about 4⅓ cwts per acre.

LIBERIAN COFFEE.

THE species of coffee which is indigenous to Liberia, in West Africa, seems destined to have an important influence on the industry of those countries in which the coffee-blight has almost extinguished the Arabian coffee plant. A little pamphlet by Dr. H. A. A. Nicholls, just published by Messrs. Silver & Co., gives some interesting information on the cultivation of Liberian coffee in the West Indies, and especially in Dominica. The plant was first grown in England in the Royal Gardens at Kew during the year 1872, and from thence seedlings were forwarded in 1874 to Dominica and to several of the colonies in the West Indies. Fifty years ago Dominica was essentially a coffee country, at one time, indeed, over three million pounds of this staple were exported annually, and the coffee was of so fine a quality that the Dominica produce usually obtained the highest price in the English market. Unfortunately, however, early in the present century a blight attacked the trees, and within a few years it committed such ravage that the cultivation of coffee became almost extinct. Naturally, on the introduction into Dominica of a new species of coffee, more vigorous than that of Arabia, hopes were entertained that the leaves would be impervious to the ravages of the blight and these hopes, happily, were fully realised, for the young plants soon shot up into vigirous large shrubs, free from blight, and loaded with flowers and ripe and unripe berries. This immunity from blight enjoyed by Liberian coffee is, as Dr. Nicholls says, of the utmost importance to the welfare of Dominica and the neighbouring colonies, both English and French, for there is now nothing to prevent the islands of the Lesser Antilles from being once more large coffee supplying countries. In Dominica the cultivation of coffee may be said to be re-established, although it is only yet in its infancy, and the productiveness of the Liberian trees is a matter of astonishment to those of the older residents, who remember the coffee estates of 40 years ago. The Liberian coffee plant is much larger than that of Arabia, being, indeed, in its native state, a small tree. It has several other characteristics which render its cultivation different from that of its Arabian congener, and gives it several advantages all in favour of the planter. Its leaves are much larger; it flowers for several months, so that flowers and berries may be found on the same plant, and the berries are twice the size of the ordinary coffee bean. The ripe berries do not fall from the tree, like the ordinary coffee plant, but remain on the tree, without detriment to their quality for weeks; an important feature where it may be difficult to procure the labour necessary for speedy gathering. Dr. Nicholls gives many useful details as to the mode of cultivation and preparation. The flavour of the coffee, he maintains, is excellent, and he adduces evidence to show that it is quite as good as Java coffee. The success of the Liberian coffee in Dominica has been so great that already large supplies of berries are exported to several neighbouring islands. The history of the establishment of the new cultivation, Dr. Nicholls tell us, is full of promise to the future of the island. The plant is thoroughly acclimatized, the young trees are unaffected by blight, and their fruitfulness surpasses all expectations. In the island there are many abandoned estates, and large tracts of virgin soil, well watered with fine streams, eminently adapted for the cultivation of coffee and limes and other tropical plants. The plant has also been introduced into Ceylon, and Liberian coffee from that island has lately obtained 93s. per cwt in the New York market—that is, 12s. above the quotation at the time for middling plantation Ceylon (Arabian) coffee to the London markets.—*Times*, July 2, 1881.

COFFEE AND ITS ADULTERATIONS.

THE following extract from a London paper shows that attention is being given to this matter in England:—

"A very important subject for all tropical producers is the condition in which their produce finally reaches the consumer. Efforts, legislative and otherwise, are constantly being made to prevent adulteration, or if the public taste demand that other things should be mixed with the main article, those other things ought to be clearly known and defined to the purchaser, and it should indeed be at his option whether the mixture should be made at all. The mixture for instance chicory with coffee, if it is clearly understood, does no harm. A good many of the British public under a mistaken impression and with its false taste, prefer chicory with the coffee, but this is no reason why anybody, preferring the pure coffee, should be compelled to swallow a mixture they do not like. Substitutes for coffee, but claiming its name, are springing up. The so-called date coffee surely has no right to be called coffee, which is well recognised as the particular produce of a particular tree, and the French coffee which is sold in tins so largely at 10*d.* per lb., although pleasant to the taste, can hardly be Ceylon plantation. These general remarks have been suggested by reading an article in the *Ceylon Times*, embodying a proposed petition to the Secretary of State, regarding the legalized adulteration of coffee. The petition says that a capital of ten millions sterling has been invested in coffee production, and it is the staple on which Ceylon depends. It shows how the revenue of the island has increased as the coffee exports have grown. It declares that the public taste in Great Britain is vitiated by the almost universal practice of adulterating coffee. In countries where the unadulterated coffee is sold alone, the consumption has increased. In Great Britain it has fallen off, the consumption being 14,540 tons in 1880, against 16,780 tons in 1849. There is no doubt the Ceylon planters have a real grievance to place before Lord Kimberley, but whether his lordship can help them is another thing. If a purchaser goes into a shop and asks for coffee unmixed, the seller is bound to supply him with the exact thing he wants, under pains and penalty, and a system of public analysis has been established to act as a check upon the honesty of the seller. What is really wanted, that would satisfy the Ceylon planters, is an improvement in the public taste. There can be little doubt that genuine coffee will always hold its own, for no substitute or combination could ever permanently usurp its place, or really emulate its qualities. The consumption of coffee in the United Kingdom in 1880 was, as stated above, 14,540, and that of chicory 5829 tons, which, it must be confessed is a very large proportion, and justifies the complaint which is coming home from Ceylon, that true coffee is not appreciated as it should be.

Again, with regard to sugar, so many substances have saccharine qualities, that the name does not now represent any particular source from which the finished article is derived. Formerly the word sugar always suggested the cane of tropical countries. In later years, the beetroot claimed equally prominent attention, and now so many materials exist from which sugar can be taken that the mere word conveys no idea of its source. But it is clear that only that product can be called sugar which is crystallizable. The product called glucose cannot be sugar, and its distribution under that name, whenever it occurs, is undoubtedly wrong and misleading. There are a number of glucose factories in the United States consuming 21,600 bushels of corn per day, each bushel yielding on an average 26lbs. of glucose. The glucose syrup is mixed with cane-syrup, and from the mixture a kind of product is made called the 'new

process sugar.' Now to sell this mixture as sugar, when there is only a proportion of true sugar in it, is, as the *Journal of Applied Science* says to palm off upon the public an article which professes to be what it is really not. The subject is one which eminently deserves the attention of the tropical sugar producers, whose interests may be severely injured by this so-called 'new process sugar.' It is a matter too to which the attention of the Board of Trade, which deals with questions of adulteration, might properly be called.

CACAO.

CACAO IN ECUADOR.

THE *American Mail* tells us that the Christmas crop of cacao in Ecuador (usually a fair indication as to the probable yield of the entire crop of the year) proved to be very small, and a cacao on the spot was quite scarce. There had been continual and heavy rains, to a considerable extent destroying the blossoms. Consequently only a small crop is expected in 1881. The total production of 1879 was 315,342 quintals, and that of 1880 has been ascertained to be 338,785 quintals. The quintal is 100lbs. but whether the lbs. are the same as the English lb. we do not learn. The French metrical system is the only legal one, but commerce still clings to the old weights—as it does with us for cacao to the arroba, of 110 lbs. English, instead of the cwt., or the very convenient cental of 100 lbs. Engl. introduced into Liverpool for certain articles, from New York. Ecuador had 85 miles of railway in 1877. Its public revenue in the year 1876-77 was £340,966.—*Trinidad Chronicle.*

TOBACCO CULTIVATION IN THE PHILIPPINES.

"A TELEGRAM dated the 26th June, has been received from the Minister for the Colonies to the following effect:—

"*Gazette* publishes to-day the following Royal Decree:"

1.—From the 1st July next year the sowing and cultivation of tobacco in the whole of the territory of the Government General of the Philippines will be entirely free; also its manufacture, sale, and interior consumption, from the 1st January of the successive year.

2.—Of the crops the appraisement of which will be begun in August of next year, the Administration will take charge on the usual terms, The Director-General of Government Estates will see that the Government manufactories produce only so much as may be necessary for the interior consumption until their place can be filled by private enterprise.

3.—In order to supply the want of manufactories in Spain, a tax will be charged on tobacco leaf, divisible among all the provinces where tobacco is grown, enough to cover the said want in the quantity fixed by Government estimates as subvention, and in accordance with existing conditions,

4.—In order to reimburse the deficit which will occur in the estimates through this reform, the Minister for the Colonies is authorized to establish taxes, not to exceed ten per cent. on one quintal (100 lbs. Spanish) of tobacco leaf and cigars intended for exportation; also to equalise the existing personal taxes, on the basis of a reduction of the time allowed for payment, which shall not exceed twenty days; also to reform the present tariff of duties.

5.—The Minister for the Colonies in accord with the authorities and Corporations of the Archipelago and Council of the Philippines, will submit for the examinations of the Council of State the regulations and necessary instructions for the execution of this decree.

6.—The Government will inform the courts of this decree.

This is published in the *Government Gazette* for general information,

(Signed) PRIMO DE RIVERA.

Manila, 6th July 1881.

Manila Gazette.

STATISTICS.

THE trade of Singapore during last year, exceeded the previous year by nearly ten million dollars. The total imports and exports during the last decade were as follows:—

	Imports.	Exports.
1870	$39,058,564	$31,731,022
1871	36,766,530	32,003,807
1872	43,415,383	39,020,121
1873	47,880,090	41,752,115
1874	46,887,070	41,508,798
1875	43,766,201	41,619,519
1876	45,466,070	40,614,783
1877	49,327,317	41,428,407
1878	47,259,337	39,421,921
1879	56,278,292	49,250,238
1880	60,675,733	54,578,981

AN American exchange tells us that since 1st January 1881 over 16,000 miles of railroad have been built in the United States, and over 720,000,000 dollars new capital raised for the purpose. This is at the rate of £9,000 per mile, and although the American system of railways is not so substantial as ours perhaps, still the purposes for which they are constructed are served. It may be noted that this length of line, built in a few months, is almost twice as much as we in India have built since the commencement of the railway enterprise in 1853.

THE population of the United Kingdom is an interesting study. The following table gives details of the recent Census, as compared with the last in 1871:—

	1871.	1881.	Difference per cent.
England and Wales ...	22,712,266	25,968,286+	14·33
Scotland ...	3,360,018	3,734,370+	11·14
Ireland ...	5,411,416	5,159,839−	4·65
Channel Island and shipping	373,638	384,067+	2·79
Total	31,857,338	35,246,562+	10·64

The population of London has increased from 3,254,260 in 1871, to 3,814,571 in 1881, or at the rate of 17·21 per cent., and is now more than the whole of Scotland.

EDUCATIONAL statistics in Europe are interesting, and furnish material for comparison with what is doing in India. The following figures are from a return now being issued by the United States Bureau of Education. "The following are the educational statistics of countries which have more than a million pupils enrolled:—

Countries.	Date.	School Population.	Pupils Enrolled.
Austria ...	1878	3,122,863	2,134,683
England & Wales ...	1879	2,500,000	3,710,883
France ...	1877	6,409,087	4,716,935
Hungary ...	1877	2,127,950	1,559,636
Italy ...	1876	4,527,582	1,931,617
Japan ...	1877	5,251,807	2,162,962
Prussia ...	1871	4,396,738	4,007,776
Russia ...	1876	15,000,000	1,213,325
Spain ...	1870	2,603,265	1,410,475
United States ...	1878	14,596,183	9,373,195

The value of these statistics, however, depends almost entirely upon the "school age" adopted in the different States. In America it averages fourteen years, in Europe seven. With a school population of 2,500,000 Great Britain is reported to have no fewer than 3,710,883 enrolled on school registers. The pre-eminent distinction of having 50 per cent. more children at school than the total number of our school population is however more apparent than real. The "school population," is limited to children between seven and thirteen, the "pupils enrolled, included those from three to fifteen. When the figures are adjusted so as to take only those of the same age under both heads, the number of pupils enrolled is reduced to 2,333,973.

THE following table illustrates the relative increase in the various departments of trade during the past ten years in the United Kingdom and in the United States. There can be no doubt that it exhibits an increase on the part of the latter nation at such a rate as shall speedily place America at the head of the list of the trading nations. The table is taken from Mulhalls' *Balance Sheet of the world*:—

	Millions Sterling.
British commerce increased during the decade	145
United States commerce increased in same period	120
British manufactures increased	116
United States „	206
British Mining „	19
United States „	34
British agriculture decreased	20
United States increased	110
British carrying trade increased	43
United States „	26
British sundries „	6
United States „	8
British banking „	28
United States „	35

THE following statement is from the *Economist* and shews the indebtedness of the United States at the three periods 1865, 1880, and 1881—

Rate of Interest	July 1, 1881. $	July 1, 1880. $	August 31, 1865. $
7·3 per cent.	...	...	830,000,000
6 per cent.	...	235,780,400	1,281,736,439
5 per cent. ...	76,000,000	484,864,900	269,175,728
4½ per cent. ...	250,000,000	250,000,000	...
4 per cent. ...	738,652,950	739,347,800	618,128
3 per cent. ...	14,000,000	14,000,000	...
3½ per cent. ...	544,219,950	...	...
Bonded debt	1,622,872,900	1,728,098,100	2,381,530,295
Yearly interest. ...	64,063,816	79,633,981	150,977,698
Average rate of Interest...	3·94	4·62	6·34

It will thus be seen that in 16 years the American Government reduced their debt from 476 millions sterling, to 324, and the annual charge from 30 millions sterling to 13. This is

what can be done by a little energy. The security offered by America is certainly no better than that offered by India, and yet our annual charge for interest is close on five per cent. To enable us to save a large sum annually we must refund, and the result of the last Loan shows that we can do that at 3½ per cent., possibly at 3 per cent. For this operation we want statesmanship and energy, and Major Baring has thus a great opportunity.

THE strides which the United States are making, constitute an interesting study. The republic of America is but of yesterday, and yet she stands well up in the list in the order of national wealth. The latest statistics on the subject of capital valuation are as follows :—

United Kingdom ...	... £8,880,000,000
France ...	... £7,340,000,000
United States ...	... £6,400,000,000
Germany ...	... £4,400,000,000
Russia ...	... £3,000,000,000
The Netherlands ...	... £2,230,000,000

The annual income per head of population brings the United States even more to the front. The statistics on this head are as follows :—

	£
United Kingdom ...	... 33
United States ...	... 35
Netherlands ...	... 26
France ...	... 25
Germany ...	... 17
Scandinavia ...	... 17

The former table is perhaps a fairer test of national wealth, because the question of income is so mixed up with the cost of living, that a bare statement of income is not a correct test. One man may have a better income than another, but relatively to the cost of living, his income may be much less.

As a contrast to the progress making by America in reducing her national debt, the progress in the other direction being made by Russia is remarkable. In 1878 the national debt of Russia stood at £350,000,000, and at the close of 1879 it had increased to £490,085,900. This large sum is only £5·10·0 per head of the population, but when the poverty of the Russian peasant is taken into account, this seems a very large sum. The debt of the United Kingdom is equal to £22 per head, and although this is four times as heavy as the incidence of the Russian debt, it is relatively much less, owing to the comparative prosperity of the English peasant.

CONFERENCES seem fashionable at present, and we observe that the European brewers have been, indulging in one. Statistics presented at the meeting show that England does not deserve the name she has acquired, of being a beer-swilling nation. The quantities consumed are as follows in quarts per head of population :—

Bavaria	... 269
Belgium	... 149
England	... 143
Austria	... 31
France	... 21
Russia	... 2

It must not be supposed from this that Russia is a particularly sober nation, the fact being that the Russian drinks something much stronger than beer. The quantities of spirits consumed in the United Kingdom were as follows, also in quarts per head of the population :—

England ...	... 3·86
Scotland ...	... 10·20
Ireland ...	... 6·09
Average	4·85

This is a tolerably heavy bill, and it is one of the most absorbing problems which occupy the attention of social and political economists, to find out where the money for all this liquor comes from.

SERICULTURE.

SILK GROWING IN AMERICA.

THE rapid growth of the silk manufacturing interest in the United States was recently made evident in these columns by a review of the census statistics gathered by Mr. Wycoff. Commenting upon the same facts, and the superior quality of American manufactured silk, the Philadelphia *Public Ledger* gives a large amount of interesting information touching the production of raw silk and its possibilities in the United States.

"It is as easy to raise cocoons as sheep—easier. The intermediate stages between the cocoon and the factory have yet to be undertaken, but cocoons and eggs are both raised in this State, in North Carolina, and in Missouri, for sale and export. The shearing of the cocoons, or the filature is the step that has to be taken on an extended scale. The great cocoon market for the world is Marseilles. The silk filatures are grouped in the departments around Lyons, and the French raised cocoons are consumed in the immediate neighbourhood in which they are raised; but the foreign cocoons, coming from all countries, are distributed from Marseilles, and there they are purchased to the best advantage. Consuls Peixotto points out in a private letter to the American Minister at Paris, in answer to some inquiries made through Mr. Noyes by the Philadelphia silk school, that American-grown cocoons can be sold at Marseilles as readily as any others, as soon as the quality, and especially the uniformity of the cocoons become known in the markets. By the efforts of this school American-grown cocoons will doubtless soon be placed on sale in this important depôt to direct the attention of American silk raisers to this point. There have been already given in the *Ledger* such details of silk growing under the management of this school as will satisfy any one that all that is needed is such a point to which the numerous little harvests all over the country can be gathered and forwarded. Here is one experience from Gwynedd, Pa., representing six weeks' care of one crop. There were raised in one farmhouse, just as an experiment and to see how it would work, thirty pounds of cocoons and fifteen ounces of eggs. The cocoons are worth at a market two dollars a pound; the eggs, from three to four dollars an ounce. From a North Carolina farmer comes a letter on a larger scale. He has put up one hundred and fifty racks this year, four feet long by three wide, and each rack is to accommodate two thousand worms. He expects to raise this summer one thousand barrels of cocoons (North Carolina cocoons, pure white, took a permium at the Centennial); but this grower raises also from the French eggs the large flesh-coloured cocoons, of which about one hundred and ninety weigh a pound, and from the Japanese eggs also a fine cocoon.

"But why, asks the protective and otherwise thoughtful reader, need the cocoons be sent abroad to be sold, and this golden fleece sheared by French hands? Why can they not be kept at home, seeing that the silk manufacturer can, or at least could, take all that can be raised for years, to come? That is the point which is now occupying the minds of *sericulturists*—seriously occupying them. Cocoons and eggs and all that, they know. They know that the mulberrry will grow wherever the apple tree does, and that the osage orange does about as well as the mulberry. They know that the season begins on the 11th of May and lasts six weeks, and that it is possible, by skilfully retarding some of the eggs to make two seasons in the year. What they have not yet reached is the perfection of reeling, although they are experimenting upon it. The hand reeling of Italy and France is an old story. Silk has been reeled by hand here, and is still, and if the farmer's daughter puts her reeling at the same price as her knitting or crochet, to fill up the unemployed time, and not for an occupation to live by, hand-reeling would pay to that extent. For an extended business the great filatures are needed, where American cocoons can be reeled at home by machinery, the only thing that can come into competition with the cheap day labour of the Italians, French, and Japanese hand reelers. A young American engineer is at this time in France, experimenting on the reeling of silk by electricity, which is the motive power destined to lighten labour as well as streets. This is the one missing link that is needed to complete the chain between Horstmann's fringes and ribons and the New Jersey silk dress goods and handkerchiefs, the Connecticut sewing silks, &c., and the cocoon racks in American farm-houses. The Philadelphia school, that has done so much in gathering up these threads of detail, and in sending out its cocoons and instruction over the country, is a real credit to the city and the State."

TOBACCO.

SHOULD the report that the Spanish Government is about to discontinue the tobacco monopoly in the Philippine Islands prove true, one of the closest and most strictly enforced monopolies that ever existed will be put an end to. The production of the Manilla cheroot was fenced about with protective regulations even from before the moment that the tobacco seed was put into the ground almost until that at which it was placed between the lips of the smoker. Some land in the Island of Lucon being better suited to the cultivation of the plant than others, all owners and occupiers of property in certain districts had to see that a proportion of their land under cultivation—the amount being regulated by the Government—was devoted to growing tobacco. The kind of seed sown and the mode of rearing the plants were closely supervised by the authorities. The product of the harvest could be purchased only by the Government; and no one else could manufacture it into cigars or cheroots. No unmanufactured tobacco could be sold even for exportation, unless it were to be carried beyond the Cape of Good Hope—a regulation made to prevent the starting of a rival manufacture at Macao or Hong-Kong. The factories of Manilla and Cavite are immense establishments. Every visitor to the former city must have been struck by the crowds of "hands"—chiefly Tagal women and girls—which stream out of their gates at the close of the working hours. Their interest in the proposed change must be considerable.

THE system pursued in Cuba has long been altogether different. The *vegas* or tobacco farms of the celebrated Vuelta Abajo—the region in which the finest tobaccos are grown—are usually small holdings cultivated chiefly, if not entirely, by white men. Slave labour in Cuba has had little to do with the production of at least the raw material of the celebrated Havana cigars, but was principally employed on the great sugar estates. The cultivation of the plant, free as it is, is not more so than the manufacture of the cigars and cigarettes. Though the huge factories of Manilla are not to be found at Havana, a remarkable change in the system of cigar-making has taken place within the last five-and-twenty years. At the beginning of that period the small factories were many in number; some streets—notably the Calle del Sol and the Calle Obispo—were lined with little shops, in which might be seen some half-a-dozen white creoles vigorously smoking and rolling cigars. Some years later these had nearly all disappeared, and the manufacture had apparently passed into the hands of large firms with manufacturing establishments of considerable size. The great cigarette works of La Honradez were one of the sights of the city. Though perhaps not even those whose Eastern experiences tend to

preserve pleasant recollections of the Manilla plant will dispute the superiority of an Havana, it is worth remembering that the former was, and indeed is, by a long way the cheaper.

TOBACCO CROPS OF 1880 AND 1870.

J. R. DODGE, special agent for the collection of statistics of agriculture, has issued from the Census Office, a report showing the tobacco crops of the United States for the census years 1880 and 1870. The comparative statement in the report shows an apparent increase in the production of 80 per cent. during the decade, the product in 1880 being placed at 473,107,573 pounds, and that of 1870 at 262,735,341 pounds. This apparent increase, Mr. Dodge says, exaggerates the real advance in tobacco cultivation, at the preceding census the crop was a small one, and the fear of taxation may have operated to prevent a full crop of tobacco in 1870. The crop reported, in 1880 was one of medium production, not in excess of present requirements for home demand and export. Fifteen States produce now, as in 1870, more than 99 per cent. of the tobacco of the United States, although it is reported in twenty-two other States and six territories. Of these fifteen, only Missouri, Illinois, Indiana, and Massachusetts produced less than in 1870. Kentucky occupies the first position, producing 36 per cent. of the total product of the country. Virginia then holds second place; Pennsylvania has advanced from the twelfth to the third; Wisconsin from the fifteenth to the tenth; and North Carolina, Connecticut, and New York have each gained one point in the rank of tobacco States. Those that have retrograded in relative production are Massachusetts, Maryland, West Virginia, Indiana, Illinois, Missouri and Tennessee. The average yield per acre is shown to be 731 pounds, varying from 1,599 pounds in Massachusetts to 471 pounds in North Carolina. This variation in the rate of yield, the report states, is due in differing degrees to the use or neglect of fertilizers, the habit of growth of different varieties and vicissitudes of season.

The following table shows the total product in pounds and yield per acre in 1880 in fifteen leading tobacco-growing States.

States.	Total Yield.	Average.
Kentucky	... 171,121 134	756
Virginia	... 80,099,830	553
Pennsylvania	... 36 957,772	1,340
Ohio	... 34 725,405	1,001
Tennessee	... 29 065,652	707
North Carolina	... 99 286 418	471
Maryland	... 26 082,147	683
Connecticut	... 14.044,652	1 620
Missouri	... 11 991,077	773
Wisconsin	... 10 878 463	1,234
Indiana	... 8 872 842	742
New York	... 6,553,351	1,327
Massachusetts	... 5 369 436	1 599
Illinois	... 3 396 700	699
West Virginia	... 2,296,140	[illegible]

TOBACCO TRADE IN CEYLON.

THE trade in this article seems to suffer from greater depression produced by causes which are not far to seek. Tobacco exported to India last year remains in stock, there being no demand. The Indians turn out as good tobacco as any sent from Jaffna The crop produced in India this year is reported to be sufficient to meet the demand there. Another cause is that a larger number of men than in any preceding year having taken to tobacco cultivation, the culture is far in excess of the demand. This year's crop has been gathered in, and the market is now flooded with tobacco. Prices have considerably fallen. We are assured by men whose veracity is unimpeachable that it is found difficult to sell tobacco even at a rate that would barely cover the expenses of cultivation, the cultivator making up his mind not to charge for his labor and trouble. This is indeed a sad state of things. None but those who are acquainted with Jaffna affairs are able to understand what depression in tobacco means. As we have often remarked the chief industry of the place is the cultivation of tobacco: when tobacco produced at great trouble and expense lies in hands uncalled for and unsold, you may safely conclude that distress and want have made their appearance. Money is very scarce: tobacco cultivators struggle hard to keep body and soul together, and we fear that should this depression continue even for a short time it will affect the well-to-do classes.

The only class of men that seem to derive benefit from the existing depression are the cigar traders. They combine and keep down prices. The mysteries of trade are so strange that what is ruin to one is a benefit to another. Now that there is no demand in India for tobacco, the cigar traders buy it cheap, and rejoice in the prospect before them.

Times of depression are also times of sickness. When tobacco is dull or when paddy is short, you may expect with certainty the appearance of some sickness, which generally drives people to live upon unwholesome articles. It was so in 1877. A speedy change in the trade is very desirable, and any measure calculated to effect it, will be heartily welcomed.—*Jaffna Patriot.*

MADRAS GOVERNMENT SCHOOL OF AGRICULTURE.

A NEW class will be formed in September. For rules of admission, &c., see Fort St. George Gazette, dated the 16th of August 1881, Part 1, page 434, or, apply to the undersigned,

(Sd.) W. R. ROBERTSON, M.R.A.C.,
Superintendent Government Farms.

GOVERNMENT FARMS OFFICE,
Saidapet, 24th August 1881.

Registered No. 182.

THE INDIAN AGRICULTURIST.

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NOTICE.

SUBSCRIBERS to the STATESMAN, FRIEND OF INDIA, *and* INDIAN AGRICULTURIST *are informed that arrangements have now been made by which these journals will for the future be published under the general superintendence of the undersigned.*

All communications regarding literary matter should be addressed to the Editor of the paper for which it is intended.

All communications concerning the general business of the STATESMAN AND FRIEND OF INDIA *Office, Advertisements, and Subscriptions to the* daily STATESMAN AND FRIEND OF INDIA weekly FRIEND OF INDIA AND STATESMAN, *and* INDIAN AGRICULTURIST, *should be addressed to the MANAGER,*

WILLIAM RIACH.

13*th June* 1881.

CONTENTS:

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.

All correspondence must bear the full name and address of the writer. not necessarily publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

ACKNOWLEDGMENTS.

REPORT on Public Instruction in the Madras Presidency for 1879-80. Madras : Government Press, 1881.

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TEXT Book of Indian Botany, Part II., by W. H. Gregg : **Calcutta :** Thacker, Spink & Co., 1881.

REPORT on the Cawnpore Experimental Farm, for 1880-81. **Allahabad :** N.-W. P. and Oudh Press, 1881.

REPORT on Horticultural Gardens, Lucknow, for 1880-81. **Allahabad:** Government Press, 1881.

REPORT on Government Botanical Gardens at Mussoorie and Saharunpore, for 1880-81. Allahabad : Government Press, 1880.

CORRESPONDENCE.

FORESTS AND MALARIA IN BURDWAN.

TO THE EDITOR.

SIR,—In 1879 our attention was directed by a certain vernacular newspaper, the *Somalochuk*, to the febrifugal properties of the willow tree, by the plantation of which Cyprus had been deprived of fever, as stated by the correspondents of the *London Times*. Baboo Trailakhya Nath Mukerji, the Darjeeling correspondent of the *Somalochuk*, proposed to us to inform his Highness, the Maharajah of Burdwan, of the virtues of the willow tree, to prevent fever, and to request him to plant the same along the sides of every road in Burdwan. We, being totally unacquainted with the virtues alluded to, had occasion to search through the leading botanical authorities of Northern India, and while so engaged, we received much information regarding the virtues of many trees, to lessen the cause of malarious fever.

With regard to the virtues attributed to the willow tree, to prevent fever, Dr. King, Superintendent, Royal Botanical Garden, Calcutta, thus states in his letter of the 20th April 1879 :—"Salicin, an alkaloid obtained from willow barks has some power as a febrifuge, but is much inferior to the cinchona alkaloid. I never heard that willow trees have any influence in preventing malaria in feverish districts."

In August 1880, we asked the Superintendent, Royal Botanical Garden, Calcutta, for information regarding the virtues of the sunflower, *toolsee*, tobacco, maize, and willow. In his letter No. 1138, dated 7th August 1880, Dr. Cunningham, the Officiating Superintendent, said :—"There is no satisfactory evidence, as far as I know, that any of the plants, to which you allude have any *special* protective influence against the development of the cause of malarious fever."

With reference to the virtues of the abovementioned plants, Mr. Gollan, Officiating Superintendent, Government Botanical Gardens, N.-W. Provinces, remarked as follows in his letter No. 2316, dated 4th September 1880 :—"Plantations of the willow tree, sunflower, &c., or in fact anything will undoubtedly lessen the cause of malarious fever. Cultivation no matter of what kind will."

In his letter No. 3798, dated 17th November 1880, Dr. King reported :—"I know of no plant that has any specific influence in making feverish places less so. The relation of vegetation to malarious fever is a subject which I am not prepared

to discuss at length. If fever is caused by excessive moisture in the soil, the kinds of trees which most freely absorb such moisture, are of course most likely to diminish the fever. I am not aware that the *Pithecolobium saman* has ever been credited with any special virtues as a fever destroyer."

Mr. Duthie, Superintendent, Government Botanical Gardens, N.-W. Provinces, thus remarked in his letter No. 1112, dated 19th May 1881 :—"Regarding trees and the prevention of fever, I may say that Dr. King's remarks are so exactly in accordance with my own opinion on the subject, that I need not repeat the same. Any quick growing tree, such as, *eucalyptus*, *pithecolobium saman*, giris, willow, &c., planted on ground, become malarious from excess of moisture, will by draining the soil gradually lessen its feverish growing character.

Referring to the virtues of the *eucalyptus* by the plantation of which France, Algeria, &c., have been deprived of fever, as stated by the *Indian Agriculturist* for June 1881, Dr. King stated in his letter of the 14th June 1881, as follows :—"*Eucalyptus* will not grow in Burdwan as think I have already told you. If you wish to remove malaria by planting trees to drain the soil all over the district, you will undertake a very big job. I am sorry I cannot give you any further advice than I have already given."

With regard to the fever dispelling properties of the *neem* tree, as have been given in the proceedings of the Agricultural and Horticultural Society of India for June 1881, Dr. King said in his letter No. 40P, dated 9th August 1881, as follows :—"With reference to your letter No. 46, dated 7th instant, inquiring whether *neem* (*Melia Aza darichta*) and *toolsee Ocimum sanctum*) have febrifugal properties or any special virtue to prevent the cause of malarious fever, I beg to inform you that in my opinion they have none of the properties alluded to in your letter under acknowledgment.

"I can give you no further information about *neem* than you appear to be already in possession of."

In connection with the above, Mr. Gollan, thus states in his letter No. 1915, dated 13th August 1881 :—"In reply to your letter dated 9th instant, I agree with what Dr. King has told you about the *eucalyptus*. The climate of Saharunpore during nine months of the year is very much drier than that of Bengal. I have never found it difficult to keep any species of *eucalyptus* alive during the hot and cold seasons, but I have always found it difficult to keep all varieties alive during the rainy season.

"You seem already to know all the reputed virtues of the *neem* tree. I do not know what other information you wish to have. If you wish a botanical description of the tree, I shall gladly send you one.

"I do not believe very much in the virtues of any particular tree to remove malaria. The climate of Saharanpore is said to have been very malarious about 20 years ago. No one ever attributes the improvement in the climate to the planting of *neem* or any other species of tree, but every one is prepared to admit that an extensive system of drainage, executed by the energetic Collector some years ago, has greatly improved the climate. If your district is badly drained, which I perceive it is from your description, the most practical way to remove malaria is to begin and drain it, then plant *neem* or any other species of trees which your fancy may suggest as a finishing stroke to your work."

That systematic drainage is the only means for removing malaria, every one will admit. It is very interesting to note that in the Government circular resolution, dated the 29th April 1879, his Honor the Lieutenant-Governor came to the conclusion of what the late Rajah Digumber Mitter said that "one, at least of the chief causes of unhealthiness in Bengal, and of the fevers which in late years have done so much misery, suffering, and mortality among the people of large tracts of country, is the excessive humidity of the soil by obstruction to drainage." His Honor was pleased to direct the District Road Committees and municipal bodies to improve local drainage and supply good drinking water in the above resolution. From time to time we represented to the Burdwan Municipality the conditions of the villages in Ward C, which are still suffering from the fatal fever, and more than half of the population of which villages died only of fever, and strongly insisted on their constructing metalled roads supplying good drinking water and carrying out drainage works. The Municipality promised to redress our grievances, but as yet did nothing. In the resolution of his Honor the Lieutenant-Governor, dated the 12th June 1880, the municipal bodies and District Road Committees were further ordered to improve local drainage and supply good drinking water and proper conservancy. We then sent the following petition to the Burdwan Municipality, in which the condition of our village and the negligence of the Burdwan Municipality are fully described :—

To the Chairman of the Burdwan Municipality, Municipal Commissioner's Office, Burdwan, dated Khojanarber, Burdwan, the 1st November 1880.

The humble petition of the Municipal rate-payers of Khojanarber in C Ward, Burdwan.

Respectfully Sheweth :—That your petitioners are regularly paying their rates to the Burdwan Municipality, but unfortunately they have received as yet no benefit from the Municipality, that the road around your petitioners' village is full of mud during the rainy season, and full of dust during the summer and winter seasons ; that the road is never macadamised by the Municipality ; that they are drinking and bathing in very unclean and stagnant water ; that your petitioners are suffering from the great prevalance of malarious fever attributable to the presence of a superabundance of water, and that not fresh but stagnant water lying on the ground, which is caused by the negligence of the Municipality ; because it is admitted that after the rainfall is over, the water lies all about the village in pools and ponds, stagnating and breeding malaria, which would not have been the case if proper drainage works were carried out by the Municipality ; that in February last they together with the other inhabitants of C Ward petitioned the Municipality, craving redress of the above mentioned grievances, and that it was ordered on their petition that the Commissioners of C Ward should report where those works should be carried out, but to the wonder of your petitioners no report has yet been submitted by the Commissioner ; that your petitioners had occasion to read the resolution of his Honor the Lieutenant-Governor of Bengal on the improvement of drainage of towns and villages in Bengal, dated Darjeeling, the 12th June 1880, where it is remarked :—

"2. The Lieutenant-Governor is, however, glad to find from the reports received by Government that within the limits of Municipalities and Unions much has been done, since the issue of the Government orders of August 1876, to improve local drainage and to introduce that improved conservancy to which the Sanitary Commissioner very rightly attaches such great importance. Very much, however, still remains to be done, and the Sanitary Commissioner and local authorities must continue to devote unremitting attention to the provision of effective surface drainage in towns and villages, to the introduction of a proper conservancy, and to the purification of the supplies of drinking water. As already promised, if in any case municipal funds are inadequate for the carrying out of really useful schemes likely to do good on a large scale, the Lieutenant-Governor will be ready to consider reasonable applications for assistance. In Dinagepore and Rungpore, schemes of drainage have already been started with the help of Government, which are expected very materially to benefit those stations."

"Your petitioners therefore humbly pray that the Municipality will be pleased to make special arrangements in the Budget for the year 1881-82 for macadamising the road around Khojanarber, digging a well at Khojanarber for the supply of good drinking water, and supplying proper conservancy. And your petitioners as in duty bound, shall ever pray."

The following resolution of the Burdwan Municipality on the above petition, dated the 15th December 1880, should not be out of place here :—

"The Vice-Chairman next laid on the table for consideration a petition from the residents of Ward C for a well, drainage works, and a metalled road to be made in that quarter.

"Resolved that as provision has been made for improvements as stated in Clause 3 of the foregoing resolution the petition be filed."

The clause referred to above, is as follows :—

"3. That Rs. 400 be alloted under the head 'local improvement' for the sinking of a large well in Ward C, where the want of good drinking water is very much felt, and Rs. 200 for drainage

works, and that the Commissioners of the Ward be asked to select an open site for the well in Bere."

In April last the Commissioners of the Ward selected "an open site for the well in Bere," but as yet no well has been dug, nor any drainage works have even been commenced. It is necessary to mention here that in 1880 the Municipality resolved to sanction Rs. 1,000 for the improvements suggested by the Commissioners of the Ward, but not a single rupee has been spent for the improvement of the Ward, and it is very wonderful to note that out of that Rs. 300 was expended for the construction of a road in another ward which has no connection with C Ward. Such is the condition of our village and such actions are taken by the Municipality for the construction of roads supplying good drinking water and carry out drainage works.

Such is the condition of every village in Ward C. Some of the villages, such as Mirsoba, Nootangram, Degree, Mohunbag, Dewanganj, Ashatta, Batcharhat, and Ballamhat, are pure rural villages, who enjoy no benefit of road or other municipal improvements. They had occasion to represent their own condition to the Commissioner of the Burdwan division. In his letter No. 81, dated 14th April 1881, the Divisional Commissioner ordered the Magistrate to inquire into and report on their petition. The Magistrate of Burdwan submitted the report in which it is stated that the majority of the population of the above villages are chiefly employed in agricultural pursuits, and that no benefit of road, &c., are enjoyed by them. The Divisional Commissioners as well as the Municipal Commissioners therefore resolved to exclude the above villages from the Burdwan Municipality from the next official year.

The above exposition will shew that no action has been taken by the Municipality relating to the subject of drainage or supplying drinking water in Ward C. We therefore pray that Government will be pleased to appoint a Committee to inquire into and report on the state of the Burdwan Municipality, and to inquire into the sanitary condition of Ward C, and the measures adopted by the Municipality for improving the drainage of C Ward, and to call upon the Municipal Commissioners to take due measures for the drainage of Ward C, and then to plant different kinds of trees as a finishing stroke to the work under Government Circular Resolution dated the 12th June 1880.

B. K.

COFFEE BUG.

(To the Editor of the Madras Mail.)

SIR,—With reference to the inquiry made by a "Planter," as to what would stop the spread of "bugs" in young coffee, I suggest, that if the bugs have already made their appearance, the best remedy is, to sprinkle upon the young plants a decoction of wormwood." Yours, &c.

C. B.

CASUARINA CULTIVATION.

(To the Editor of the Madras Mail).

SIR,—Referring to an extract from *The Eurasian and Anglo-Indian Advocate* which appeared in your issue of 20th July, regarding the cost of planting casuarinas, the writer says :—" It is estimated that under very unfavorable circumstances as much as Rs. 100 per acre will be required for the first year." On referring to his estimate for planting six acres I find, after deducting an item, cost of watering and all sundries, which I will suppose is expenditure incurred after the first year, the cost of raising planting and tending for one year, on six acres, to be Rs. 156 or Rs. 151 per acre.

The writer of the extract also says :—" Land for casuarina cultivation may be had for Rs 10 per acre. I shall say Rs. 20 to be on the safe side." On going to his estimated abstract of receipts and expenditure, I find Rs. 1,400 as gross expenditure on 6 acres ; but on referring to detailed account, I cannot find any charge for cost of land. Again a profit of Rs. 7,600 on an outlay of Rs. 1,400 would, by my calculation, be 542·8 per cent. instead of 550 per cent. Will the writer of this, or the editor of the paper referred to, be so good as to explain, and if I am wrong put me

Travancore, 3rd Sept.

RIGHT.

INDIAN TEA.

(To the Editor of the Times.)

SIR,—In your leader of the 27th instant, you refer to the production of Indian tea, and allude to the damage done to the crops by the red spider.

As brokers, we are often asked for information on the subject, and after careful inquiry have come to the conclusion that the injury to the crop from this cause has probably been very much overrated.

It may perhaps, be satisfactory to your readers to learn that the new season's importations from India are so far generally of excellent quality, and that the crop promises to be a good one, both in this respect and as regards the yield.

The Secretary of the Indian Tea Districts Association alluded in *The Times* of to-day to the development of the industry. The deliveries will soon amount to 50 million pounds per annum, and there can be little doubt, considering the growing and high estimation in which Indian teas are held by the buyers throughout the country, that a very much larger quantity, if the standard of quality be high, would rapidly find its way into consumption.

Apart from our export trade, the delivery of China tea is about 116,000,000lbs. annually. It is fully expected that India will supply us this year with one-third of our total requirements.

For many years past Indian teas were only used for the purpose of blending with China, but it is now known that some of the largest retailers are selling them pure, with advantage to their trade, their customers disliking the admixture. We are, Sir, yours faithfully,

WM. JAS. AND HY. THOMPSON.

38, Mincing-lane, July 29.

SHORT CROPS DUE TO POOR CULTIVATION.

(To the Editor of the Ceylon Observer.)

SIR,—I agree with your correspondents who hold that crops which are short this year are due, not so much to season or elevation, since there are so many instances where a line of coffee separates, on the one, 10 cwt per acre from nothing per acre, on the other.

It would surely be a very extraordinary thing if a line which was not a mountain ridge could so influence as to separate the season on its either side ! The fact is, that wherever coffee was cheaply worked ast year, there the crop is bad ; let this cheap coruse be repeated, and next year the crop will be worse.

In most instances, wherever coffee was highly cultivated, especially in manuring, there the crop is very good. Where manure failed, the wood was too late and unmatured. This wood is now ready, but unfortunately this is not the blossoming season.

No improvement, but the reverse, unless they change hands, can be hoped for from estates too involved to afford manure.

Very much prominence is given to the Kelebokka valley this year where some places which have always been highly kept up are doing last tolerably well.

But the crops there cannot hold a candle to some in Dimbula, and, after two such very short seasons, would have, three years ago, caused more grumblings than congratulations.

Is there not an error in the statement " that the crops from average estates there amounted to as much during the last five as during the five previous years ?"

There was, it is true, a very heavy crop from every estate in the dry season of 1876-77, the surplus of which, by spreading it over succeeding seasons, helped to uphold the average, but its influence for such a purpose was expended some time ago, and if the average for five years, ending with the coming crop, were placed beside that of the five previous years, it would compare most unfavorably. With a generous expenditure upon manure, Kelebokka will, however, hold its own beside most other districts in the country.

TRAMP.

July 13, 1881.

IRRIGATION.

(To the Editor of the Indian Chronicle.)

SIR,—In the last issue of your paper, I have said that the scene on both the sides of the canal, which runs parallel to the Punpun is quite ruinous. There remains only one question to be answered, the question why the tenants inhabiting the left side of the canal do not manage to irrigate their rice crops with canal water. I have many things to say why they do not. If I can point out to your entire satisfaction the inconveniences of buying water from the canal, I will think I have attained my object. Before trying to solve this question, I may as well ask what measures Government has adopted or will adopt for the safety of those who inhabit the right side of the canal. To answer the first question which I have started, *viz.*, why the inhabitants of the left side of the canal do not avail themselves of canal water, we should see whether the irrigation by means of canal water is cheaper than the old *pain* system or otherwise. Secondly, which of the two is the most convenient ? And thirdly, which of the two is more suited to the soil of the district. In order to know

which of the two system is cheaper, we must have a clear idea of the scale of expenditure incurred by the tenants in irrigating their crops according to both the methods.

The following are the rates of *puttas* which the tenants execute before they are entitled to take water from the canal :—

	Rs.	As.
Sugar-cane field	3	2
Rice field	1	14
Rabi crop	1	9
Opium field	1	9

So that sometimes the tenants have to pay to Government for the irrigation of their land an amount equal to the rent of the land itself. Irrigation through *pains* was decidedly cheaper than this. Zemindars and rayats were to be only a little careful in clearing out the mouths of the *pains*, and everything was done. Every mouzah had its own indisputed *pain* to gain free admittance to the river at the time of inundation. Zemindars, in order to derive greater advantages from the river water, dug the *pain* deep, and thus the slightest rise of water served to irrigate their fields.

But now this cheap system of irrigation is gone, I may say, gone for ever.

A rayat possessing a beegah of paddy land must necessarily irrigate it at least three times if there is a scarcity of rain. But if the natural rainfall is in abundance, there is no need of doing this so often. Coming again to the *bandh* system I should say, as I have already said above, that the irrigation of a beegah of land is only a matter of a penny or two. Though at first this may look somewhat exaggeratory; but it is a fact beyond all doubt as I will presently show. A firm *bandh* in the Punpun which cost Rs. 700 irrigated innumerable beegahs of land. These *bandhs* were never prepared only by one zemindar; but they were the results of the joint effort of many. Suppose (and the supposition will be very near the truth) that ten *mouzahs*, each in average consisting the area of 5 beegahs of land, on each side of the river were benefited by the out-flow of water through the *pains*. Now the cost of it though at first appears to be considerable, amounting to something like Rs. 700, would be reduced to annas and *pies* when divided among the above large number. This out-flow of water, besides serving the purpose of *khareef* did good also to the *rabi* crop.

The aim of Government is decidedly laudable; but somehow or other the good intention is lost in its execution, and what might have been a boon, often becomes, through mismanagements and havocs of the patrols, and the petty amlahs of the department a source of real grievance. After the tenants have legally executed the *patta*, they as a matter of justice, are entitled to irrigate the crop at the proper time. We do not blame Government but the poor tenants, owing to some mysterious causes do not get water in time. You can well imagine Sir, the chagrine, of a poor tenant, who sees the green *khareef*, his wealth and everything for him, turning pale for want of water, for which he has already paid. Though he has legally paid for it, yet he does not get water, at the proper season, unless he does a bit of *khoshamud*, if not something substantial to the petty canal lords. Sometimes the patrols and other petty *amlahs* intentionally open some of the *nalas* and thus cause the water to flow out. They make this the ground of a threat to the ignorant rayats and impute the mischief to them, which coming before a court of justice becomes, owing to many causes difficult to be disproved, and these amlahs make a good bargain for themselves from the job. The *rabi* crop to some certain extent is indebted to the canal water, because we can have the prospects of a rich *rabi*, even if there is no rainfall. But we cannot possibly have a rich *khareef* if the rain is not in abundance.

I hope to resume this subject in a future issue.

VILLAGER.

The Indian Agriculturist.

CALCUTTA, OCTOBER 1, 1881.

TEA COMPANIES.

A RETURN has recently been issued by the "Planters' Stores and Agency Company, Limited," of the results of the working of eleven tea companies having their offices in London, from which a considerable amount of information is available. A careful perusal of this document shows conclusively why some companies are paying dividends and others are working at a loss. The table gives details for each company; we shall here deal with the averages of the eleven companies :—

			1879.	1880.
Gross price of tea per lb. including all receipts	...	*d.*	17·37	14·41
Cost of making per lb. including all charges	...	*d.*	16·03	14·18
Profit per lb. of tea	...	*d.*	1·34	0 23
Dividends paid	...	%	4·77	3·07
Yield of tea per acre	...	lbs.	...	349
Capital employed per acre		£	...	87
Capital per maund of ten maunds	...	£	...	21

To any one who has studied the financing of tea concerns, this table speaks in language not to be mistaken. Here we have an average cost per pound for making for the two years of 15·10*d.* while the price realised averages only 15·89*d.* leaving a profit of only ·79*d.* per lb. The cost of making in individual gardens runs from 12·25*d.* to 17·62*d.*; the prices realised were from 9·12*d.*, to 19·37*d.*, and the results per lb. from—4·12*d* to+·25 to 5·12*d.* Now we can understand without much difficulty why two gardens making an equal quality and having an equal outturn of net profit, should pay different dividends, as those, depend on the amount of capital invested : but after allowing for local peculiarities in the way of expense, we are at a loss to understand why there should be such vast differences in the cost of manufacture. It is no doubt true that a large garden can be worked cheaper per lb. or per acre than a small one, many of the items being constant, but these gardens under notice are all pretty large concerns. We also know that a garden yielding 470lbs. of tea per acre, costs less relatively than one yielding only 192lbs. These latter figures depend, then, on management, and by management we do not use the term in its narrow meaning as referring to the garden management. We do not think the garden management is so often at fault, as there is an *esprit de corps* which impels managers to try their very best. By management, we use the term in the sense of control. If gardens were, first of all, carefully provided with good managers, the proper plan would be to give these gentlemen reasonable discretionary powers, and allow them to do their best, without being hampered by instructions from directors or managing agents, who may be good business men, but who, in many instances, have little practical experience of tea planting and manufacture.

The difference between the selling prices of 1879 and 1880, *viz.*, 2·96*d.* per lb., is accounted for by the extremely low market ruling in the latter year. The minimum should be 18*d.* or say 12 annas, and in 1879 it nearly rose to that. On the other hand, a useful lesson is learned by looking into the difference between the cost of making in the two years, which amounted to 1·85*d.* On this head 8 annas or 12*d.* ought to suffice, and a little more economy exercised in the direction of office charges would reduce the price to that figure. The column containing dividends is slightly misleading; it does not contain dividends earned, but dividends paid, and as some are guaranteed, the column does not give a true idea of the profits made. Perhaps the fairest mode of estimating this is to work out the profit made per acre. We hold that by proper management and control a fairly worked garden should give Rs. 100 profit per acre per annum. The Borelli, one on the list before us, made 470lbs. of tea, and made a profit of 5·125*d.* per lb. This at par is exactly £10-0-8¾ per acre, and, given an ordinary good market, we see no reason why this should not be the rule, rather than the exception.

Let us now look at the capital account of those eleven gardens. The figures are given in pounds sterling per acre, a very good method for purposes of comparison. These range from £27 (Jorehaut Co.) to £160 (Eastern Assam Co.), the average being £87. Now we have got reasons for the opinion that £50 is amply sufficient to bring a garden to paying point. How then have some gardens been made for £27, while others have cost £160 per acre? In the early days of the industry, there was no thought of economy; where a speculation was popularly supposed to yield 300 per cent., there was no incentive to saving. Money was recklessly thrown away on land and on establishment, while promoters made fabulous sums. The crisis of 1866 brought all this to an end. Some companies struggled through and are still existing, but being burdened with their original enormous cost, can never hope to pay

reasonable dividends; while others succumbed, and new proprietors bought them for a tithe of their cost. Those gardens weighted with excess capital should have this written off. When dividends on the reduced capital could be made, shareholders could not lose by striking off half of their capital and accepting one share for two or three, as the dividends would remain the same absolutely. Another mode of overcoming the difficulty is to pay no dividends, but utilise all profits in extending. Say a garden has 300 acres and its capital is £30,000; let the annual profits be used in extension till the garden consists of 600 acres, when the capital value would be £50 per acre. By this mode the shareholders would lose nothing. Now they would get no annual dividends, but the value of their scrip would steadily rise year by year.

Another column contains the amount of capital invested for each maund of tea produced annually. This ranges from £6 (Assam Co.) to £50 (British India), and the average is £21. Allowing a garden to cost £50, and the outturn to be 400lbs. per acre, this sum should never exceed £10. To bring this estimate within reasonable bounds, the outturn must be good, and the invested capital low, and this brings us to consider the last item in the list, *viz.*, the outturn per acre. In the list before us this item ranges from 192lbs. (British India Co.), to 470lbs. (Borelli Co.), and averages 349lbs., a very fair average indeed. Keeping out four of the lowest companies, the average of the other seven is 406lbs., proving that our estimate of 400lbs., is not Utopian. We might insist on a much higher average, but are now only concerned with the figures before us. If one company can make 470lbs. per acre, there exists no good reason why others should not also do so. Any cause which operates against this must be either concerned with finances or bad management, or perhaps both. It is perfectly foolish of companies to go on making half of what they ought to do. If the management be at fault—change it; if the directors—change them; and if the cause be want of funds, why, sell the concern and get out of it what may be, rather than drag on a ruinous and bankrupt concern.

EMIGRATION TO THE TEA DISTRICTS.

THE Indian Tea Association has been in communication with the Government of India on the subject of the proposed amendment of the Labour Districts Emigration Act VII. (B.C.) of 1873. The draft Bill, it will be remembered was prepared by a mixed Committee composed of officials, a representative for the Tea Managing Agents of Calcutta, and an experienced tea-planter from Cachar. The draft Bill has now been before the Government of India for some time, having been handed up by the Government of Bengal. The object of the correspondence was to endeavour to induce the Government of India, to pass the Bill before the Simla season closed, the winter season being the most suitable for recruiting. The Indian Tea Association has received the following reply, dated Simla August 18:—"I am directed to acknowledge the receipt of your letter, dated the 6th instant, in which you urge, on behalf of the Committee of the Indian Tea Association, the expediency of the Assam and Chittagong Emigration Bill being passed into law at an early date.

2. In reply, I am directed to say that the Government of India will employ all means in their power to expedite the passing of the Bill, and that it will, if possible, be passed at Simla. I am, however, to add that it is not probable that the measure will be ready for enactment before October next."

We trust the Bill will become law early in October, as it would in many cases save an entire year, to have it passed in time, for the recruiting season, which commences usually in September. There are one or two points which we may notice here in connection with this Bill. It is proposed to give planters power to arrest coolies without a magistrate's warrant. This provision seems to have occupied the attention of the Viceregal Council. It is no doubt a very important provision, and directly invades the liberty of the subject. There are, however, circumstances connected with the contract between planters and coolies, which render special legislation in this direction advisable, if not imperatively necessary. Planters are frequently situated at a great distance from the magistrate's office, and if they must apply for a warrant before detaining a coolie who is bent on breaking his contract by bolting, they may as well let the man go: for before they have obtained their warrant, the run away may be a hundred miles off and beyond the magistrate's jurisdiction. There are other points in connection with this amended Bill which we noticed when the draft was submitted to the Lieutenant-Governor by the Committee, and which do not require further notice here. When a Bill is sent up before the Council, it is usual to append to it a series of reasons and objects, showing what is sought to be obtained by the Bill; and in connection with protective legislation of this sort, the great point has hitherto been the protection of the poor coolie. In his letter to the Government of India, the Honorary Secretary to the Indian Tea Association says: "Nor is such registration at all necessary for the protection of the locally engaged laborer, who, as pointed out by the Government of Bengal, and as the Committee know from their own experience, is thoroughly well acquainted with his rights and privileges, and perfectly able to take care of himself in any engagement he may enter into." The truth of this statement will not be called in question by any one who understands the subject thoroughly, and who has been for years in charge of such coolies. It is therefore with much satisfaction that we observe a departure from the time-honoured principle of protecting a man who has been shewn to be perfectly able to look after his own interests. One prevailing principle observable in this draft Amended Bill, is the protection of the employer. This latter individual has been groaning for years under the crushing protection afforded to the labourer, at the expense of the employer, and we are pleased to see a change coming over the system. It may be mentioned here, also, that we do not think the provisions of this new amended Act will remain long in force. The opening up of communications between the recruiting and the tea districts will soon make the act obsolete. Coolies will soon find their way to the tea districts, when all arrangements made between them and the employers of labour will be under the ordinary provisions of the Contract Act of India. The need for special legislation will then have ceased to exist.

REBOISEMENT.

OF the many benefits which the British Government is undoubtedly bestowing upon this country not the least is the persevering effort to reboise it. There was without doubt a time when Upper India was well wooded. Indeed, we know that upon those Trans-Indus plains which are now the very perfection of hideous sterility, there stood forests of such growth as to shelter the red deer and the rhinoceros. The memoirs of Baber describe how he and his hardy Moghul followers hunted these with the glee of men who find unaccustomed game, when they first descended from the steppes of Turkestan through the savage Afghan passes into the plains of India, to found that Moghul Empire to which we have succeeded. The forests of Hindustan, however, have disappeared beneath the tramp of contending armies. West of the Jumna, wave after wave of invaders—Afghan, Moghul, Persian, Tartar, Biloch, have consumed them for the firewood of their mighty hosts. Even the people of the country struggling up to independence against enfeebled oppressors—Ghukker princes resisting the Afghan, Sikh Misls defying the Moghul—have not spared the ancient witnesses of their rule, their despair, and their resistance. The giant trees which had stood through centuries amid this whirl of conflict, with branches stretched toward Heaven as if in prayer for the deliverance of the land from its oppressors, have fallen to the greatest extent by the ungrateful axe of the sons of the soil. Traditions are rife of the vandalisms perpetrated by the Sikhs. Mighty plane trees, whole groves of mulberries and mangoes, cleared off for firewood or to root the huts of their temporary camps. East of the Jumna again the Mahratta and Pindari swarms followed the same *rôle*. During the break-up of the Moghul Empire, Hindustan was a wild and tossing chaos, torn and convulsed by the struggles of dynasties for the mastery. Principalities were erected with incredible rapidity by successful leaders, only to fall to pieces the next moment, while other warrior chiefs built up petty

sovereignties out of their *débris*. Vast torrents of desolation poured down from time to time from the Afghan mountains or from the highlands of the Mahrattas. And over the whole there spread ceaseless the curse of the Pindari hordes, eating up, like the locust, every green thing. Such were necessarily bad days for the peaceful trees, and they fell to the axe of the destroyer. The provinces between the Son and Jumna were stripped as bare as the Punjab; Oudh and Behar only escaped through the approach of the foreigners from the East. But the day of the trees was to return. Their avenger was not far off—the red line advanced further and further on the map and a belt of green followed it.

Wherever the Englishman has placed his foot trees have sprung up; first around his habitation, then on the roads radiating therefrom, then in groves at places where he is wont to camp, lastly round about among the villages, whose inhabitants, settling down into prosperous agriculture under his ægis, recall to mind the ancient pleasures of coolness and shade, and the profits of fruit and timber. Finally the Government took up arboriculture on a system. It has become a department. Now, in the territories under the Government of Allahabad at any rate, the smiling *paysage* of the old Hindoo days bids fair to return, and Dryad and Hamadryad will soon visit their ancient homes and inhabit the cool shade of frequent groves. The Department of Agriculture in that province gives but a few lines in its report for last year to the description of its exertions, but the results we gather therefrom are indeed gratifying to those who believe in reboisement as one of the first necessities in this country for protection against both pestilence and famine. "Out of 2,500 miles of public road in the North-Western Provinces and Oudh, about 590 miles are every year under arboricultural operations, involving the maintenance of about 500,000 trees. Upwards of 200,000 plants are every year planted out on roads from the nurseries, most of which are fruit and fodder producing. Without special reasons no other trees are allowed to be planted. These plants are raised in 110 nurseries scattered all over the province. Groves are also planted here and there, and instructions have been given for their establishment on an extensive scale in the Jhansi division, which is most deficient in trees. Private persons have also been encouraged to plant trees on road sides with the privilege of taking the fruit and dead wood, and in some districts they have come forward to do so with alacrity.

* * * * *

Besides avenues on public roads, opportunity is taken to interest private persons in horticultural operations by supplying them with seeds and plants from public gardens free of, or at a nominal cost, by giving instructions for planting, and by explaining to them the benefits of tree planting."

This stage of progress has not yet been attained in the Punjab. In fact the success in respect of arboriculture of the North-Western Provinces is entirely owing to an individual, Mr. Buck, and no Mr. Buck has as yet arisen in the next province. In the Punjab, arboriculture is left to the idiosyncrasy of the district officer, and to the spasmodic efforts of tehsildars. It is paid for from the district funds, and more or less money is devoted to it accordingly as these officials are inclined to the saddle or the chair. Even where sufficient funds are applied to arboriculture, they are apt to be greatly wasted. A grant for way-side trees very probably becomes a fund to support in happy idleness, as bheesties and chuprassies, various hangers-on of the tehsil establishment. It is generally reckoned that every tree brought to maturity on a district road has cost ten rupees, and at this rate it is evident that many years must elapse before the Punjab will present the appearance that the N.-W.P. presented even twenty years ago. But there can be little question of the far greater need of the Punjab. The stations there are generally fairly wooded, but reach the outskirts of most of them and then gaze out astonished at the howling wilderness beyond you: undoubtedly, when the autumn and spring crops are on the ground, the plain, though treeless, looks green and fertile. When the crops are cut, however, gazing over the barren expanse, no one would ever imagine that anything grew thereon. The plain stretches for miles to the horizon, bare, desolate, treeless, or if a few trees are to be seen, they are the tamarisk and kikar which are by no means calculated to take off from the aspect of desolation. Of course there are districts like Delhi or Hoshiarpore, to which this description does not apply; but on the other hand there are many, such as Montgomery or Sirsa or Dehra Ismail Khan, for which it is not half bad enough.

Arboriculture, then, in the Punjab, should be taken up on a system as in the N.-W. P. and Oudh. A central authority should, like Mr. Buck under the Government of Allahabad, prescribe a systematic method of planting and maintenance. It is evident, when we consider the small amount of means available in the Punjab, that the great outlay necessary for growing avenues generally along all the public roads cannot be undertaken. No doubt with care and supervision, the trees could be brought to maturity at an average rate of two rupees or even less. We refer to fruit or fodder producing trees, as in the N.-W.P. But this money can be laid out to better purpose in groves, and for the road sides it should suffice, except in the immediate vicinity of head-quarter and tehsil stations, to plant tamarisk cuttings and sow kikar seed on the trench system. Trenches averaging two feet deep and three feet wide should be dug on each side of district roads, the earth being used to raise the centre of *kutcha* roads or to spread over the cosses of *pucca* ones. In these should be stuck double rows of tamarisk cuttings, or kikar seed sown broadcast in the autumn. The operation costs little, and no further attention is required Ninety per cent. of the seeds or cuttings may fail, or be destroyed by goats and cattle, and yet the results are profitable Of course gaps caused by such failures should be filled up yearly with more cuttings and more seed. Near stations, where better trees are planted, the best known method is that of borrow-pits, connected by small, shallow trenches.

The main strength of the Arboricultural Department in the Punjab should, however, contrary to the N.-W. P. system, be devoted to the planting of groves. For these, waste patches of land can everywhere be found, which either belong to the Government or can be acquired at small cost. It must indeed be a bad soil which will not grow some kind of tree. For these, irrigation is required, and must be obtained either from a canal or by construction of wells. Evidently the initial expense and the keeping up of the wells for the irrigation of the groves, is a very different thing from the watering of miles of roadside trees by bheesties. Where a road-side tree costs a rupee, a grove tree costs a pie, or less. Certainly the advantage of shade for travellers is lost, but this is a very minor object. To dot a country with groves must in every other respect offer all the advantages obtained in traversing it with long lines of trees. The first object in either case is to encourage tree planting by the people, and this is to be attained by shewing them that tree-planting is profitable, which is best demonstrated by groves, and that it is advantageous and agreeable in respect of the shade afforded, the food and fodder yielded, the wood supplied for fuel, thus releasing the cowdung for manure, and finally of the power of the trees to attract and retain moisture. A department working on this system and by means of a native extra assistant in each district specially told off to superintend the district operations in communication with the superintendent of arboriculture, would soon cover the Punjab with groves and border the long lines of arid road with a fringe of useful timber and fuel-producing trees.

NOTES FROM A COTTAGE GARDENER.

"THE HYACINTH."

(Communicated.)

As it will soon be the season for potting and planting these sweet-scented and lovely spring flowers, a few hints on the best mode of cultivating them will be found useful. They are grown in three ways, namely in glasses filled with water, in pots, and in beds in the open ground.

In Glasses.—Whenever you have the opportunity, choose your own bulbs, or deal with a trustworthy man. Select such as are of a middling size, of a close, compact, round form, without offsets at the bottom; also notice that the apex or the top of the bulb is full and firm. There are now several kinds of glasses, some made of

clear glass, and in old-fashioned shape; others of the same shape, but with the glass of various colors; and there are others of the more recent fashion with the lower part bell-shaped. Where fancy rules, it is difficult to decide on which to fix. I am, however, inclined to the first named; namely, those upright ones made of clear glass. It may be said with truth of this form and make, that the roots and the water are better seen, and of course if anything be wrong, it can sooner be set right. Be the choice as it may, now is the time to procure the roots and the glasses. Fill the glasses with clear rain water or soft water, and place the bulbs in the cup at the top of the glass, taking care that they are not in actual contact with the water, I would say, let the thickness of a shilling be between the bottom of each bulb and the top of the water. The roots will quickly push and find their way down in the water. Then place them in a dark and cool room, where the temperature is pretty nearly of an even character. Let them remain here until the roots have grown downwards nearly to the bottom of each glass.

If they are then examined at the roots, they will generally be found covered with a greenish slime, and the water will be dirty. In that case draw the roots carefully out of each glass, throw away the water, wash the glasses quite clean inside and out, refill them with fresh, clear, soft water, and then wash off carefully the green slimy matter, leaving the roots as white as snow. This washing must be carefully done, so as not to break or bruise any of the roots. When once done effectually, they will not require washing again. The water should be changed once every week or ten days. With this slight attention good healthy bulbs will produce very fair flowers, and will ornament the parlour window for a considerable time, the bulbs, however, will suffer considerably by this water culture. The only thing the amateur can do is to turn them out of the glasses, and lay them in by the heels in the open ground in some shady border. They will here ripen their bulbs, and will do to plant in the mixed border the following season.

In Pots.—The soil for hyacinth in pots should be rich and firm. Turfy loam two-thirds, and well decomposed cow-dung, at least two years old, one-third will form as good stuff as needs be for them, and it will be an improvement if a liberal sprinkling of sharp river sand be added. The pots for hyacinths are deeper and more upright than ordinary, but they will do very well five inches in diameter, place one bulb in each. If more than one is put into one pot, the size must be proportionably larger. In potting lay an oyster-shell or a piece of broken pot over the hole; then put in about an inch of soil, press it down very firm, then add a second inch, and press it down firmly also, and so proceed till the pot is nearly full. Then place the bulb upon the soil, and add soil enough to just cover it, excepting the very apex of the bulb. To keep the bulb from rising up (which it will do, or rather the roots as they spring forth will lift the bulb up), press the soil around it even more harder than that under it. I have always found this hard pressing of service. It prevents the roots from quickly rushing down to the bottom of the pot, thus giving them time to gather up nourishment during their descent.

The season for potting is as early in October as may be convenient. For a succession a second batch might be potted towards the end of November.

As soon as they are potted, place the pots in a bed in neat straight lines, and cover them over with sifted ashes or rotten tanner's bark, or even sawdust would do (though I think ashes the best), three or four inches deep. Here they are to remain to form roots and just start in growth. Then take a portion out at a time, wash the pots, clear off the ashes, and place them in a little warmer spot. Whilst here, they should be freely watered, and the flower-stems supported with neat green sticks or wire supports.

As soon as the blooming season is over, the pots should be removed into a favourable situation, and there be plunged quite overhead in the ordinary soil, continue to water them freely, and thus the bulbs will be regularly fed, and will become very fair plants for borders the following year.

NATIVE AGRICULTURAL EXPERIMENTS.

Communicated.

At about three miles from Ghyali, there are two villages called Aroon and Thathangoody. In these villages my father purchased 15 years ago 144¼ acres of land, for Rs. 15,000, of which 85 acres are in Aroon and 59¼ acres are in Thathangoody.

The village Aroon consists of 193¼ acres in extent, whereof 180 acres are wet lands, while the remaining 13¼ acres consist of 2 or 3 elevated patches taken up for habitation, &c.

And the village Thathangoody consists of 135 acres, of which 130 acres are wet lands, and the remaining 5 acres being taken up for habitation, &c.

The village Aroon is somewhat better irrigated by a channel branching from the river Collaroon (a branch of Cauvery) than the village Thathangoody, which has only a very precarious and uncertain supply of water from a channel branching from a drainage river called Palavar.

The soil in both the villages from the surface to a depth of 4 or 5ft. is of dense clay, and the subsoil below is sandy. A thin flow of subterranean water in the sand, below a depth of 6 or 8ft. from the surface is obtainable during the hot season.

These lands from the time of purchase, are scarcely yielding any margin of profit, and as many other villages are labouring under similar difficulties, and reference into the accounts of the past years, showed that the yield has been gradually declining, I determined to take up the cultivation of the lands in Aroon and Thathangoody villages, under my direct management, and ascertain experimentally what could be done to remedy the evils.

I herein give a regular description of the routine practices of agriculture followed in this taluq and generally in the district.

The wet lands as a rule are given to the under-tenants or Porakudies, who cultivate for varum (a share in the produce) and the varum in these villages is 30 per cent. of the produce.

In addition to the abovementioned varum, they also enjoy a piece of land as *Inam*, and hold punya lands or dry lands if there be any, on a low rent.

During the season of cultivation they get a premium of paddy, for seeds and wages, and the amount of these items is deducted from their varum, payable on the outturn of their labours.

Some servants as Thotti, water-man, carpenter, black-smith, &c., and some institutions as pagoda, Bramin, priesthood, &c., are maintained both by *Inam*, and also by a share in the produce.

From the month of August the supply of water is obtained from the river, and the tenants or Porakudies, after a period of rest, during the hot season, get a loan from the Merasdar to purchase the cattle gapped out in the previous year, and get some wood and purchase a mammatti blade from the bazaar, and carry them to the carpenter and blacksmith who makes and give them mammatti and plough.

In the month of August the seed beds of kar varieties are watered, ploughed, and kar seeds sown.

In September the kar varieties are transplanted, and the seeds of sumba varieties are sown. The kar fields form only ⅓th or ¼th of the extent of the wet lands in the village, and the rest are transplanted with sumba varieties, and sumba transplantation extends over October, November, and December.

In November and December the kar varieties are harvested, and in February and March the sumba varieties are harvested.

Three to four ploughings are given for the puddling, and no manuring is practised, and the paddy plants are weeded once.

This system has long been in practice and has produced several evils.

The Porakudies and servants who were almost slaves in former days, have gradually grown idle by the abolition of slavery by the British Government, and have neglected their duties because they have no corporal punishment as they had before. The yield of the land became gradually reduced, and it now ranges only in such amounts that it is scarcely possible for a Porakudie even to pay back the stipulated advance he obtains from the Merasdar during the cultivation.

The following accounts of a Porakudie, shows the condition in which the agricultural labourers in the taluq stand.

A Porakudie cultivates with a pair of cattle 4 acres of wet land, and the yield of 4 acres ranges on average from 80 to 90 kulums, therefore the share or varum of the Porakudie ranges from 25 to 30 kulums.

For these the items of advances they get are as follows:—

Seeds at 2¼ kulums an acre	... ...	10 kulums
Cultivation, expenses at 2 ditto	... ...	8 „
New year's day, &c., festivals	... ...	3 „
Total	...	21 „

The remaining 5 to 10 kulums he gets at the harvest, but he recklessly spends at the very harvest season, this 5 to 10 kulums together with 5 to 10 kulums which he could get from the *Inam* lands.

Thus if the yearly account of a Porakudie were to be settled, taking the loans he gets for cattle purchase, marriage, &c., into consideration it could leave no margin of profit, but only leave an addition to their old debt.

Therefore the annual income of tenant or Porakudi including the *Inam* and wages, will never exceed 30 or 35 kulums, unless he gets something more by petty thefts and pilfering. Consequently the Porakudies are no better than the cattle, and they really starve bitterly for many months, as they recklessly consume away the little stock they secure during the harvest season.

Thus in the whole of my estate, I can find only a very few Porakudies who are not indebted to me in hundreds of rupees.

I find it an universal custom with the Porakudies to appropriate for their own private use, a portion of the seed, and cattle purchase money in collusion with the village agents, and sow the nursery thin, and purchase worthless cattle unfit for work, which scarcely last for a single year. Consequently the death of the cattle comes up in every year to an awful percentage, and I am obliged to spend annually a large sum of money in cattle purchase.

Consequently the Porakudie system rendered the working class ignorant negligent and untrustworthy paupers, and I find it totally impossible to attempt any improvement without altering the present system.

In the year 1879 I attempted to abolish the Porakudie system in the Aroon and Thathangoody villages, as they are situated at a convenient distance from my place of residence, and at the same time as they are not in the centre of my villages to tend to the creation of any unpleasant feeling on the part of the labourers, likely to lead to general confusion in other villages at the outset.

I relieved the working class from the worthless contract, and brought them as daily labourers, allowing them the enjoyment of the *Inam* lands.

I withdrew the *Inam* of the servants, and the pagoda and other institutions, and made them receive the monthly payment.

I took a few worthless cattle left with the Porakudies, crediting their value to their account. I constructed and purchased ploughs and other implements and appointed trustworthy agents to conduct the process of operations under my direct supervision.

I built cattle sheds and other necessary buildings, regulated myself the food for the cattle, and made arrangement for their sanitation, treatment, &c.

I now find all the cattle with the exception of those taken from the Porakudies, fit to work, with light improved ploughs and with carts, and the awful percentage of their mortality is not felt for the last two years.

The following table shows the total outturn and cultivation, expenses of the Aroon and Thathangoody villages for the past 15 years :—

THE TOTAL PRODUCE.

YEAR.	Paddy in kulums of 24 Madras measure.	Market value per kulum.			Money value			Value of straw, manure, &c.			TOTAL.		
1866 ...	3198½	1	7	...	4297	10	0	150	0	0	4147	10	0
1867 ...	3481½	1	..	...	3481	10	0	100	13	6	3592	7	6
1868 ...	1168½	1	5	...	2584	10	6	92	4	7	2676	15	1
1869 ...	3157½	...	15	6	3058	9	4½	128	0	0	3206	9	4½
1870 ...	2718½		12	3	2081	5	7½	127	6	11½	2208	12	7
1871 ...	2589½	...	15	9	2500	1	0	119	1	0	2619	2	0
1872 ...	2687½	...	15	10½	2666	10	0	125	15	6	2792	9	6
1873 ...	2603½	1	1	9½	2695	0	7½	122	0	7½	1317	1	3
1874 ...	2266	1	...	...	2206	0	0	106	4	0	2772	4	0
1875 ...	......	...	...	...	......	...	...	......	...	...	......	...	...
1876 ...	2345½	1	12	7	4190	12	2½	109	15	0	4299	15	2½
1877 ...	1969	1	15	...	3804	15	0	92	4	9	3897	3	9
1878 ...	2606½	1	12	6	4749	11	3	120	0	0	4874	11	3
1879 ...	2628½	1	3	1	3041	10	11½	118	9	6	3155	4	5½
1880 ...	2762	1	...	...	2762	0	0	222	10	0	2984	10	0

OUTLAY AND RESULT.

YEAR.	Total. Seed & wages	Money value.			Expense of cattle keep, &c.			Kist.			TOTAL.			Profit			Loss.
1866 ...	1408½	2017	8	6	600	0	0	83	8	7	3301	1	5	1146	8	7	......
1867 ...	1559½	1559	6	...	610	13	0	696	1	1	2865	14	7	726	8	7	......
1868 ...	1805½	1713	10	1½	392	4	7	710	0	0	2815	14	8½	......			138 15 7½
1869 ...	1648½	1596	11	10½	428	0	0	710	0	0	2784	11	10½	491	13	6	......
1870 ...	1378½	1051	12	6	427	6	4½	710	0	0	2189	2	10½	19	9	5½	......
1871 ...	1402½	1380	7	6	419	1	0	710	0	0	2509	8	6	100	9	6	......
1872 ...	1370½	1359	14	0	125	15	6	710	0	0	2405	11	8	296	11	8	......
1873 ...	1231	1368	13	6½	422	0	7½	710	0	0	2500	14	2	516	3	1	......
1874 ...	1228	1228	0	0	406	4	0	710	0	0	2341	4	0	428	0	0	......
1875 ...	......	...	...	...	......	...		...	......		......	...	...	...	......		......
1876 ...	1072½	1116	9	11½	409	15	0	710	0	0	3326	4	7½	1266	10	7	......
1877 ...	1322½	2727	10	6	392	4	8	710	7	0	3830	6	3	66	3	0	......
1878 ...	1297½	2310	7	1	425	0	0	710	0	0	3445	7	1	1304	4	2	......
1879 ...	1308½	1736	2	7½	324	13	4	719	5	5	2780	5	4½	375	15	1½	......
1880 ...	1317	1817	0	0	606	2	10	728	2	0	2651	5	1	333	5	2	......

As both the villages Aroon and Thathangoody lie close together, the cultivation operations are carried on as if they are one and the same village.

In 1880 the village Thathangoody as almost in every year, suffered severely from want of water during September and the early part of October, just at the time of transplanting, and the fields became thoroughly dried and cracked.

Thus the average yield per acre in the village Aroon is 27⅝ kulums, and 27 loads of straw worth Rs. 28-14, and the average yield of the village Thathangoody is 12½ kulums of paddy, and 9½ loads of straw worth Rs. 13-1 per load. The cultivation expens. inclusive of kist, for both the villages, Rs. 20-0-3 per acre. Therefore the loss per acre in the Thathangoody village is Rs. 6-14-9, and the profit per acre, in the Aroon village, is Rs. 7-2-9, and therefore the profit on the whole for both the villages is only Rs. 2-7-10½ per acre.

The Field Experiments.

The experiments conducted this year include the determination on the effect of—

(1.) Deep cultivation and inversion of soil.
(2.) Farmyard manure.
(3.) Bone ash.

The paddy in the wet lands, is the crop on which the experiments were made.

I was able to conduct only a very few experiments this year, because

(1.) Much of my time and attention was spent in bringing the labourers in the experimental village to proper order, they totally disliking their idle system to be altered.

(2.) The wet lands in the experimental village as most other villages in the taluq suffered severely both from draught during September, and submersion during December, owing to the imperfect arrangement of irrigation and total absence of drainage.

None of the fields experimented were manured in the previous years.

Cost of Cultivation.

The data given below concerning the cost of cultivation has been determined by actual measurements, and represents the cost per acre of each operation, carried on by higher labour under supervision not of a very strict nature.

1st of Operations.	Per acre. Rs.	As.	P.
Ploughing by light improved iron plough ...	1	12	0
Ditto by the country plough for the 1st ploughing	1	11	0
Ditto by the country plough for the 2nd, 3rd, and 4th ploughing	0	12	0
Raising the seedlings	0	8	0
Digging and bordering	0	6	4
Transplantation	0	7	9
Weeding	0	4	7
Irrigation	0	4	5
Harvest	2	6	0
Inam	0	14	0
Sundries	0	10	1
Superintendence	2	1	9

2nd of Manures.	Rs.	As.	
Farmyard manure	0	5	per cartload.
Bone ash	2	8	„ candy or 500 lbs.
Kar seed	1	4	„ kulum.
Gumbra seed	1	10	„ „

One kulum of Tanjore is equal to 24 Madras measure or Avois, 72 lbs.

EXPERIMENTS ON DEEP CULTIVATION AND INVERSION OF SOIL.

Plot.	Area.	Treatment of the crop. Ploughing.	Manuring.	Transplantation.	Irrigation.	Miscellaneous.	Previous treatment.	Outturn. Actual. Grain in kulums of 24 Madras measures.	Straw in loads of 32 lbs	Rate per acre. Grain.	Straw.	Cost of cultivation including kist per acre.	Value of the produce according to the market rate per acre.	Profit per acre.
(1) Experimental field.	6¾ acre.	In August watered and ploughed once by the iron plough, to a depth of 7in., and in September again ploughed once by the country plough.	Not manured.	In September transplanted with kulian seedlings, a variety of Gumba paddy, raised from 10 kulums of seeds.	The field was watered in September before ploughing and kept under water up to harvest.	Weeded once in November.	Not manured, and Gumba paddy grown as usual.	190	160	28½	24	18 10 3	30 0 0	11 5 9
(2) The adjoining field.	3¼ acre.	In August watered and ploughed twice by the country plough, and again in September ploughed twice by the same plough.	Do.	Do. with kulian seedlings raised from 5 kulums of seeds.	Do.	Do.	Do.	75	57	22½	17	20 0 3	23 9 0	3 8 9
		Percentage of increase				in grain 26·6			in straw 41			in profit 220		

EXPERIMENTS ON THE EFFECTS OF FARM YARD MANURE.

Plot.	Area.	Ploughing.	Manuring.	Transplantation.	Irrigation.	Miscellaneous.	Previous treatment.	Actual Grain.	Actual Straw.	Rate per acre Grain.	Rate per acre Straw.	Cost of cultivation.	Value of the produce.	Profit per acre.
(1) Experimental fields.	2⅓ acre.	In August watered and ploughed twice by the country plough, and again in September twice by the same plough.	100 cart-loads of farmyard manure, for pit manure applied just before watered.	* In September transplanted with Gumba seedlings raised from 5 kulums of seeds.	Watered in August before ploughing and kept under water up to harvest.	Weeded once in November.	Not manured, and Gumba paddy grown as usual.	100	150	30	45	23 12 3	32 13 0	9 0 0
(2) The adjoining field.	3¼ acre.	Do.	Not manured.	Do.	Do.	Do.	Do.	75	57	22½	17	20 0 3	23 9 0	3 8 9
		Percentage of increase				in grain 33·3			in straw 164·6			in profit 255		

* Being planted too thick as usual, the plants were very close, and yielded more straw—only.

EXPERIMENT ON THE EFFECTS OF BONE ASH.

Plot.	Area.	Treatment of the crop. Ploughing.	Manuring.	Transplantation.	Irrigation.	Miscellaneous.	Previous treatment.	Outturn. Actual. Grain in kalums of 24 Madras measures.	Straw in loads of 82 lbs.	Rate per acre. Grain.	Straw.	Cost of cultivation including kist per acre.	Value of the produce according to the market rate per acre.	Profit per acre.
(1.) Experimental field	½ an acre.	In July watered and ploughed 3 times by the country plough, and in August ploughed twice by the same plough.	37½lbs. of bone ash dressed at the time of transplantation.	In August transplanted with Burmese seedlings, a variety of kar paddy raised from [illegible] kulums of or 1½ Madras measure of seeds.	Watered in July before ploughing, and kept under water up to harvest.	Weeded once in September.	Not manured, and kar paddy grown as usual.	30	15	60	30	22 0 3	61 14 0	38 13 9
(2.) Adjoining field	1 acre.	Do.	Not manured.	Do. with the same Kar [illegible] seedlings raised from 1½ kalums of seeds.	Do.	Do.	Do.	31½	28	31½	28	20 [illegible] 3	36 4 0	16 3 9

Percentage of increase in grain 75·3 in straw 7·1 in profit. 239·3

EDITORIAL NOTES.

We publish in another column a letter which has been addressed to the Calcutta Chamber of Commerce on the subject of the imposition by the Chinese of certain duties on opium in some of the treaty ports, which are unauthorised by the Treaty of Tientsin. The importers contend, and their position is unassailable, that under the treaty a tax of 30 taels a picul, or about Rs. 115 per chest, and no other tax whatever, is leviable upon opium within a treaty port. But it is said that the Chinese have imposed, or are about to impose, duties which will amount (together with the lawful Rs. 115) to Rs. 874. The moment the opium gets outside the premises of the importers, it is held to be liable to these extra duties. This position is of course entirely indefensible. The opium cannot be made liable to any extra duty until it has got, not merely outside the importers' premises, but outside the treaty port, without a breach of treaty. How far the Chefoo Convention would justify the action of the Chinese authorities is not a relevant question, so long as that convention is unratified, and it is as plain as possible that the Chinese are just as well aware as the opium importers are that they are breaking the treaty. It will take a long time, however, and will cost a deal of trouble, to get the wrong rectified, and in the meantime the officials will be able to collect large sums in this high-handed way. As Messrs. Herton & Co. observe, this action of the Chinese officials will probably be ascribed by the Anti-opium League to their desire to discourage the importation and consumption of opium. These Chinese officials, we shall be told, see with anguish the evils which the vice of opium-smoking is working among the people, and, as Britain will force opium upon them, they are doing what they can to put it beyond the reach of the people. But the explanation which Messrs. Herton & Co. give of the motives of the Chinese authorities is, we fear, the true one, and though the Indian drug may be put beyond the reach of many who use opium, the effect will only be to compel them to use the native article. It does not appear, however, that the most vexed questions connected with the opium trade need be raised in connection with Messrs. Herton's letter. Whatever our views on these questions may be, we cannot help seeing that the opium traders are within their rights in asking that the treaty be adhered to until another arrangement has taken its place. Of course the action of the Chinese must tend to lessen the demand for foreign opium, and so the opium merchants and the Government in this country are interested, as well as the importers in China. Accordingly we understand that the Calcutta Chamber of Commerce propose to bring the matter to the notice of the Government of India, and in the meantime the Chamber invite an expression of opinion on the subject from persons interested in the opium trade.

In connection with the Assam Railway scheme, the Lieutenant-Governor said that an effort would be made to induce the offer of local capital, especially from natives. There is no reason why such work should not be taken up almost entirely by native capitalists, except the potent one of want of patriotism. We can thoroughly understand the wealthy native who refuses to advance his captial on the chance of obtaining four or five per cent. when, by lending it among his own people he can obtain from 12 to 36 per cent. for it. There is, however, another way of looking at it. When a railway runs through a district, the value of land and other property is materially improved, a demand is created for land, rents rise, and the

position of the owner is very much improved. A consideration of this fact should induce wealthy zemindars to invest largely in such schemes, looking on them as they would on extensive drainage or other schemes for land improvement purposes. This is where their want of patriotism is shewn, and where a total absence of other than purely selfish motives is the controlling power, one cannot look for broad statesmanlike views to be taken. At home, commercial men support such schemes from motives of a mere secondary nature. A man will invest largely in a railway which does not go near his land, but which is calculated to improve trade and commerce generally, he hoping to benefit more in that way than in dividends. A strong effort should however be made to point this out to wealthy zemindars, and if possible the capital of our railways should in future be raised here, when loss by exchange would largely be done away with.

In this connection, we may notice a proposal to run a line from Balagunge to Luckeepore on the frontier of Munoopore, by way of Sylhet and Silchar. We do not approve of this scheme. It necessitates crossing the Khooseara at Bangha just below the point where the Barak bifurcates in the Soorma and the Khooseara, and the Barak a little above the sudder station of Silchar. The Assam Railway, as proposed by the deputation who waited on the Lieutenant-Governor last week, on the other hand provides for both Cachar and Assam Proper, and avoids all the large rivers except the Megna, which would be crossed at Goalundo. Another objection to the Soorma Valley line is the fact that it provides for a steamer between Goalundo and Balagunge, which would always take four days at least, and would continually lead to irregularity in timing. It would, besides, be utterly impossible to adapt it to any extension by way of Assam Proper. We trust that the Goalundo and Mymensing line will be prosecuted with energy, and that the two extensions towards the Brahmapootra and Soorma Valleys will not be lost sight of. The best route for the latter will be to get to the Terai at the foot of the Garrow, Khossia, and Jaintia hills soon after leaving Mymensing. The Sylhet station would then be in the town of Sylhet, while the Cachar line would pass opposite the sudder station of Silchar. The rivers between these two stations are not very large, *viz.*, the Loob and the Jatinga, and could be bridged without an extravagant expense.

An American paper has the following :—

The inhabitants of Great Britain are making steady continuous inroads upon their hitherto waste lands. The cultivated area in 1880 was 32,101,909 acres, as compared with 29,727,047 acres in 1867 ; between 1879 and last year about 26,000 acres were brought into cultivation ; in previous years the average advance had been from 100,000 to 150,000 acres. So far this is encouraging. What we have heard from the farmers now for some years prepares us to find that the acreage under corn (including beans and peas) is slowly decreasing, and whereas it was 9,234,780 acres in 1867, it was 8,875,702 last year. In green crops the diminution has been slighter in the same period, namely, from 3,498,163 acres to 3,476,653. Hay and rotation grasses show an increase from 3,989,974 to 4,431,339 ; and permanent pasture from 11,136,036 fifteen years ago to 14,426,959 acres last year. Market gardens have made a satisfactory advance, showing that increasing attention is being paid to the small cultures ; the acreage has increased from 36,201 in 1872 to 44,490 in 1880. The area under orchards has fallen off from 206,583 in 1871 to 189,596 acres in 1880. So far as the statistics of live stock can be depended upon, the number of agricultural horses is slightly less than last year ; cattle have increased, and number nearly six millions ; sheep have decreased from 28,157,080 to 26,619,050 ; and pigs from 2,091,559 to 2,000,842. In Ireland, on the other hand, ground has gone out of cultivation, the quantity being about 180,000 acres less in 1880 than in 1876. All the principal crops have slightly diminished, and the cattle have increased in number ; but both sheep and pig are becoming fewer in number in Ireland :—

The Punjab Government have passed the following remarks on the report of the Superintendent of the Agri-Horticultural Society's Garden, Lahore, for the year 1880-81 :—The experiments in arboriculture have to some extent shown what trees are suited for the Punjab, and the best methods of growing them. So far it seems probable that the Rain-tree cannot stand the cold of this province, but steady progress is being made in the distribution of Eucalyptus plants and seed, and the success of the experiments made in grafting the European olive is satisfactory.

2. The experiments with oats and wheat from America are interesting, but a better judgment could have been formed as to the results, if the area sown, mode of cultivation, and yield, however poor, had been stated with greater exactness ; and the Lieutenant-Governor would like to receive fuller details in future regarding experiments in raising new staples, and trials of new implements.

3. The increasing number of plants sent out by the garden is an evidence of its usefulness His honor observes that the financial working of the year is satisfactory, and that Mr. Spooner deserves credit for his management of the gardens.

Some idea may be formed of the traffic in vegetables in England from a return of one of the Railway Companies, the Great Eastern Railway Company. This company carried between the 14th June and the 8th August of the present year no less than 3,407 tons of green peas. Although this figure is enormous, it is stated that it falls short of the return for the corresponding period of 1880, by 2,460 tons, the decrease in the current year being attributed to failure of the pea crop owing to the hot dry season.

The following is from an American agricultural journal.

The census bulletin on agriculture just issued shows that the past ten years have been the most remarkable period of agricultural growth in the history of the country. The entire cereal product of the United States has made the enormous advance of nearly one hundred per cent. During the preceding decade the increase was but 12 per cent., while between 1850 and 1860 it was 43 per cent. The yield of wheat alone has advanced from 287,000,000 to 456,000,000 bushels, a gain of 73 per cent., while the product of Indian corn has sprung from 760,000,000 to 1,772,000,000 bushels, an increase of 133 per cent. The enormous productive capacity of the great West and North-West is shown by the fact that seven-tenths of the entire wheat crop of the United States is grown in the States of Illinois, Indiana, Ohio, Michigan, Minnesota, Iowa, California, and Wisconsin ; while the three States, Illinois, Iowa, and Missouri together produced in 1879—the year covered by the census returns—upward of eight hundred million bushels of corn, or more than the yield of the entire country in 1869. Verily the United States will be able not only to feed its own rapidly multiplying people, but also to supply Europe with bread and meat whenever needed.

An American journal the *Ohio Farmer* says :—We gave recently the comments of Mr. J. R. Dodge, on the comparison of cereal products for 1880 and 1870. From statistical tables we present the following summary, which will give a better idea of the actual increase of production :—

Cereals.	Acres in 1880.	Bushels in 1880.	Bushels in 1870.
Corn	62,326,952	1,722,909,846	760,914,549
Wheat	35,487,065	450,591,093	287,745,626
Oats	16,150,611	470,970,712	282,107,157
Barley	2,005,466	44,149,479	29,761,305
Rye	1,841,321	16,863,632	16,918,795
Buckwheat ...	851,304	11,851,738	9,821,721

An examination of the tables show but one State that produces less corn than in 1870—Maine—which in that year reported 1,089,888 bushels, and in 1880 only 960,633 bushels. The Eastern States generally shew but little comparative increase. The greatest per cent. of increase is made by Iowa, which jumps from a little less than 69 millions of bushels up above 276 millions. Illinois increases from a little less than 130 millions to nearly 328 millions. The figures for Ohio for 1870 are 67,501,144 bushels, and in 1880, 112,681,046, which is a very respectable increase, considering that but little area has been added to her cultivated lands in that period.

In wheat, several States have receded, as follows :—Arkansas, Lousiana, Massachusetts, Missisipi, Nevada, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Wisconsin. Rhode Island only raised 290 bushels, and in 1870 she reported 784

bushels. The figures for Ohio for 1880 are 46,014,869 bushels, and for 1870, 27,882,150 bushels. Ohio 'went back' on rye from 846,860 bushels in 1870 to 389,221 bushels in 1880. As explained by Mr. Dodge, the figures given cannot be taken as exact indications of progress or retrogression, for they represent but two single years a decade apart, and in many localities one or the other was an exceptional year, good or bad.

THE cultivation of the indigo plant in Europe has met with no greater success than the attempts to produce the dye artificially. The chemical production of indigo has fallen through because of the costly nature of the process and the inadequacy of the outturn for commercial purposes. For reasons somewhat similar an interesting experiment in the culture of the plant has resulted in failure. This experiment was recently made in Hungary, by a land-owning Syndicate, encouraged and assisted by the Ministry of Commerce. But the result is disappointing. According to the Pester Lloyd, a report has been issued by the Ministry of Commerce, *from which it appears that the money and trouble expended* on the experiment are out of all proportion to the results obtained.

THE orange crop in Kiushui, Japan, has been unusually large this year. From the two townlands of Arita and Uuami, in that province, about twenty thousand boxes of fruit have been sent daily to the Osak and Kobe markets. The number of oranges in a box depends, of course, on the size of the fruits—that of the boxes being generally fixed—but we shall not be far out if we estimate it at one hundred and fifty, at which rate the consumption of the Kobe and Osaka fruit eaters would amount to some three millions of oranges per diem. But indeed eggs and oranges represent something more than mere edibles in Japan. They are messengers of courtesy, the very rank and file of that intrinsically worthless but morally inestimable army of gifts from which all the outposts of Japanese amity and conventionality are garrisoned.

Abolish baskets of oranges and baskets of eggs from the region accessible to coppers, and you shall subject the social existence of this country to a loss not less paralysing than that of the jacket button, without which its owner was not at liberty to construe Horace.

Oranges deftly piled up in plaited pyramid, and eggs neatly pillowed in a bed of husks, do not convey much from the donor or confer much on the recipient; but in the eyes of the Japanese they are bulwarks of that very material old hospitality which forbade friendship to be ever empty-handed, and taught at the same time that the value of a gift is measured by its intention, not by its quality.

MANY have an idea that although hens do need care in winter, when the weather is cold and water freezes in their pens, it is not at all necessary to pay any attention to them in summer. But this is a mistake under any circumstances. On the farm where hens have unlimited range, there may not be any particular attention given during the summer months. But when kept in small quarters, in town and villages, the poultry need far more attention during the warm months of summer than they can possibly need in winter. In summer, vermin abound; the pens and runs become coated over with droppings; ventilation is needed; clean, fresh water must be supplied, and wholesome food furnished in such quantities that it will not become stale and uneaten in the pens. To attend to all those things requires time and care, but without time and care what profit or success comes in any line of effort?

EGGS fall off during the very hot weather of summer in consequence of the unfavourable conditions of the season, unless these conditions are met and overcome by proper attention. This being the case, the hens are healthy and the number of eggs is kept up—two results which always follow good care. Remember, then, that the best economy of the poultry yard demands that it have daily care throughout the heated months. Fresh water given daily, a change of food, and a constant watch that an over-supply be not given at any time; fresh grass and sods placed in the yards at intervals of a few days; abundant ventilation of the pens must be given; the droppings kept cleaned up; the perches occasionally coated with a mixture of lard and sulphur; dust baths furnished, and thorough watchfulness. Toward night—say during these long days at five or six o'clock P.M.,—turn the hens from their pens and give them the benefit of a leg stretching in the garden and among the grass or fruit trees. While they are enjoying this airing get a spade and dig over the earth in the pens. It will be good exercise, and the next morning the hens will think they have new quarters. Attention to these things will yield health to the hens, and a good supply of eggs for the family right through the hot weather.

ACCORDING to the agricultural statistics for 1880, the yield of wheat in Australia for the year has not proved so large as was anticipated, an increase of area from 233,368 to 252,540 acres only resulting in an increase from 3,613,266 bushels to 3,708,737 bushels.

DURING the year 1880-81, several interesting experiments were tried at the Saharunpore Botanical Gardens. Not the least interesting was one with *Taraxacum officinale*. An indent for 200lbs. of the extract having been received from Calcutta, an attempt was made to grow the plant and prepare the extract on the spot. It is satisfactory to find that the experiment was thoroughly successful. From half an acre 109lbs. were made, at the following cost:—

To cultivation, &c. ...	...	13	8	0
„ preparing extract ...	...	62	8	0
Total ...	...	76	0	0

or 11·156 annas per lb. The avarage price of the drug in England is 2*s*. 2*d*., so that when freight charges and loss by exchange are added, the cost in India will not be less than 1 rupee 8 annas per lb. From this experiment it will be seen that an acre will produce over 200lbs. of the extract, and as improved modes of preparation will no doubt be found out, the cultivation of this valuable medicine will become one of our industries.

ON the flowering of the bamboo, the same report speaks as follows:—

The present year will be a remarkable one in the history of the *Lattang bans (Bambusa arundinacea)*, which is now in flower in this district, and in Debra Doon, where it has formed magnificent clumps of over 30 years' growth. The destruction of these, which is the inevitable result after flowering, if left to themselves, will deprive Dehra for a time of one of its most beautiful features. Among the remedies which have been suggested for keeping them alive under these circumstances is one known very well to natives, and is said to have been successful. As soon as the flowers begin to appear, all the stems are cut down close to the ground, after which the roots are covered over with manure and litter and set fire to. When the rainy season comes on, it is said that an abundant crop of young shoots will break out from the old roots. It is not difficult to understand the cause of death under ordinary circumstances when we consider how the plants must be weakened by the sudden production of such an enormous mass of flowers; and at the same time, being almost devoid of leaves, the plants are thereby deprived of the means of obtaining their proper nourishment by the action of the roots. The effect of fire being applied may possibly be to seal up the points from which the remaining strength or sap of the plant was issuing, and to cause it to be stored up just as Nature does in the case of bulbs, tubers, and other fleshy underground organs, and which under suitable conditions are capable of perpetuating the plant. There will be an abundant supply of seed for sowing during the rains.

THE value of human excreta has been repeatedly brought to notice, but we almost despair of making any progress in introducing this valuable manurial agent to the notice of the Indian rayat. The only form in which they will use it, is in the form of *poudrette*. At the Cawnpore Experimental Farm a careful experiment was tried, with marvellous results. The crop grown was barley. The following were the results:—

		Manured.	Unmanured.
Grain	lbs.	2,851	1,842
Straw	„	3,603	1,968
Value of crop	Rs.	66-7-1	40-12-9

The manure cost practically nothing beyond the labour of incorporating it. The cultivation in both cases was good, and if the prejudice held by the rayat against this manure were got rid of, much good would result. The example set our Municipalities by Poona and Umritsur, might be followed with advantage all over the land. Umritsur conveys the excreta, deluged with water to

large tanks where it is precipated, but Poona goes to the root of the the matter, by changing the excreta into *poudrette*, in which form it loses all its noxious properties, and is valuable as manure.

THE subject of wind-mill too has occupied the attention of the Cawnpore agricultural authorities. The results of an extensive experiment are given, but we do not by any means consider them at all satisfactory or conclusive. In all such experiments, the data on which we go must be exact, or the deductions are valueless. The Superintendent says:—"The experiments are not so satisfactory as could be wished since it was only possible to make a rough guess as to the most important factor—the velocity of the wind." It is so far satisfactory that the importance of this factor is seen and acknowledged, as in Lucknow at a recent trial of ploughs the element of draught was eliminated, as of no importance, which, from a consideration of the class of cattle owned by the rayat, we should have imagined it one of the most important factors in the experiment. It is clear to begin with, that the class of wind-mill experimented was very inferior, as with a breeze estimated at from 8 to 9 miles an hour, the horse power evolved was only ·055. It is assumed that the average speed of the wind in those provinces is 5 miles per hour, and at that rate it was found that 1,500 cubic feet of water was raised in 24 hours, at a cost including all charges, of 5 annas. Now 1,500 cubic feet will supply an inch of water, over 5 acres, so that the supply of an inch of water over an acre costs only one anna. In this country where labour is so cheap, this may not be considered of any value, but it must be remembered that most well irrigating is performed by bullocks, and in that department we are sadly behind. So far as this experiment has shown anything definite, it is in favor of the adoption of the wind-mill. To utilize this mode of drawing water, it will now even be necessary to have large *pucca* tanks placed along side each well, at such a level as shall make the last drop of water available for irrigation by gravitation. Until this is done, the wind-mill will only be of advantage when there is sufficient wind to turn it. By having large tanks of *pucca* masonry, they can be filled when there is wind, and the contents will then be available when wanted.

THERE is plenty of elbow-room in Texas still. The census returns for the State show that of fifty-seven counties fifteen have no population, and the others have from three only to five hundred inhabitants. These fifty-seven counties are practically uninhabited. It must be remembered, too, that this great State is habitable in almost every part, the "bad lands" being very small in proportion to the whole area, while railway enterprise is opening up a very large part of the State to immediate settlement.

WE extract the following from an American paper Experiments in sowing wheat at different depths show the following results. The first column shows the depth seed was sown; second column the number of days that elapsed before the plants appeared above ground, third column, proportion of plants that came up.—

½ inch ...	... 11 days ...	... 7/8
1 inch ...	... 12 „ ...	... all
2 inches ...	... 18 „ ...	... 7/8
3 inches ...	... 20 „ ...	... 3/4
4 inches ...	... 21 „ ...	... 1/2
5 inches ...	... 22 „ ...	... 3/8
6 inches ...	... 23 „ ...	... 1/8

FROM the Agricultural statistics of Great Britain for 1881 just published, we gather that the extent of land under wheat was 2,806,057 acres, or 103,381 acres less than in 1881. Barley 2,442,405 acres or 25,036 acres less than in 1880; oats 2,901,135 acres, or an increase of 104,230 acres; potatoes 579,431 acres, an increase of 28,499 acres over 1880, and hops 64,128 acres, or a decrease of 1,577 acres. During the year the live stock of this country numbered cattle 5,911,524; sheep and lamb 24,582 154; and pigs 2,048,034.

A *Standard* telegram from New York says that it is reported from North Carolina and Virginia that the cotton crop is three per cent. below that of last year. Charleston reports say that out of fifty-three replies to a circular addressed to cotton-growers in South Carolina forty-five are unfavourable. Over sixty replies from Alabama are of an undecided character, while those from Mississippi range from fair to good. As to those from North Mississippi, North Arkansas, and West Tennessee, out of eighty-two replies twenty-five are good, nineteen moderately good, thirty-eight poor. New Orleans reports that out of over a hundred replies from cotton-growers in Louisiana the majority state that the crop is not nearly so good or promising as that of last year. It would seem, then, from the bulk of the reports, that previous estimates of the crop were too sanguine. Drought is generally complained of, but much depends on the picking. We wonder whether this means better prices of India cotton. Possibly it does, and we are encouraged to hope that the ryots may be able to meet the deficiency as the weekly reports for the Central Provinces and other cotton-growing districts continue very favourable.

THE following paragraphs give us a fair idea of what Railway enterprise is doing in America and at home:—

During the first two weeks of July last the Eastbound grain shipments from Chicago averaged 670,000 bushels daily. While that moved by the railway averaged 339,015 tons per day.

The gross earnings of all the railways working in America for the year ending 31st December 1880, was Rs. 1,23,08,03,862, while the net earnings were Rs. 51,03,86,872.

The London and North-Western Railway carry on an average 50,000,000 passengers annually, and between 30,000,000 and 40,000,000 tons of merchandise, while the earnings amount to Rs. 20,00,000 per week.

When will our railways ever move 339,015 tons of grain per day? As we have often pointed out, the American railways have reduced their grain-carrying rates to the lowest possible paying point, and they are getting their reward. With the solitary and honorable exception of the East Indian line, our system is to choke a rising trade by increased charges, a notable example of this being the Great India Peninsula line whose earnings, we observe, have fallen to Rs. 285·14·4 per week per mile.

THE *Colonies and India* remarks that the following return of sheep held by "squatters" taken from the *Government Gazette* for Canterbury and Otago, New Zealand—gives an idea of the vast flocks owned by single individuals in the Australasian colonies:—New Zealand and Australian Land Company 300,000 sheep; Mr. Robert Campbell, 386,000 sheep; Mr. George Henry Moore, 90,000 sheep, Messrs. Dalgetty & Co., 208,000 sheep; Messrs. Clifford and Weld 80,000 sheep; Sir Dillon Bell 82,000 sheep; Hon. William Robinson, 68,020 sheep; Sir Cracroft Wilson, 48,000 sheep; Mr. Kitchen, 80,000 sheep; Mr. Allan M'Lean, 500,000 sheep.

A PLANTER writes:—"Can you give me any information about the Chinese tallow tree; *i e*, its value or the price the seeds fetch in the home market?" From the *Treasury of Botany* we take:—

"Stillingia.—The tallow-tree of China is the best known representative of this genus of *Euphorbiaceæ*; but there are two or three other Chinese and Japanese species, and as many more natives of the Southern States of America. With the exception of the tallow-tree and one herbaceous species, they are shrubs; and all have alternate entire leaves and terminal catkin-like spikes of flowers. The fruit is a capsule composed of three one-seeded opening pieces, and is girded at the base by an enlarged bracket. *S. sebifera* the tallow-tree, is a native of China and the adjacent islands, but it has been introduced into and partly naturalised in India and the warm parts of America. It has rhomboid-shaped sharply taper-pointed leaves about two inches broad, on slender stalks with two prominent glands at the point of attachment between the stalk and leaf; and its flowers catkins are from two to four inches long. Its fruits are about half inch in diameter, and contain three seeds thickly coated with a fatty substance which yields the tallow. This is obtained by steaming the seeds in large cauldrons, then bruising them sufficiently to loosen the fact without breaking the seeds, which are removed by sifting; and the fat is afterwards made into flat circular cakes and pressed in a wedgepress, when the pure tallow exudes in a liquid state, and soon hardens into a white brittle mass. This tallow is very extensively used for candle-making in China; but as they get soft in hot weather, the candles generally receive a coating of insect

wax. A liquid oil is obtained from the seeds by pressing. The tree yields a hard wood, used by the Chinese for printing blocks, and its leaves are employed for dyeing black."

A MAN, by name of Tanaka Tsurukichi, living in Tsukudacho, Fukagawa, Tokio, has been paying the utmost attention to salt manufacture for a long time past. He has visited every reputed salt-producing district throughout the Empire since the era of Keio (1865-67), and in 1872 he went to America, where he diligently inspected similar establishments. After his return he again undertook a journey through Japan in order to discover a place where the American methods of manufacture could be adopted. At last he fixed upon the Ogasawara (Bonin) islands as a suitable site to carry out his enterprise. Therefore, a short time ago, he went thither with a Tokio merchant, Kinoshita Junnosuke, who has made several visits to the islands. After due trial he obtained a result not inferior to that averaged in America. Having lately obtained from the Tokio Fucho permission to establish salt works in Ogasawara, he is said to be about to go there on the 5th proximo. If the Nichi Nichi adds, the manufacture is successful, a great benefit will be bestowed on the people in their daily consumption.

SPEAKING of a proposed utilisation of the water power of the Punjab Canals, the *Civil and Military Gazette* says: "In the case of the Egerton Mills, a prominent characteristic of the undertaking is the utilization of the mechanical power which is supplied to India in the descent of the water brought by the monsoon to the Himalayan ranges; a power which, under the developments of modern science now so rapidly progressing in this direction, may be expected to afford a motive force to machinery which will go far to compensate for the absence of coal and other fuel in the upper regions of the continent of India. The Egerton Mills will be worked by a turbine set in the channel leading out of the Baree Doal Canal. The stream conducted through this channel will—after performing its duty of providing motive power to the machinery, be returned to the canal and utilized for its original purpose—namely, irrigation. We are glad to know that the co-operation of the Punjab Government in affording liberal terms for the utilization of waterfalls on the Punjab canals has given an important impetus to the establishment of this undertaking, which will no doubt be followed by others of similar character in North India, wherever this economical supply of motive force is attainable." The amount of power available from the flow of canals on the plains may be comparatively trifling, but there is sufficient fall in the "lay of the land" on the canals under the Himalayan and Sub-Himalayan ranges, to produce a large amount of motive power. For instance, in the Doon Canals, the fall southward from the Himalayas is about one foot in 100. At every three hundred yards there is a fall from 6 to 9 feet, and as a large body of water falls this distance, it follows that a large power is developed, which is but partially utilised by a wretched flour mill here and there. The bulk of water is about 2 to 4 superficial feet of cross section, and if it were carried on the level and allowed to fall 16 to 20 feet, it would develope 30 horse-power if utilised in working a turbine wheel.

SIR GEORGE COUPER'S resolution on the irrigation report of the North-Western Province and Oudh for the *rabi* season of 1880-81 is before us, and it confirms the opinion that the rate as at present fixed is much too high, and that the only way to reduce it and to make the canals and other irrigation works more popular and useful, is to make the rate a compulsory one, payable on all lands irrigable by the canals. The following are the statistics of acres irrigated, and assessments for the *rabi* seasons of the last four financial years:—

		Acres.	Assessment. Rs.		Assessment. per acre.
1877-78	...	729,845	15,23,990	...	Rs. 2 1 2
1878-79	...	1,075,952	21,75,715	...	" 2 0 5
1879-80	...	844,330	16,51,524	...	" 1 15 3
1880-81	...	1,032,010	21,09,061	...	" 2 0 8

Here then we have a charge of two rupees per acre for one-half of the year—the dry half, it is true. But we may nevertheless safely assume three and-a-half rupees as the annual charge per acre. This sum capitalised at three and-a-half per cent.—for if the Oudh and Rohilkund Railway Company can borrow at this rate, surely the Government of India can—represents a capital cost of Rs. 100 per acre. Now a fourth part of this sum spent on wells would place the cultivator practically beyond the fear of drought, and make famine impossible. It may be said that these canals are capable of irrigating a much larger surface than these figures represent. This is very true, but while payment for water used only follows the use of water, so long will the cultivators refuse to use water until spurred by the fear of famine. With a compulsory assessment at perhaps one-third the above rate, all would use it, and the income of the irrigation would cease to depend on the rainfall.

OUR railway contemporary of Allahabad tells us that "In 1879 wheat was carried from Buffalo to New York, 450 miles for one anna three pie, and corn for one anna and one pie a bushel, the lowest it had ever touched. At the same time steamers on the Upper Lakes were carrying wheat the long detour from Chicago to Buffalo, 1,000 miles, for eight pies per bushel, and corn was carried for less." That is to say, the carriage of wheat was at the rate of ·14*d*., and of corn at ·135*d*. per ton per mile. Wheat carried 1,000 miles for eight pies per bushel is at the rate of ·037*d*. per ton per mile—and yet we are asked why does not India engage more largely in the wheat trade to England. A comparison of these rates with those prevailing in India will form a sufficient answer to the question.

THE duplicity which attends all diplomatic action is a very disgraceful feature in our political systems. The latest instance in which this is illustrated is in a letter to the Society for the Suppression of the Opium Trade, a society, the members of which are doubtless actuated by worthy motives, however little these may be directed with discretion. The letter is written by no less an official than the Grand Secretary to the Emperor of China. He says: "Opium is a subject in the discussion of which England and China can never meet on common ground. China views the whole question from a moral standpoint; England from a fiscal. England would retain a source of revenue in India, while China contends for the lives and prosperity of her people. The ruling motive with China is to repress opium by heavy taxation everywhere, whereas with England the manifest object is to make opium cheaper, and thus increase and stimulate the demand in China. With motives and principles so radically opposite, it is not surprising that the discussion commenced at Chefoo in 1876, has up to the present time been fruitless of good results. The whole record of this discussion shows that inducement and persuasion have been used in behalf of England to prevent any additional taxation of opium in China, and objections made to China exercising her undoubted right to regulate her own taxes—at least, with regard to opium. I may take the opportunity to assert here, once for all, that the single aim of my Government, in taxing opium will be in the future, as it has been in the past, to repress the traffic—never the desire to gain revenue from such a source. Having failed to kill a serpent who would be so rash as to nurse it in his bosom? If it be thought that China countenances the import for the revenue it brings, it should be known that Government will gladly cut off all such revenue in order to stop the import of opium. My Sovereign has never desired his empire to thrive upon the lives or infirmities of his subjects. My Government is impressed with the necessity of making strenuous efforts to control this flood of opium before it overwhelms the whole country. The new treaty with the United States, containing the prohibitory clause against opium, encourages the belief that the broad principles of justice and feelings of humanity, will prevail in future relations between China and Western nations. My Government will take effective measures to enforce the laws against the cultivation of the poppy in China, and otherwise check the use of opium; and I earnestly hope that your society and all right minded men of your country will support the efforts China is now making to escape from the thraldom of opium." This plausible gentleman does not say a word about the steady efforts which are being made to extend the cultivation of the poppy in China, in order that the Chinese Government, and not the Indian may get the benefit of the duty.

THE Chinese are evidently arousing themselves. They have, like Rip Van Winkle, been asleep for an indefinite period, but are at last showing signs of returning animation. China must at one time have been a progressive nation, as is evidenced by the state of its civilisation and general advancement, in an age when Western Europe was very far behind in the race of progress. But for many centuries China has stood still, and so conservative has she been, that only a very few years ago her Government purchased a railway which a few sanguine individuals had contrived to construct, for the express purpose of pulling it all up. Within the last twelve months, however, rumours of the dawn of an era of activity are not wanting. The latest phase of this is a desire on the part of the Chinese to develope the vast resources of a mineral nature which are known to exist in their country. On this subject a home journal says:—

The Chinese authorities are making strenuous efforts to develope the vast mineral resources known to exist in the country to the west and north of Tientsin. The district of Chihli is said to be eminently a country of minerals, and as a result of mining operatoins that have recently been carried out, enormous beds of coal of old formation have been found, mostly between limestone layers. Then in the same districts are almost inexhaustible beds of ironstone, and iron ores of the better kind, such as spathose, limonite, hematite, have also been discovered in rich deposits. At no great distance from the chief coal mines, copper ore of abnormal richness has been met with; and in the hills which bound the vast coal and iron district, lead, silver, and manganese await the miner's advent." If the country is half as rich in mineral resource as the amount we have summarised indicates, then there is a magnificent field opening up for the exercise of Celestial enterprise. It is anticipated that the first produce of the coal mines will be brought to and sold in the Tientsin markets before the close of the present summer.

This desire to keep up in the race with other countries, has for a considerable time been seen among her mercantile classes, who are known to be shrewd, clever, business men. All along the coast of China, there are fine steamers running, carrying on the vast trade which is necessary for such a large population, and many of the best of those lines are owned by Chinese. We learn that a movement is at present on foot in Rangoon, where many Chinese merchants have their places of business, to establish a line of steamers between that port and Singapore, and it behoves the mercantile community of San Francisco to see to the efficiency of their oceanic mail service, or some day the "Heathen Chinee" may prove a powerful competitor.

THERE are in Great Britain 23,000 females who are farming. These women enjoy all the rights and privileges of men with one exception, they cannot vote for members of Parliament, but they can vote on all municipal questions. It is very seldom, however, that they exercise this privilege.

THE Census Bureau furnishes the following statement, giving the result of the first count of the cereal crops of 1879 80 in comparison with that of 1869-70 :—

	Acres.	Bush. 1880.	Bush. 1870.
Buckwheat ...	851,304,	11,851,738	9,820,721
Barley ...	2,005,466	44,149,479	29,761,305
Oats ...	16,150,612	507,970,712	282,107,257
Wheat ..	35,487,061	459,501,093	287,745,626
Indian corn ...	62,326,852	1,773,106,576	760,944,546
Rye ...	1,845,321	19,863,632	16,918,795
Total ...	118,601,619	2,716,243,230	1,387,299,153

THE sugar beet is a native of the shores of the Mediterranean where it grows wild without the aid of cultivation.

THE first wheat of the 1881 crop, was received at St. Louis on the 9th July from Fort Worth Texas, consigned by Brooks and Myles of that place, and was sold at auction at the fancy prize of $1 50 per bushel. The first wheat of the 1880 crop reached at St. Louis, May 29th, eleven days earlier than this year, and also came from Fort Worth.

THE Scinde, Punjab and Delhi Railway seems to have passed the turning point, and is now on the way to success. For a very long time the working expenses of this line made a dividend quite out of the question. The following table will illustrate this :—

			Working expense %
Average of 4 half-years ending ...	Dec.	1873	83·06
Average of 4 half-years ending ...	June	1874	75·65
Average of 4 half-years ending ...	Dec.	1877	68 42
Average of 4 half-years ending ...	June	1868	60·94
Half-year ending 31	Dec.	1878	66·64
Half-year ending 30th	June	1879	68 25
" 31st	Dec.	1879	57·23
" 30th	June	1880	53·44
" 31st	Dec.	1880	58·72

The three latter half-years show some improvement. For comparison, we may state that the percentage of working expenses in the East Indian line for the half-year ending 30th June 1880 was only 32 51. We understand that the coal question has a good deal to do with this, the coal on the S., P. and D. line costing Rs. 22·9 per ton, while on the E. I. R. the cost is only Rs. 6·4. The statistics in the report for the half-year ending December 1880, are here and there a little hazy; for instance, we are gravely told that "on the intermediate class there has been a decrease of 80·1 per cent. in numbers, and of 223 1 per cent. in value." We are under the impression that a decrease of 100 per cent. would be quite sufficient to obliterate the traffic altogether, and we cannot quite understand how anything can possibly decrease by 223·1 per cent.

CERTAIN experiments recently made by Professor Tyndall, upon the use of sulphuric acid in promoting the more rapid germination of seeds, or rather fruits, contained in shelly capsules, such as nuts, almonds, and stones have been attended with such marvellous results that attention may well be directed to it in India, where the difficulty of raising fruit trees from imported stones with a view of improving stock, has been the frequency of mildew setting in before germination takes place. Seeds and stones soaked in a solution of the acid receive such a germinating impetus from this tonic that they shoot in a space of time hitherto unknown to agriculturists. This should be good news to those residents of our hill stations who have failed hitherto in raising plants from English or Australian stock: many seeds of aquatics, such as water lilies, have been known to remain dormant for two years, sorely trying the patience of those enthusiasts who have essayed their growth.

A VERY rapid cure of the foot-and-mouth disease in cattle is said to have been discovered by the Duke of Brunswick. He uses a solution of salicylic acid, prepared by pouring some hot water on about three tablespoonfuls of the acid in an earthen vessel, adding lukewarm water to make up a gallon. The mouth and feet of the diseased animal should be carefully washed three times a day with this liquid, and the tops of the hoops well powdered with the dry acid after each washing. To the drinking-water should be added two tablespoonful of the acid dissolved in hot water.

EXPERIMENTS which have been made for some time past at the Saharanpore Botanical Gardens with Austrian meadow grasses have proved their inferiority on the whole to the Indian *dup* grass.

ACCORDING to the last municipal report, there are five sewage farms in Madras, but three of these are of importance. The object of establishing these sewage farms by the Municipality is not so much to make a profit as to dispose of the sewage "which has as yet shown no bad effect on those residing near the places of disposal." The working of DeMellow's road farm last year resulted in a profit of Rs. 46 11-5—the sale of grass and hay amounted in the year to Rs. 2,468-2-1. The Triplicane farm brought in Rs. 2,200 by the sale of hay and grass, but the expenses were Rs. 2,791-10 5. The Kistnampet farm was worked at a profit of Rs. 479-14-5. The Egmore farm was worked at a loss of Rs. 885. The failure of the crops of grass in some of the farms is attributable to insects having attacked the crops after the heavy rains of last year.

THE following comparative statement of the foreign wheat crop is from French statistics just published :—

	Bush. 1879.	Bush. 1880.
France	216,000,000	240,000,000
Russia	180,000,000	160,000,000
Germany	108,000,000	120,000,000
Spain and Portugal ...	95,000,000	120,000,000
Italy	68,000,000	115,000,000
Austro-Hungary... ...	64,000000	90,000,000
Turkey and Roumania ...	60,000,000	76,000,000
United Kingdom ...	48,000,000	77,000,000
Holland and Belgium ...	25,000,000	30,000,000
Greece	5,000,000	5,000,000
Sweeden and Norway ...	3,000,000	3,000,000
Denmark	3,000,000	3,000,000
Switzerland	1,000,000	2,000,000
Total	877,500,000	1,041,000,000

The culture of bees in Northern Italy has given rise to an industry which appears likely to increase in importance, namely, the supply of queen bees and swarms to various countries in Europe and America. The queen bees travel in wooden boxes, accompanied by 200 working bees. The boxes have four slits for air. Inside are two small frames, one containing a full, the other an empty honeycomb. They vary in size according to the distance they are sent. The Italian bees have the reputation of being more docile and productive than any other kind of bees, and it is to this that they owe their value.

A German statistician has arrived at the conclusion that the following is an approximately correct statement of the population of the world:—

Europe	315,929,000
Asia	834,707,000
America...	95,405,000
Africa	205,679,000
Australia, &c.	4,121,000
Polar Regions	82,000
Total	1,455,923,000

The extremes of density and sparseness of population are China and the Polar regions, of which the details are as follow:—

	Square miles.	Population.	Population per Sq. miles.
China	7,383,750	434,600,000	58·86
Polar Regions	2,411,875	82,000	·034

There are no doubt more densely populated regions than China, but it must be remembered that the above statement includes much land that is not populated at all.

In agriculture, giant growth is due to giant culture.

Mexia, Texas, with only 1,250 inhabitants shipped over 20,000 bales of the cotton crop of 1880.

The wool clip of Coleman county, Texas, for 1881, is set down at 150,000 pounds. Prices from 21 to 21 cents. per pound.

The total area of lands available for wheat culture in the United States is not less than 470,000,000 acres. Our entire wheat crop of the past year would not supply seeds enough to sow so vast an area of wheat land.

The average of corn per acre in 1879 in Vermont as given in the report of the Department of Agriculture, was 30 bushels. The lowest average was in North Carolina, 7 bushels; the highest in Nebraska, 41 bushels.

The following is from a Mercara correspondent:—The steadiness and attention which this product is meeting in this country, augurs well for its future success; and the day is not far distant, when there will be large supplies of a rich bark, holding its own in London, against that sent from other parts of the world; for in the course of two or three years at the most, there will be many acres of cinchona trees of sufficient growth to be stripped or barked.

In accordance with a suggestion of Colonel Beddome, the Government have sanctioned the expenditure of a sum not exceeding Rs. 1,000 for the experimental trial of various patent manures. It is understood that valuable artificial manure can be obtained from the firms on the West Coast, Mr. W. Rowson, Assistant Superintendent, Government Chincona Plantations, Neddiwuttum, having proposed "that our soils be sent home for analysis, and that suitable patent manure be procured from England." The Government have replied that no analysis of the soils need be made at present.

The *Mainichi* remarks:—Two gentlemen of Sanuki province by name Miyatake and Mukoyama, have established a sugar factory on a western model at Shido-mura, the Samukawa district; and after several trials white sugar has been successfully made. Specimens have been forwarded for examination to the Agricultural and Commercial Department, which after careful comparison with foreign articles has found it to be not inferior to the imported staples. It is said that the Minister intends to present some home made sugar to the Imperial Household shortly.

OFFICIAL PAPER.

OPIUM IN TREATY PORTS.

To the Chairman, Chamber of Commerce, Calcutta. Pakhoi, China, 31st July 1881.

Sir,—As we find the Chinese authorities, under one pretext and another, are establishing more and more offices for the collection of new taxes on Indian opium in the Treaty Ports of Pakhoi and Hoihow in the Province of Kwang Tung, to the great detriment of trade in this article, and as one of these new offices, called the *Haitang* (Defence Tax), has lately interfered with our legitimate business as regards opium by molesting our customers, and even forcibly seizing our own opium from our own people, we have complained to her Majesty's Consuls both at Pakhoi and Hoihow, who have referred the whole question to her Majesty's Minister at Peking.

Considering this question to be one which not only affects ourselves, but which may also have a good deal of influence on trade in Indian opium generally, and as such may interest your Chamber, we avail ourselves of this opportunity to state as briefly as possible what has transpired.

We take our stand point on the following ground, *viz.*:—Clause 1, Rule 5, section 3, Articles of trade with China, Tientsin Treaty, 1858, says—"Opium will henceforth pay 30 taels per picul import duty, The importer will sell it only at the port. It will be carried into the interior by Chinese only, and only as Chinese property."

It has been urged by the Chinese authorities that it was contemplated by the framers of the Chefoo Convention, that a change should be made, and that the *Le kin* (war tax,) should be paid by the purchaser. It is, however, this very clause which has not been agreed to by Her Majesty's Government, and as the Chefoo Convention is not ratified, it cannot be brought forward either in support of or against the action of the Chinese authorities.

The clause of the Tientsin Treaty above referred to is all we have to go by at present, and we submit that, in accordance with that clause, no tax whatever beyond the import tariff duty of 30 taels per picul (say Rs. 115 per chest, about) can legally be levied within the limits of the Treaty Ports on foreign opium imported by a foreign vessel from a foreign country.

As foreign merchants our limit in which to transact business in opium, that is to *buy* or *sell* the article, is clearly defined as being restricted to the Treaty Ports. The clause permitting us to *sell* in the open port must reasonably permit purchasers to *buy* from us without molestation. If this is not the case the portion of the clause permitting us to sell appears to us to be nugatory.

As matters now stand, however, although we have no doubt the Chinese authorities are well aware that they have no legal right to levy arbitrary duties within the limits of the Treaty Ports, either on Indian opium or on any other foreign goods within the limits of the Treaty Ports, yet with their well-known propensity for trying how far they can go with impunity, they have commenced first by establishing the *Le kin* (war tax) office in the ports and imposing a tax of 23 taels per picul (say about Rs. 90 per chest). At the close of 1879 the *Haitang* office was opened and 22 taels (say Rs. 69) per chest demanded; this was opposed by native merchants, who appealed to foreign merchants for assistance, and so far as British merchants at this port were concerned H. M.'s Consul, in reply to a communication from the Prefect, clearly expressed his views that in accordance with the Treaty no other tax beyond the 30 taels per picul could be levied in the port on Indian opium imported by foreign vessels from a foreign country. This principle was admitted by the Prefect, and for some time the business of British merchants was not interfered with directly, but the office was not removed.

In January last, the officials finding that they had gone along so far without being obliged to close their establishments in the ports, imposed another tax called *Kan li* (a tax on prepared opium) taels 30,20 (say about 94 rupees) per chest. The actual collection of this tax commenced about May last, and for their own convenience, they made it payable on raw opium, in the same way as the other imposition.

They now contemplate levying an additional tax of 150 taels (say Rs. 506) per chest, also to be collected in the open port. So that duties will then total in round figures as follows:—

Import Tariff duty per chest	Rs.	115
Lekin tax	"	90
Haitang	"	69
Kauli Tax	"	94
New tax proposed	"	506
Say total per chest rupees		874

of which we contend that only the equivalent of Rs. 115 per chest is legally leviable in the port.

The Chinese authorities are evidently of opinion that the time has now come for them to make a bold effort to over-ride altogether the article of the Tientsin Treaty above referred to, and no doubt with this object the *Haifang* office has lately placed soldiers around our premises, seized our customers just outside our door, and crowned their actions by seizing and maltreating one of our own men close to our house and forcibly taking from him our own opium which he was carrying along. We had paid the legal tariff duty on this opium and it had not changed hands. The same things have been done at Hoihow.

Both at Pakhoi and Hoihow her Majesty's Consul demanded the immediate restitution of our property, but the *Haifang* office persistently refused to give it up. That office, the *Haifang*, we may here explain is carried on by a company of Chinese merchant, principally from Hong-Kong who hold no official position and to whom the Viceroy of Canton has farmed the privilege of collecting the *Haifang* and *kanli* taxes for the sum of taels 90,000, say Rs 3,03,750 per month, their area being the province of Kwangtung.

The Prefect of this port although in reply to the representation of H. M.'s Consul, he again admitted the principle for which we contend, dared not compel the restitution of the opium as the *Haifang* office immediately appealed to the Viceroy of Canton to whom the Prefect is responsible for his action. The Viceroy, in reply to H. M.'s Consul, said that he would cause inquiries to be made as to whether the opium seized had passed out of foreign possession or not, but we are in possession of proofs that at the same time he privately instructed the Prefect not to return the opium.

The Viceroy further stated to H. M.'s Consul that while opium in foreign possession could not be taxed beyond the tariff duty yet the moment it passed into Chinese hands, '*no matter whether in the Treaty port or not*, it could be taxed in any way the Chinese authorities might please.

A copy of a document has come into our possession, which clearly shows that the *Ts'ung Li Yamen* (Board of Foreign Affairs) at Peking, will, if possible, support the Viceroy.

If the principle which the Viceroy contends for be admitted, then the right granted to importers under the Treaty of Tientsin, to the whole area of the Treaty Ports, in which to transact business, is at once done away with, and each individual merchant will be limited to his own individual premises, because the moment opium passes his door, it will be seized. And should the Chinese officials succeed in their present attempts, legitimate business in Indian opium at the Treaty Ports will no longer be possible either for foreign or native merchants. Smuggling will no doubt be carried on to some extent, but Indian produce in this direction must eventually give way to the native article Yunnan.

Lately there has been a greater demand for Indian opium in China, but this is explained by the fact that native merchants are anxious to import prior to the imposition of the new tax.

The well meaning people connected with the Anti-Opium League may perhaps be of opinion that the imposition of these almost prohibitive duties shows the desire of the Chinese Government to put a stop to the traffic. This, however, is certainly not the case.

Prior to the signing of the Treaty of Tientsin, the whole system of taxation (barring salt and land) was on transit, and arbitrary, being collected by insufficiently paid officials in the provinces, who were dependent on what they could decently stop out of their receipts, and who besides had a lively notion of the taxableness of foreigners. The revenue had to filter through their hands, and somehow before reaching Peking had enabled the officials (salaried at ridiculous rates, which would not pay one of the several secretaries necessary in their Yamen) to acquire wealth.

The framers of the Treaty of Tientsin were well aware of this, and it was precisely this system which they intended to alter. By the provisions of that treaty duties were thenceforward to be collected according to the prescribed tariff, and the result without deduction was to be sent to Peking.

The Peking Government, though now in receipt of a large and certain revenue (which is collected and remitted through the Foreign Inspectorate of Customs) instead of the quota which formerly reached it, has made no change in the salaries of its provincial officers, who have still to keep up the same establishments, make the same presents, and remit the same quota of revenue to the Peking Government as before, and still manage to retire wealthy after their term of office has expired. To enable them to do this, it is very plain that new sources of revenue must be found, and Indian opium is one of the articles fixed on as convenient to tax, more especially if it can be done in the Treaty Ports.

When a new tax is instituted, the right of collecting it is farmed to whoever will give the highest price. The farmers, who go into the business purely on speculation, come along armed with a proclamation from the Viceroy, and proceeded straightway to make as much money as they can. They have no regard for the Treaty, or for the morality or immorality of the trade, or for anything else but their own pockets—and it is scarcely necessary to point out what must be the result under such a system; matters will in fact soon become worse than they were before the Treaty of Tientsin were signed.

We contend that the meaning of the Treaty of Tientsin is very clear, *viz., that all goods of foreign origin, opium included*, from a foreign port by a foreign vessel shall be imported unto and sold in the Treaty Ports of China, on payment of tariff duty *only*. And it is only when such goods *leave* the port for the interior, that they become subject to other regulations. The transit regulations are intended to provide for the introduction of piece-goods, cotton, yarn, &c., &c., into the interior (though the transit pass for such goods in the provinces of Kwangtung and Kwangse, is at present practically useless, in consequence of the officials persisting in imposing differential duties on certificated goods and doing their utmost to throttle any attempt to convey the same to or from the interior. This affects Indian trade very materially, because if foreign goods could be conveyed into the interior on payment of half the import tariff duty as provided for by the Tientsin Treaty, the consumption of Indian cotton yarns, &c., would increase enormously. As concerns opium, foreigners have by Treaty given up all control of the article as soon as it leaves the port *but not before*, and this fact, combined with the circumstance that it was necessary to make a special clause in the Chefoo convention when it was contemplated that the purchaser of opium should pay *lekin*, shows that under the Treaty of Tientsin he the purchaser is *not* obliged to pay *lekin* or any other tax beyond the import tariff duty, in the Treaty Port.

In conclusion, we are glad to say that we have met with warm support from Mr. Consul Ford of Pakhoi and Mr. Consul Johnson of Hoihow, and we hope that her Majesty's Minister at Peking may decide the question at issue in a manner favourable to foreign trade.

The reluctance with which Chinese officials in this direction carry out any of their Treaty obligations, and their evident desire to utterly ignore the Treaty on all possible occasions, in which it is but too much to be feared that they are supported either directly or indirectly by the Central Government at Peking, tends to show that any concession made to them at present would be most disastrous not only to trade in Indian opium, but to the advancement of business generally at the Treaty Ports. In representing this matter to your influential body we shall be glad (should our views meet with your approval) if you will support us. If necessary we shall have pleasure in furnishing you with further particulars.

We have the honour to be, Sir, your obedient servants,

HERTON & CO.

SELECTIONS.

THE PERSIAN WHEEL.

THERE has always been a certain class of persons in this country of opinion that canal water for irrigating purposes should be invariably delivered below the surface of the ground, so that it should not be allowed to flow away wastefully in excess of requirements; but, as it would always cost money to lift it, it would only be used when required. Also, it was assumed that canals so constructed would lose less water by percolation, and would consequently tend less to raise the spring level and so swamp the country, than if they were constructed in embankment.

Paradoxical though it may appear, experiment shows that a canal in embankment loses less by percolation than one in cutting, and therefore tends less to raise the spring near it, probably because the soil near the surface is less porous than what is reached by digging a few feet down. Luckily for the country, the advocates of this low-level canal system were overruled, and our perennial canals deliver most of their supply by flow. It is interesting, however, to consider what extra expense would be thrown on the cultivators if all the water for irrigation had to be raised. Take, for example, that Bari Doab Canal, which delivers about 2,500 cubic feet of water per second, on an average, through the year. All canal water which is lifted in this canal is lifted by means of a modification of the Persian wheel, altered in certain respects to suit a low lift, and known as a *jhallar*. A *jhallar* worked day and night requires four pairs of bullocks, costing Rs. 60 per month to keep, and is capable of lifting about one-sixth of a cubic foot per second, so that, to lift all the water supplied by the canal 15,000 *jhallars* would be required, and the monthly charge for bullocks would amount to nine lakhs of rupees, or per annum, Rs. 1,08,00,000 paid on one canal for raising water, which might have been delivered on the surface. As it is, about a tenth of the water has to be raised, so that the annual sum paid for bullocks for raising water on the Bari Doab Canal may be taken at about 10 lakhs per annum. This water is probably raised on an average five feet, in some cases, the water being only just below the surface, but scarcely ever more than 10 feet below, as it would not pay to dig a watercourse deeper than this, even if water were granted for such high land. A *jhallar* from its construction must always raise water three feet above the watercourse in which it is to flow away, the top earthen vessel or *tind* being two feet above the trough, and the trough at its high end a foot above the bed of the watercourse; consequently, in order eventually to raise the water five feet, it is necessary to raise it eight feet and drop it three. Now, this loss of 37½ per cent. of the work is extra to such unavoidable losses as friction, evaporation, leakage, &c., which, no doubt in such a primitive machine, amount to as much again; and it might be nearly all got rid of by the adoption of a more economical motor. The case quoted is taken as the probable *average* for the whole canal; but in cases where water has to be lifted only one foot, *jhallars* may be seen at work in many places raising the water four feet and dropping it three, and so wasting 75 per cent. of the bullock's power, and costing their owners Rs. 45 per month uselessly. Here is a field for the Punjab Agricultural Department.

These latter remarks do not apply to the whole of the country, or even to the whole of the Punjab; for the method of raising water a few feet by means of a basket swung by two men, and which is universally adopted on the Western Jumna Canal, is probably one of the most economical methods which could be devised. But this will not do for the zemindar

of the Northern Punjab; he must have a method of utilising bullocks, not coolies, the latter being too expensive, too scarce, and too idle.

The Sirhind Canal will in a few years be distributing 5,000 cubic feet of water per second over about a million acres of land, and there is no reason for doubting that twenty lakhs of rupees will be wasted annually in like manner in raising its water.

Let us consider the figures in another way. A *jhallar* in which a pair of bullocks are yoked lifts one-sixth of a cubic foot of water per second, five feet, that is, the work done per second is $\frac{62\frac{1}{2}\times5\times60}{6}=3,125$ foot lbs. of work per minute. Let us compare this with the supposed efficiency of various animals taking the figures from "Molesworth's Pocket Book." Mr. Molesworth gives the work obtainable in foot lbs. per minute from a horse as 21,000 ft. lbs.; one ox 12,000 ft. lbs; an ass 3,500 ft lbs.; man rowing 4,000 ft. lbs.; a man on a treadmill 3,100 ft. lbs. per minute. At last we have arrived at our figure. A pair of oxen do just the same amount of work on a Punjab Canal as a convict on a treadmill.—*Civil and Military Gazette.*

DECCAN AGRICULTURISTS' RELIEF ACT.

THE proposed amendments of this Act have elicited from Mr. Justice West of the Bombay High Court, some severe criticisms on the practical working of the measure.:—

The Act, which it is proposed to amend, has now been in operation for a year and-a-half. There has been time to judge, in some respects at any rate, how far its results correspond to the sanguine expectations with which it was launched. "The problem before us," it was said "is how to keep the money-lender in his place to encourage and support him in all useful functions. . . . We must foster due credits.

We must hold the ryot responsible in our courts for what he has really borrowed, not for what he has not; and make him repay by his own exertions all that he reasonably can repay, not set him free by sudden, one-sided or heroic remedies to enter on a fresh career of indebtedness." Now, unless the general opinion is wholly mistaken, the most conspicuous consequence of the Act has been to oust the money-lender from his place by means of a one-sided remedy which has extinguished credit in making the ryot irresponsible. The whole class of those who furnished capital to the cultivator have, with a very few exceptions, closed their business, and except when retained by the hope of recovering some portion of the money due to them or by imprisonment at the suit of their own creditors, they intend to leave the districts. Where the money-lenders have bought land or lent on mortgage, an early retreat is impossible; but their former function is no longer performed. As regards the ordinary ryot, the Act, by which it was said, "We must foster due credit," has simply extinguished it. The pressure of this annihilation of credit is as yet hardly felt. The harvest of last year was unusually abundant, and the ryots, not frittering away their fortunes in paying their debts, are revelling for one year in a fool's paradise. A single bad season will bring them to ruin, and even without a bad season their funds will, in three or four years, have been as much consumed in waste as if they had paid their debts. The difference will be that the creditors having been in many instances impoverished, and having in all cases become distrustful, the ryots will be without any resource to tide them over the first time of adversity.

The principle having been formulated that "we must hold the ryot responsible in our courts for what he has really borrowed," effect was given to it by inviting every agriculturist debtor to deny his creditor's claim. The duty was imposed on the court of "going behind the bond of searching amongst by-gone transactions of years ago, evidence of which would for the most part not be forthcoming for any excuse that might be made for repudiation. The Subordinate Judges understand, as no one could fail to understand, the purpose of such provisions, and what they are expected to do under them. They cannot but be in some measure demoralized by the lop-sided equity which they are commanded to exercise. The debtor himself is directly and pressingly invited to dishonesty. He may gain, but cannot lose by a lying story. An honest admission of his debt is not received. The appreciation of the remote and obscure facts is assigned to a class of Subordinate Judges, imbued generally with the prejudices of an impecunious class, with promotion to earn, and with everything urging them to demonstrate the usefulness of the Act, the wisdom of the Government, and their own efficiency, by rejecting or cutting down the claims of the money-lenders.

Mr. West has a good deal to say also of the conciliation provisions, which do not find much favour with him.

The most interesting part of the Act is that which relates to conciliation. It rests on a highly beneficial principle, but the machinery is essentially defective. The tribunals of conciliation which were, I believe, first employed in Holland were thence borrowed by France, Denmark, and other countries, and in all they have, to the whole worked well. But in all the central idea of conciliation has been maintained and the functions of the conciliators have been restricted to simple cases with which they were competent to deal. No evidence is taken by a conciliator on the Continent. He may look at the simple documents which only can be produced in the cases brought before him; but true to his purpose he hears only the parties in presence of each other and tries to bring them to an agreement. He may put considerable pressure on the creditor by forcing him to attend again and again before granting a certificate, and he thus constrains him in many instances to make a large abatement of his claim. This the conciliators under the Act also can do. A remedy against any unfairness is to be found in a limitation of the proceedings before the conciliator to two appearances and a short interval between the two. The general result, however, of the conciliation system has, so far as I can learn, been all in favour of the creditor who knew how to use it. It has been described by a native newspaper as "like putting a knife into the hands of a butcher." This is no doubt an extravagant comparision, but it is obvious that a *sowkar*, having a friend for a conciliator and debtors as helpless as the ryots are assumed to be, may readily turn all the defences raised by the sections of the Act which empower a court to "go behind the bond," and settle people's affairs in a way they never contemplated. He obtains an assent to a certain sum as due before the conciliator no less readily than to a renewal of a bond in his own shop, and the certificate thereon granted virtually shuts out further controversy. No cause can be shown why "the agreement," which the debtor must admit, "should not be filed," and once filed it becomes a decree.

It is no wonder under these circumstances that the applications to the conciliators should have been very numerous. The proceeding costs nothing; it holds out the only hope of fair treatment to the creditor; it is the only avenue by which in a suit against an agriculturist the court can be reached. Yet the working of this elaborate machinery seems to bring matters in the main to almost exactly the same point they would be at without it. The 16,000 cases out of 29,000 in which conciliation was tried and wholly failed, represent the old proportion of contested suits quadrupled by the debtors having no cost to pay for an unconscientious defence.

The two advantages of the conciliation system are that in general the conciliator is rather nearer than the court to the debtor's house, and that no court fees have to be paid. On the other hand, the conciliators being scattered about at places not convenient for the class of creditors, the latter are harassed by repeated and too often fruitless attendances which interfere with other business so as to cause considerable loss. For this the borrowers must in the end pay, if borrowing continues at all. When conciliation fails, as it does in the great majority of cases, the creditors' time and travelling expenses have been thrown away; the debtor has been deprived of three or four days' earning for nothing; and the witnesses who have been prevailed on to attend, have been subjected to useless and vexatious harassment, if not to actual want.—*Pioneer.*

MADRAS SCHOOL OF AGRICULTURE.

A MADRASSEE, or a dweller in the plains of South India must have buried himself in some very unaccommodating corner, if he has not at one time or another heard of the Madras School of Agriculture and of Mr. Robertson, its Superintendent's strenuous efforts for a number of years to remove some of the old land-marks of native conceptions of agriculture. Taking the Indian agricultural class as a body, it is impossible to exaggerate the ignorance in which they move and live. As they work on their several holdings, the external world and the prospects of a good or a bad harvest have some hold upon them through the medium of their senses, but to all those higher sources of intellect which lead to an examination of the several objects they ought to be interested in, they are perfect strangers. The high lights of the picture of agricultural life presented before them by Mr. Robertson, throw but into deeper gloom their own startling ignorance, and though it seems cruel to provoke them to wrath by ridiculing and exposing to ridicule, the crudities of thought and practice they have fallen into true benevolence, to them suggests that the picture of their ignorance should be drawn with no sparing hand. To what a high degree of proficiency the Madras School of Agriculture has attained is shown by a pamphlet, which we have received, containing the "Question Papers of Class I. of 1876 in the Madras School of Agriculture." Eminently practical in their character, and admirably suited to test the thinking powers and the capacities of his students generally, no one can rise from even a cursory glance at them without feeling convinced that a thorough knowledge of the various subjects mentioned in the papers cannot but constitute a scientific agriculturist in every sense of the term. Economically considered, the country has been too long a sufferer to the agricultural charlatanry which it has been a victim to, and Mr. Robertson has never ceased to point the means of escape from the dangers of a neglected agriculture. Field chemistry and geology are points which Mr. Robertson very justly lays much stress upon. They are subjects which the ordinary ryot treats with huge disdain, and the various papers set for examination show that the Superintendent of the Government Farms is anxious, beyond all things, to impress on the minds of his young pupils that Nature has no superfluities, either organic or inorganic, and that certain processes whose utility may not be apparent to us at first sight or thought either, are as necessary to the comfort of animal life as is the food that such life is supported by. Mr. Roberson leads with some very practical questions as to benefiting the soil by hoeing, deep tillage, and the conditions under which crops benefit by the latter. He has omitted no pains, apparently, in the analysis of waters, and expects his class to be able to determine the difference between hydrostatic water, capillary water, and hygroscopic water. Manures, and the several gases that go to form a fertile field, in short all the elements of plant food, are

points on which he must have well grounded his class, to expect it to be proficients. Flax and wheat, sugar, cotton, and maize are crops whose scientific cultivation he urges the necessity of, while the growth of tobacco, hemp, and fibre of all descriptions on principles better calculated to develope them to their fullest capabilities could not have been omitted in his lectures. Coffee loses none of its importance by the side of cereals and fodder-producing plants. Farm implements and gear generally are matters Mr. Robertson thinks his class ought to be adepts in; and, looked at from every point of view, the portion of questions set by him shews that there is no part of a farm, no concern of it, however petty it may be, that has not a recognised and highly important function to discharge. Doctor Western's paper on veterinary science follow those of Mr. Robertson They are of a highly professional character, and extend to all matters connected with animal life on the farm either in health or disease. He is critical in the use of terms employed in the pharmacopœa of veterinary lore; and the general tenor of his paper denotes the inestimable value he sets upon cattle and the condition of perfect freedom from disturbing influences he would see them in. Mr. Hamilton's questions on chemistry are proof of the high standard of perfection to which the class must have attained to be able to answer them. A discriminating intelligence alone could enable a student to pass through them successfully, and we feel certain that the questions demanding an explanation of the different kinds of acid known to the field chemist are meant to be some thing more than tentative. Mr. Wilkins follows with a string of very pretty questions on botany, and we would fain hope that the replies received were significant of the value the class attached to that branch of Nature's choicest gifts which the science of botany illustrates. Wiser than our ancestors in not a few respects, it is an unmistakable evidence of triumph of modern botany that we no longer labour with them in the ignorance which once existed with reference to a thousand discoveries that the science has made known in these latter days. Dr. Kyes's questions on zoology are searching and interesting at the same time; and the habits and characters of the animals he calls upon the students to classify cannot be contemplated with indifference. We have left ourselves but little space to notice the papers on Physical Geography, Arithmetic, and Book-keeping, Mensuration, and Building set severally by Mr. Ganapati Iyer and Seetharam Moodelly Garoo, and have only to add by way of concluding remarks that the little volume contains matter which we would give the students of class I. of the Agricultural School the full credit of being thoroughly acquainted with.—*Madras Times*,

SEWAGE FARMING IN THE PEOPLE'S PARK.

THE public of Madras have been brought under so many municipal saws and harrows that they have become quite resigned to whatever further trials of temper the city Archons may choose to inflict on them. All Madras rose as one man when a proposal was made some years ago to give up a portion of the Park to suit railway conveniences, and meet railway requirements. There were giants in those days, and they determined that Madras should not lose one inch of its park for any man, be he King or Kaisar. Resolutions were made, which the great Indignation Meeting was afterwards to carry; they were freely canvassed everywhere before the eventful day—"upstairs and downstairs, and in my lady's chamber;" and the upshot of the matter was that the citizens of Madras triumphed. But they have become very meek apparently since then, and make no stir now when a project is being carried through of converting a portion of the park into a sewage farm. The site chosen for the purpose is one near the Napier drinking-fountain, and almost contiguous to a public thoroughfare affected by all classes and conditions of men, from the highest to the lowest. The sanitary results of the utilization of sewage in the manner proposed to be done is a question which ought to be at once and for ever decided, there being so many and such conflicting opinions on it. French *savants* appear to be equally devided with our own experts in their judgments. Six or seven years ago, the inhabitants of a French village near Asnieres grew nearly frantic when it was intimated to them that sewage irrigation would at no distant day be brought within their senses of sight and smell. They instanced the case of the port of Marseilles into which sewage had been diverted, and which proved a terrible calamity to the people there, having been found provocative of disease. They urged that if so undesirable a result should have overtaken a measure that made the briny element a receptacle of a city's whole sewage, the result might be incalculably worse were the objectionable matter spread over a surface of land, no matter how scientific the process might be which sought to render it innocuous. The Prefect of the Department, on the other hand, saw nothing really to warrant the people's suspicions and fears, and his opinion carried the day; the consequence was that they one and all shunned the evil spot, ground rents in its neighbourhood fell alarmingly, and it took years to convince the people that a sewage farm need not be the *bête noire* it was made out to be. Be these facts as they may, we cannot help deprecating the uses to which the People's Park, the very lungs of the city, is to be condemned, and we trust our expression of dissent from the project may not be the only solitary one.—*Madras Times*.

IRRIGATION.

THE subject of irrigation has recently occupied a considerable share of attention. It is astonishing to observe the diversity of opinions, which the discussion has called forth. There is the party who holds that we cannot possibly have too much canal irrigation; another group have no objection to irrigation but object to the canal system; they advocate well irrigation, and so on. We ourselves do not approve of canal irrigation, but only as at present managed. We see no objection to the use of canal water. What we object to is its abuse, and under the present system, that is unavoidable. A cultivator applies for water for his wheat, a day is fixed, and the water is turned on. Knowing, as he does, that a considerable time must elapse, ere he gets any more, he floods his fields to the depth of 12 inches or so. Now, this is in utter defiance of all Nature's arrangements or intentions. By means of high retaining ridges, enclosing the fields, all this water is compelled to percolate into the soil. When such a quantity of rain falls, we have fears of a famine from flooded lands; but the ryot, through some greed, deliberately attempts to destroy his crop, in order that he may get full value for the canal rate he has to pay. Eight or ten days afterwards the same process is repeated, and if the crop does not rot in the field, the fault is not the cultivator's. This is the fault of the system, the buyer of water is charged so much per acre, instead of so much per thousand gallons. Were the latter system adopted, the ryot would not, through greed, overflood his fields, he would carefully take just what he thought would suffice, and his land would not suffer so much by this quantity being a trifle short, as it would by an excess of water being given to his land. It might be that the individual crop would suffer a little more, but succeeding crops would not, nor would *reh*, or other pests, get the upper hand, and no one knows this better than the ryot. If the canal water could be dealt out to the cultivator, at the rate of one inch, or even half an inch in depth at a time, and oftener we should have no fear of the deleterious effects of canal water. It is this flooding in excess we deprecate. Another objection to the system of distributing water from these canals is the length of time which elapses between each watering, When the weather is hot, the earth gets caked and hard. The lime held in solution, by all the canals fed from the Himalayan streams, is urged as another fatal objection to the use of this water. We do not see any harm that this would do, were the water applied in moderation. Water heavily charged with lime is not good for growing tea, although it does not seem fatal to young seedlings; but, as a rule lime is not an objectionable material for growing crops generally. One other objection, and we have done. The villagers universally use the canal water for drinking and cooking purposes, and for such purposes it is unspeakably dirty. Let us now see what well irrigation promises to do.

There are two sorts of wells known and in use among cultivators—*kutcha* and *pucca*. These names require little explanation. The *pucca* well is, as its name implies, built of solid masonry to the bottom, and usually has an inside diameter of six feet, and a depth regulated by the supply of water in the subsoil. In some districts 40 feet is a fair depth; while in others, to get anything like a steady supply, the well has to be 100 feet deep. Now, if we take 60 feet as the average depth of these wells, we arrive at an average cost of each well of Rs 600. As each of these wells is estimated to supply sufficient water for 50 acres, the cost per acre would be Rs. 12, which is equal to an annual charge of, say annas 10, interest being calculated at the rate of five per cent. per annum.

The second mode is the *kutcha* well, which is simply a deep hole dug in the corner of a field, and which fails, when most wanted, the depth seldom exceeding 12 feet, and the whole affair collapsing under a heavy fall of rain. There is, indeed, a third kind, called the *kutcha-pucca* made to the depth of 20 feet, and usually lined with rings of burnt clay, which hold the sides apart for a couple of years. Both of these latter are but temporary at the best, and on account of the continual renewals, rendered necessary by the frequent collapses, are very expensive in the end.

We may endeavour to institute a comparison as to cost between canal and well irrigation. Canal water, we know, costs one district with another about Re. 1-8 per *fasl*, or say Rs. 3 per acre per annum. Well irrigation then costs only 10 annas as against Rs. 3; but to the former charge falls to be added the cost of raising the water, and it is quite impossible to assess this, as the cultivator does not place a high value on the labour of his bullock, or on his own; because he has not to pay hard cash for it. This, of course, is wrong; whether he has to pay or not, a definite value attaches to all work of this sort done by himself or his cattle, as if they, the latter were not at this work, they might be ploughing, or be otherwise employed. There can be no doubt that if we assess a fair value as due to the work of the cattle, well irrigation will not be much cheaper than canal watering. The ryot, however, will not deluge his lands, as the raising of any water in excess of his actual requirements means a considerable amount of labor for himself and bullocks, and he, will think twice ere he exerts himself needlessly. The advantages to be looked for from well irrigation are many and valuable. If of the proper depth, there should be no intermission in the supply, which is often the case with canal water; an increased demand in an unusually dry season, resulting not unfrequently in many cultivators being unable to get any, at the very season when a little help in this way would save their crops. The well would always be at hand, and able to supply water at any moment the ryot chose to wish for it. We have known whole fields destroyed from want of one watering at a critical period, and once saw fifty acres of oats, which had been grown by an European tea planter for his cattle-food, utterly ruined in this way. The canal, with a plentiful supply of water, passed through his fields, but was reserved under some

previously made arrangement, for a couple of villages a mile beyond his place. The result of this want of water was that the cattle were ultimately turned in to graze among the oats, the crop being so seedy as not to be worth the expense of cutting. Again, the great, and in many cases fatal evil of overflooding would be entirely got rid of. No man would be so foolish as to put himself to the trouble and expense of raising more water than he imagined good for his fields. In many instances, ploughing is delayed by the ground being too hard, and it frequently happens that, at this particular time, no canal water is available for flooding. With his own well, the cultivator could have water at any time. And now we come to what appears to us the chief advantage of wells for irrigation, although it is not exactly connected with the subject of watering crops; and it is the value of these wells from a sanitary point of view. We believe that bad drinking and cooking water is perhaps the most common pre-disposing cause to fevers. This subject does not appear to receive any attention, when the question of water-supply is under consideration. One has only to live a short time in the neighbourhood of a canal to see how universally its water is used for all domestic purposes. He will then, perhaps, understand those sudden, and, in many cases, unaccountable, outbreaks of sickness, which travel over the country, decimating its inhabitants. To him they will not appear inexplicable. These wells scattered at close intervals all over the face of the country will always be at hand to furnish him with domestic water supplies. The recent investigations of the French, in the direction of artesian well, open up an entirely new view of this question of well irrigation, which calls for more attention than it has hitherto received.—*Indian Daily News.*

RUBBER IN BRAZIL.

IN *Scribner's Monthly* for June 1879, appeared an interesting paper on "The Mediterranean of America," in which the writer described a trip up the mouth of the Amazons. At the beginning of the paper the town of Breves, situated in the midst of deadly swamps, but prosperous from its rubber industry, is referred to, and the following account is given of the method of collecting and treating the milk of the rubber trees:—

In the early morning, men and women come with baskets of clay cups on their backs, and little hatchets to gash the trees. Where the white milk drips down from the gash they stick their cups on the trunk with daubs of clay, molded so as to catch the whole flow. If the tree is a large one, four or five gashes may be cut in a circle around the trunk. On the next day other gashes are made a little below these, and so on until the rows reach the ground. By eleven o'clock the flow of milk has ceased, and the *seringueiros* come to collect the contents of the cups in calabash jugs. A gill or so is the utmost yield from each tree, and a single gatherer may attend to a hundred and twenty trees or more, wading always through these dark marshes, and paying dearly for his profit in fever and weakness. Our *mameluca* hostess has brought in her day's gathering—a calabash full of the white liquid, in appearance precisely like milk. If left in this condition it coagulates after a while and forms an inferior whitish gum. To make the black rubber of commerce the milk must go through a peculiar process of manufacture, for which our guide has been preparing. Over a smoldering fire, fed with the hard nuts of the *tucumá* palm, he places a kind of clay chimney, like a wide-mouthed, bottomless jug; through this *boião* the thick smoke pours in a constant stream. Now he takes his mold,—in this case a wooden one, like a round-bladed paddle,—washes it with the milk, and holds it over the smoke until the liquid coagulates. Then another coat is added, only now, as the wood is heated the milk coagulates faster. It may take the gatherings of two or three days to cover the mold thickly enough. Then the rubber is still dull white, but in a short time it turns brown and finally almost black, as it is sent to the market. The mass is cut from the paddle and sold to traders in the village. Bottles are sometimes made by molding the rubber over a clay ball, which is then broken up and removed. Our old-fashioned rubber shoes used to be made in this way. Twenty million pounds of rubber, valued at $5,000,000, are annually exported from Para; in the dry season many thousand people are engaged in gathering it. But the business is altogether a ruinous one for the province, as Brazilians themselves are fully aware. The *seringueiro*, who gains two or three dollars from a single day's gathering, has enough, as life goes here, to keep him in idleness for a week; and when his money is spent, he can draw again on his ever-ready bank.

The present wasteful system is spoken of as follows:—

The half-wild *seringueiros* will go on submitting to impositions and dying here in the swamps, until Brasilians learn that by purchasing this land from the Government and planting it in rubber-trees, they can insure vastly larger profits, and do away with the evils of the present system. It is what must eventually be done. The rubber gatherers, in their eagerness to secure large harvests, have already killed an immense number of trees about the Pará estuary; they have been obliged to penetrate farther and farther into the forest, to the Tocantins, Madeira, Purus Rio Negro, and eventually even these regions must be exhausted, unless they are protected in some way. The trees, properly planted and cared for, will yield well in fifteen years, and, of course, the cost of gathering would be vastly reduced in a compact plantation; half the present labor of the rubber collector consists in his long tramps through the swampy forest.

THIN SEEDING.

FULL and healthy development is essential for maintaining in the highest state of perfection those qualities for which improved plants and animals are esteemed by man. Our cereals—wheat, oats, barley, rye—are all the products of man's care and skill as a cultivator, and only by the continued exercise of that care and skill can the qualities they have acquired be retained. The tendency under neglect to revert rapidly to the wild type is most marked in the oat. Thick seeding tends to promote this degeneracy, and cause a diminished yield of grain. On this interesting and important subject Professor J. P. Roberts, of Cornell, U.S., in the *Rural New Yorker*, gives the results of last year's, and the average results of five years' experimenting with the oat. The experiments were conducted on moderately poor land the average yield of the experimental plots being about half as much as the regular field crop. The following is the table of quantities:—

THICK AND THIN SEEDING, 1880.

	Yield per Acre. bush.	lbs.
Seven pecks of seed per acre	24	12
Twelve pecks of seed per acre	21	3
Sixteen pecks of seed per acre	18	9
AVERAGE THICK AND THIN SEEDING.		
Four years, 5 pecks per acre	39	20
Five years, 7 pecks per acre	38	9½
Five years, 12 pecks per acre	38	10
Five years, 16 pecks per acre	37	12
1880.		
Average of broadcast plots, 7 pecks per acre	36	18
Average of drilled plots, 7 pecks per acre	30	15
GENERAL AVERAGE FOR THREE YEARS.		
Broadcast	49	4
Drilled	43	7½
1880.		
Treated with salt	31	12
Treated with plaster (gypsum)	31	23
Adjoining plots unfertilised	27	13½
GENERAL AVERAGE FOR THREE YEARS.		
Salted	40	16
Plastered	37	9
Unfertilised...	36	7
1880.		
To plot No. 9 were applied 600lbs. of equal parts of salt and plaster	37	1
Plot No. 8 on the one side, unfertilised	29	17
Plot No. 10 on the other side, unfertilised	28	19
Average of the two (No. 8 and No. 10)	29	2

Thus it appears that last year the use of seven pecks of seed per acre gave a yield of 6 bushels 3lbs. more than was obtained by the use of 16 pecks of seed, the difference in favour of thin seeding—including the saving in seed—being eight bushels 13lbs. Then, again, an average of four years shows a gain—inclusive of seed saved—of five bushels 7lbs. per acre by the use of five pecks of seed instead of 16 pecks; and the average of five years shows three bushels 6½lbs. per acre in favour of seven pecks of seed, as compared with 16. The result of broadcast sowing with the same quantities of seed as compared with drilling, are striking, the average of three years giving five bushels 36½lbs. in favour of broadcast sowing. The effect of salt and "plaster" and plaster, used as fertilisers separately and in combination, is also worth nothing. Professor Roberts says:—"It appears from the results that either plaster or salt, or both, have the property of preventing evaporation, or of drawing moisture from the atmosphere. They probably perform both offices." I have a neighbour who will be delighted to ponder over the foregoing experiments, and they merit the serious consideration of all grain growers. My neighbour is a staunch advocate of thin seeding. His practice is to sow one bushel of oats and about 50lbs. of wheat to the acre, and he maintains that he harvests five bushels per acre more grain than he would if he used double the quantity of seed on the same land. He is an old farmer and speaks from 27 years' experience in this colony His thin-seeding ideas he brought from the old country, where he had also, experienced the benefit of saving seed and increasing the yield of grain. Professor Roberts now intends to select the best land for his experiments in thick and thin seeding, so that in a few years he may obtain data for a double comparison. Now, if a series of such experiments as the above were instituted at Dookie, carefully conducted, and demonstrating the wisdom of thin seeding, thereby saving, say, 500,000 bushels of seed annually, besides an increase of three or four millions of bushels of crop, why, the endowment of the place with a grant of two or three hundred thousand pounds would be a mere bagatelle compared with the benefit that would be conferred on the community. Moreover, experiments in manures could be carried out at the same time for the purpose of ascertaining the best, and cheapest means of maintaining the producing power of the soil.—*Australasian.*

AMERICAN CROP REPORTS FOR 1879.

THE census for the cereal product of 1880, which is the crop of 1879, has been completed, and it shows the constantly increasing prosperity of the country. The total wheat and corn crop is 2,332,079,681 bushels. The total rye, oats, barley, and buckwheat is 481,965,000 bushels. The total product of the country aggregated 2,714,608,681 bushels. This

is a remarkable increase in the productions of cereals during the last decade. During the last ten years Indiana and Illinois have nearly doubled their wheat production. Iowa has quardrupled hers, Minnesota doubled Wisconsin suffered a loss of about 1,000,000 bushels. Kansas increased, eight fold, and Nebraska and Colorado sevenfold. The following are the complete returns of wheat and corn as compiled by the Census Bureau for 1880 :—

	Wheat, 1880.	Corn, 1880.
Ohio	46,011,869	112,681,146
Indiana	47,288,9 9	117,121,915
Illinois	51,136,455	817,796,895
Michigan	35,537,097	86,844,229
Iowa	31,177 225	276,093,195
Wisconsin	24,884,689	35,191,464
Minesota	34,625,675	14,979,744
Missouri	24,971,727	203,464 820
Kansas	17,824,141	106 790,482
Nebraska	18,846,742	65,785,572
Colorado	1,475,559	455,988
Dakota	3,018,354	2,078,0 9
Moontana	469,688	5,794
Nyoming	1,752	65,0 0
Idaho	510,561	16,408
Utah	1,167,268	161 244
New Mexico ...	708,788	650,854
Arizona	189,517	86,216
Washington ...	1,921,382	39,906
Nevada	70,404	12,891
Oregon	7,486,492	127,675
California	28,787,133	2,050,007
Total ...	272,617,511	1,303,188,529

Total for the country : Wheat and corn. 2,232,679,631 ; rye, oats, barley, and buckwheat, 481,9 5,000. Total 2,714,684,681.

IMPORTANCE OF MINERAL ELEMENTS OF FOOD.

"THE more a man follows Nature," says Hufeland in his Art of Prolonging Life, " and is obedient to her laws, the longer he will live ; the further he deviates from these the shorter will be his existence. Nature has ready prepared abundance of food for man, and if he partakes of them as he has need in nearly the form offered, there is no danger of getting far out of the way. The art of man however steps in and changes, takes from and refines many articles of food, so that their original constitution is materially changed. How far such changes modify the healthfulness of food is a proper subject for inquiry.

Wheat as furnished by Nature, is a wholesome and most valuable food. In early times it was boiled until soft, or ground and made into bread, furnishing the people with a healthy food. In later times to gratify the taste and please the eye, it has been customary to separate all of the bran portion of the ground wheat, leaving only the white and fine particles for the making of the bread. One hundred pounds of wheat when ground will make about 76 pounds of flour and 20 pounds of bran. The flour contains of albuminoids as tissue making elements 1·65 per cent., and of phosphates and other salts 0·70 per cent., making a total of 2·35 per cent. The bran contains of albuminoids or tissue, making elements 3·10, and of phosphates and other salts 7·05 per cent., making a total of 10·15 per cent. In other words the bran for the purposes of nutrition is four-fold richer than the flour, the twenty pounds of bran made from 100 pounds of wheat containing more nutriment than the 76 pounds of flour. The flour consists chiefly of starch, while the flesh forming elements together with the blood and bone producing constituents are principally rejected in the bran It will be observed that nearly all the phosphates and other salts are removed from the flour in grinding leaving only 0·70 per cent, while the bran contains 7·05 per cent. of these important elements.

Is it probable that so large a proportion of the mineral elements of wheat can be thus rejected without ill effects to those who live largely upon a diet of flour bread ? This is an important question for consideration ; complete data for the decision of the question are not at present available, but some important facts have been established.

Numerous experiments in feeding farm stock have shown that when animals are fed in food from which the phosphates and other salts have been removed as completely as possible, they become sleepy and weak, especially in the extremities and finally die from lack of mineral food, although the quantity of organic food eaten and digested may be amply sufficient to sustain life. The digestion of food did not seem to be interfered with, and when the animals were examined after death, all the organs appeared healthy and well nourished. Now if such marked and fatal results attend the removal of the phosphates and other salts from the food of domestic animals, is it not probable that the removal of nine-tenths of these same elements from wheat in the process of the manufacture of flour would be attended with injurious effects. Especially would this seem probable where children who while growing need large supplies of flesh, blood, and bone material, are fed largely upon flour bread. Is it not probable that many of the pale, poorly nourished children, with small, flabby muscles, owe something of their condition to their diet of flour bread? Not all of the fat and plump children are really well nourished as is shown by the smallness of their muscle development, and their general inability to withstand fatigue or diseases. Fat is not muscle, and does not impart strength.

Is it not a significant fact that there should be comparatively so little disease among our domestic animals—so rare that one dies, so rare that the young fail to grow up—while there is so much sickness among human beings, and so large a proportion die before they are five years old ? When any of the domestic animals are sick, we attribute their sickness to improper food, or wrong management of some kind, and seek to remedy it. If one of them dies, we do not say it is a " wise dispensation of Providence." We generally believe that there has been carelessness or mismanagement somewhere. As regards the human family, we seem to take it for granted that there is to be a large amount of sickness, and do not trouble ourselves very much to ascertain the cause of it. Inasmuch as the natural period of the life of man is longer than that of the domestic animals, it would reasonably be expected that the young of the human family would be endowed with a greater degree of vitality and be less likely to die young. The fact that one child in every five of those born dies before it is a year old, and that one-third of all the children die before they are five years old is full of significance and worthy of consideration If one-fifth of all the calves born should die before they become a year old, we should have a Government commission appointed to investigate the causes of the mortality ; but the children continue to die and no one thinks of having the causes investigated.

It may be suggested that the eating of flour bread can have nothing to do with the death of children under one year of age, as they do not indulge much in that kind of food. True they do, not or should not eat bread of any kind but their mothers do and a mother who lives largely on flour bread does not obtain enough bone and blood-making material to form a healthy body for her child and her milk is nearly as poor in mineral elements as the flour bread which she eats. Thus, indirectly even the infant may suffer from the removal of the phosphates from the wheat in grinding it.

Disease in plants is found to be associated sometimes with a deficiency of mineral elements of food in the soil. The potato rot has been ascribed by good authority, to a deficiency of lime and magnesia in the soil The amount of magnesia in the ash of sound potatoes is 5 to 10 per cent., while in diseased tubers it was found to be less than four per cent. Of lime, sound potatoes contained only 1·77 per cent. Diseased orange trees found by Professor. Thorpe to contain a deficiency of lime and magnesia. If a deficiency of mineral elements is associated with disease of plants, it is highly probable that a deficiency of necessary mineral elements may be a cause of disease in the human system If the removal of the phoshates and other mineral elements from the food of domestic animals causes them to die certainly it is at least propable that the removal of so large a proportion of the mineral elements from wheat, in the process of grinding, may exert a deleterious effect upon the health of those subsisting largely upon it, It is a subject worthy of further attention.—*N. E. Farmer.*

THE HIGHLAND SOCIETY'S EXPERIMENTAL STATION AT PUMPHERSTON.

THE Highland Society's experimental station at Pumpherston, near Mid-Calder, was visited yesterday by a number of gentlemen, to whom the various experiments now in progress, to test the relative crop-producing value of different kinds of artificial manures, were explained and commented upon by Dr. Aitken, Chemist to the Highland Society. The present is the fourth year of those experiments, and the observations made have already thrown considerable light on this important branch of scientific agriculture, all the results of each season's trials having been carefully noted and collated. As at the High'and Society's other experimental station at Longniddry, there are at Pumpherston ten acres under experiment, the field being divided into 40 plots of one rood each. The cropping is a rotation of turnips, barley, grass, and oats ; and this year the crop is oats Before conducting his visitors over the station, Dr Aitken explained that the manures experimented with might be divided into three great classes—phosphatic, potassic, and nitrogenous. Of phosphatic manures there was a considerable number in the market. The whole world was ransacked to find phosphates to add to the fertility of the soil, and the question before the farmer was, which of these phosphatic manures was the best. There were here under observation five different kinds of phosphates, divided into two sections—the one dissolved and the other undissolved. On every plot on the station there was applied exactly the same amount of phosphoric acid, potash, and nitrogenous material, so that if all the manures were equal in their action there should be no difference to be seen in any of the plots, with the exception of one or two where certain ingredients had been purposely omitted. All the plots were sown on exactly the same day. Beginning with the plots to which the various forms of undissolved phosphates had been applied, Dr. Aitken pointed out that the first plot exhibited the products of bone ash, with of course, the uniform proportion of potash and nitrate of soda. To one rood of ground 20lbs. of phosphoric acid was applied, with 15lbs. of potash, and 10lbs. of nitrogen, these figures being equal to 80lbs. of phosphoric acid per acre, with 60lbs. of potash and 40lbs. of nitrogen. Of course, in order to get those 20lbs. of phosphoric acid it was necessary to apply about 60lbs. of bone ash. The next plot showed the results of ground coprolites. On both these plots the crop was a little late and rather short, but on the whole a fairly promising display. The crop grown from bone dust, which was

the next inspected, seemed riper and likely to thrash better than either of the first two lots, though their was less straw. Phosphatic guano had produced a good heavy crop of grain—heavier, probably, than any of those already mentioned. The fifth plot treated with phosphatic manure was that on which ground apatite had been applied. This is a purely mineral phosphate, containing a high percentage (74) of phosphate of lime, and capable of being ground down to an exceedingly fine powder. The results, however, were not so satisfactory as in the other phosphatic plots, the straw being short and the crop small. In the adjoining plot there were no phosphates at all, only potash salts and nitrate of soda having been applied; yet the crop seemed on the whole decidedly better than that grown from the apatite. In a line with these plots, treated with undissolved manures, were plots on which the same manures, dissolved, had been applied, the object of this experiment being to test the results of chemical as compared with mechanical means of dividing the phosphates. The outcome was to demonstrate pretty clearly that (for such soils, at all events, as that at Pumpherston—a clayey and rather poor soil), the dissolved phosphates were decidedly superior. The oats on the plots treated with dissolved phosphates were from a week to ten days in advance of those fed with the undissolved phosphates, while the yield also appeared much heavier. This is an important point for farmers using artificial manures. Much, of course, depends on the conditions of soil and climate, but it seems obvious that for late districts the dissolved phosphates would be most suitable, as by bringing the crop forward a week or ten days earlier, the grain might be saved where it would otherwise be lost in a wet or backward season. The same result might not necessarily follow in an earlier district; but this is a point which farmers could easily settle for themselves by experiments similar to those at Pumpherston, to encourage which, indeed, is one of the objects Dr. Aitken and the Highland Society have in view. The point in question—the superiority of the dissolved manures for certain soils and climates—was considered by all present yesterday one of the most valuable lessons taught by these experiments. The crops grown with dissolved phosphates were undoubtedly the best in in the field.

There are six plots of nitrogenous manures. Nitrate of soda and sulphate of ammonia have both produced excellent crops—the produce of the latter being probably the superior. An interesting feature in this section was the horn-dust plot which had produced surprisingly good results. This year shoddy, which was experimented within previous seasons, was abandoned altogether, having in Dr Aitken's opinion, been proved utterly useless as a manure. In its place horn-dust was applied. It was ground as fine as possible, and in the event has proved a capital nitrogenous manure, the crop being in some respects equal to any in the field. It was applied along with the potash salts and bone ash, superphosphate. Dried blood produced a miserably poor crop—so poor, indeed, that doubts were suggested as to whether the manure had not by some mischance been omitted altogether. In one of the plots no nitrogen was applied, but merely potash and phosphates, and the crop was almost nil. Three superphosphate plots afforded interesting evidence with reference to the efficacy of dissolving these manures. Ten, twenty-five, and forty per cent. of the manure applied to those respectively was soluble and the results showed unmistakably that the dissolved superphosphate produced a very much better crop. A curious result was brought out in one of the plots, showing the danger of overdosing crops with dissolved manure. In one or two plots two-thirds of the manure was applied on one-half of the rood and the remaining third on the other half, there being thus double the quantity on one part that there was on the other. The result in the case referred to was that the ground which had received a double portion of dissolved bone-ash, with a mixture potash salts and sulphate of ammonia, produced a decidedly poorer crop than the part which had received exactly half as much of the same manure. The oats had quite a burnt appearance, and were inferior in every respect, and this was regarded as striking evidence of the deleterious effects of too much dissolved phosphates. The experiments with superphates showed that these, when highly dissolved, gave a better yield than when less dissolved, and this result was pointed out by Dr. Aitken as going to disprove the theory of certain experimentalists who hold that insoluble phosphates were really better than soluble. Ichabo guano gave a good, uniform, well-ripened crop, and Peruvian guano also an even though not a heavy yield. Fish guano also seemed to produce a better crop than in former experiments, which, Dr. Aitken observed, appeared to indicate that this manure took some years to tell upon the soil, but that it possessed considerable manurial resources. At the close of the visit a vote of thanks was awarded to Dr. Aitken on the motion of Mr. Stewart, Secretary of the Western District of Mid-Lothian Agricultural Association, seconded by Captain Norman, R. N., Berwick-on-Tweed.—*Scotsman.*

THE HARVEST OF THE WORLD.

THE volume of reports on the harvest in the different countries of the world which is brought out by M. B. Estienne every year, is now being issued. It is a large quarto volume of over 800 pages, and a very handsome map in colours showing the state of the wheat crop in the various departments of France is published with it.

The first portion of the volume deals with the various crops in France reports being given from the various departments. The wheat crop is reported on from 90 departments, and in three of these it is said to be very good, in 30 good, in 23 fairly good (*assez bonne*), in 24 medium (*mediocre*), and in 10 bad. Last year the figures were—5 very good, 17 good, 26 fairly good, 16 medium, and 6 bad; so that it will be seen that the reports are this year from over a larger area and also indicative of a better crop than last year. Of barley we have reports from 70 departments, 8 of which are very good, 33 good, 13 fairly good, 1 passable, 14 medium, and 1 bad. Last year's figures showed this crop to be very good in 26 departments, good in 40, fairly good in 5, and medium in 3. This year's crop, it will be seen, is not so good as that, but is still fairly good. Maize is not largely grown, except in the southern parts of France, and only 25 departments (as against 33 last year) report on it. The crop is a very ordinary one, being good only in 7 departments, fairly good in 5, medium in 6, and bad in 7. Last year this crop was a very good one—3 departments reporting is very good, 19 good, 5 fairly good, and 6 medium. Oats are reported on from 81 districts; in 6 they are very good, in 21 they, are good, in 18 they are fairly good, in 26 they are medium, and in 10 bad. Rye is declared to be a very good crop in 6 departments to be good in 19, fairly good in 17, medium in 16, bad in 5, and very bad in 2. Last year's reports showed oats to be very good in 28 departments, good in 40 departments, fairly good in 7, middling in 6, bad in 2, and very bad in 1. And rye at the same time was reported as very good in 11 departments, good in 51, fairly good in 6, and medium in 8. From the whole of these figures it will be seen that the crops of this year are not up to those of last year, but that wheat is not much below the crop of an average year. None of the crops will be very bad, and none can be described as very good.

The crops in Great Britain are described as—wheat, 10 per cent. below average and likely to realize only about 10 million quarters; barley, 10 per cent. above average; oats 20 per cent. below average; and the year is described as a poor one, and in one in which farmers will not be likely, even though, with a market bare of supplies, wheat is now making a very high price, to recoup themselves for any of their losses of the past five years, even where they do not add to the m.

In Austria-Hungary the crops are spoken of as all round good, wheat and barley being both above the average. Rye is very much and oats slightly, under average. The reports from Italy all agree in describing the crops of a medium character and much below the abundance of 1880. The markets, too, are calm, and prices feeble. Of wheat the quality promises to be good, but under the ordinary weight. Oats are good in quantity and quality, although the grain is not so plump as last year. But little barley, is grown, but where it is it is this year of bad colour and lacking in weight. Rye is good and abundant and will be the crop of the year. From the Turkish provinces in the Danube comes the statement that this year's wheat harvest will be of a medium character, and the qualities of the grain various. Rye will be good and abundant. Barley is yielding a good crop for quantity, but both colour and weight are bad. Oats here will be very much above the average.

All the reports from Russia, and especially those from Odessa speak of the barley crop as the best crop of the year, doubling that of last year in quantity, but as a rule the grain is not so plump and weighty, nor the colour so good, as might be wished. Rye is an abundant crop, and wheat is also good. Throughout Germany the winter and spring sowings are in marked contrast—the former yielding good crops and the latter very defective ones. All crops are very late this year also. Oats are a very good crop, but barley is thin on the ground and the grain is not heavy. None of the crops are an average. In the Prussian States the reports on the crops are by numbers, 100 being taken as representing an average crop:—Wheat 80, rye 77, barley 89, oats 89, peas and similar crops 83; and potatoes, 95. These figures are also as near as possible an average of the crops of the whole of Germany.

Switzerland, right up to the time of harvest, was suffering from an extreme heat and drought that did considerable damage to the wheat, which is a very poor crop this year in consequence. The quality of the grain is, however, very fine. Both oats and barley are good in quantity and quality; but of the latter there is but a small area planted. Rye is a poor crop for grain, but straw is long and good. Belgian reports state that the summer and ripening time was marked by strong rains and a low temperature, the effect of which has been to make the wheat far below an average. Barley is a good crop, both for quantity and quality; and rye is good for quality but under average in quantity. Oats vary in quality, and will be under average in quantity. All crops are reported as bad from Spain, barley being the best. The area under rye is decreasing gradually, and this year it is much smaller than last. Wheat is a very poor crop both for quality and quantity. From Holland all the cereals are reported in good condition. Up to the end of May the weather was unfavourable and all crops suffered somewhat, but the more favourable weather since has had the effect of bringing the produce up to quite an average. Wheat is quite an average, not only in the yield per acre, but also in the acreage sown and the quality and weight of the grain.

All the reports from the United States go to show that in all the States the yields this year will be under an average. In quality, however, wheat is better than last year, while oats and barley are both fairly good in quality and not so much under average as wheat.

SIMPLE WEATHER LAWS.

AT a meeting of the Farmers' Club of the American Institute, held recently, Mr. A. J. De Voe, of Hackensack, N. J., sent the following ten short rules by the use of which a person can stand beneath his own vine or fig-tree in any part of the Northern hemisphere (north of latitude 15), and for hundreds of miles around him he can form an accurate opinion how the wind and weather are progressing.

1. When the temperature falls suddenly there is a storm forming south of you.

2. When the temperature rises suddenly there is a storm forming north of you.

3. The wind always blows from a region of fair weather, towards a region where a storm is forming.

4. Cirrus clouds always move from a region where a storm is in progress, towards a region, of fair weather.

5. Cumulus clouds always move from a region of fair weather, towards a region where a storm is forming.

6. When cirrus clouds are moving rapidly from the north or north-west there will be rain in less than twenty-four hours, no matter how cold it may be.

7. When cirrus clouds are moving rapidly from the south or south-west there will be a cold rain-storm on the morrow if it be summer, and if it be winter there will be a snow-storm.

8. The wind always blows in a circle around a storm, and when it blows from the north the heaviest rain is east of you; if it blows from the south; the heaviest rain is west; if it blows from the east, the heaviest rain is south; if it blows from the west the heaviest rain is north of you.

9. The wind never blows unless rain or snow is falling within one thousand miles of you.

10. Whenever a heavy white frost occurs a storm is forming within one thousand miles north or north-west of you.

If any scientific gentlemen has an idea that he can prove any of the above rules incorrect, I am ready and anxious to meet him.

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday, the 25th August 1881.

RAJAH SOUTTYANAUND GHOSAL BAHADOOR, *in the Chair*.

The proceedings of the last Monthly Meeting were read and confirmed.

The following gentlemen were elected Members:—

The Rev. Albert Williams, Messrs. E. Delius. W. MacNab, A. Bauermeister and W. D. Pratt. Manager of the Muleng Tea Estate, Assam, and Baboo Rarnarain Chatterjee.

The names of the following gentlemen were submitted for membership:—

The Superintendent of the Chumba State, *viâ* Dalhousie—proposed by the Secretary, seconded by Mr. A. Wilson.

H. Farrer, Esq. C. S., Serajgunge,—proposed by Mr. S. Gowan, seconded by Mr. H. A. Firth.

F. W. Tytler, Esq., Superintendent, Railway Mail Service, Allahabad,—proposed by the Secretary, seconded by Mr. R. Blechynden.

C. A. N. Wallich, Esq., Tea Planter, Julpigoree,—proposed by Mr. G. W. Shillingford, seconded by the Secretary.

Captain T. A. Freeman, 70th Regiment, N. I., Subathoo,—proposed by the Secretary, seconded by Mr G. L. Kemp.

Dr. C. N. Kernot, Calcutta,—proposed by the Secretary, seconded by Mr S. H. Robinson.

Rejoined—Maxwell Smith, Esq., Tirhoot.

CONTRIBUTIONS.

1. Review of the Forest Administration for 1879-80, by the Inspector-General of Forests. From the Government of India.

2. On the manufacture of Iron and the future of the Charcoal Industry in India. From the Government of India.

3. Annual Report of the Smithsonian Institution for 1879. From the Institution.

4. Journal of the Asiatic Society of Bengal. Parts 1 and 2 of No. 2, 1881, and Proceedings for June and July. From the Society.

5. A quantity of Orchids from the Dooars. From B. H. Carew, Esq.

6. A collection of Orchids from Sylhet. From C. K. Hudson, Esq.

7. A quantity of seed of the Carob (*Ceratonia siliqua*). From the Director, Department of Agriculture, N. W. P.

8. A small supply of Potato seed of three kinds. From Messrs. Sutton and Sons.

9. Some acclimatized Aster seed. From C. Nickels, Esq.

GARDEN.

A report from the Garden Committee was submitted. The Committee allude to the economic portion of the garden and to the increased amount of propagation in the Orchard. They allude to the plan for the proposed Plant house; to the steps taken for introduction of a large collection of plants from England and Australia; and to the distribution of plants in future annually to members instead of in arrears of two or three years, which has not been found to work satisfactorily. The Committee add in conclusion that—The garden is altogether in as clean a state as can be expected at this season, and the tanks, especially the western one, fuller than usual at this time of the year, in consequence of the drainage scheme of the Superintendent having worked well; as there are yet two months of the rains remaining there is not likely to be a scarcity of water next dry season.

PARTICULARS REGARDING FRUITS, THE PRODUCE OF KUMAON.

Read the following letter from Mr. W. Lee, of Messrs. Wheeler Brothers, dated Ramgurh and Julna Tea and Fruit Estates, in Kumaon, 6th August:—

On reading an account of the proceedings of the Agri-Horticultural Society at their General Monthly Meeting held at Calcutta, on the 23rd June 1881, as reported in the *Pioneer* newspaper of the 6th July, we particularly noticed the remarks which referred to a "Trial shipment of fruit from Melbourne," and it seemed strange to us that with some of the very finest varieties of English fruit procurable in India, or indeed in any part of the world, within comparatively easy distance from Calcutta, that a trial should not also be accorded to a consignment of the fruit which is produced in our Gardens and Orchards here.

We would briefly point out that the Ramgurh and Julna Fruit Gardens and Orchards were commenced as far back as 1858, since which period annual importations of the choicest fruit grafts from England and America have been made, the result being that at the present time the above Gardens and Orchards are fully stocked with the finest varieties of fruit grown in Europe.

Experience extending over a period of 20 years has amply proved that the temperate climate of the Himalayas is most perfectly adapted for the successful culture of apples and pears, both of which fruits are here produced of far superior size and flavour to similar varieties grown in the cold and damp climate of Great Britain.

We are still increasing our Gardens and Orchards largely, and we now already raise quite a sufficient quantity of fruit to supply the Calcutta market to a considerable extent. The crop of apples alone on both Estates, *viz.*, Ramguph and Julna, averages about 50,000 per annum now which will undoubtedly increase yearly as the succession of newly planted trees come into bearing; and our crops of pears may also now be estimated in the same ratio as the apples, and these will also in like manner increase.

As seeing is believing we would suggest that we be permitted to forward a small case of apples for inspection to you which we should be glad if you would submit for the approval or otherwise of the President and Committee of Agri-Horticultural Society.

The first sample case which we would propose to send from here would be of cooking apples such as are suitable for pies, puddings, dumplings and baking, and we would follow them up by sending samples of our eating dessert apples, which latter would no doubt bear the journey in perfect condition, and we could supply them regularly from August to the end of October. The cooking apples, some of which are very large and are now ready, would be those about which most difficulty might be apprehended as to their reaching Calcutta in perfect condition. The dessert apple would not be so liable to suffer.

The journey from here to Calcutta should from first to last occupy no more than a week, *i.e.*, from the time the fruit be plucked from our Orchards to the time of its reaching Calcutta, and would as soon as the projected Kumaon and Rohilcund Railway from Bareilly to the foot of the Hills is opened, occupy but four or five days.

We have hitherto found a local market for our fruits in Nynee Tal, and have sent small quantities for sale to Simla, Lucknow, Cawnpore, Meerut, Mussoorie, and even as far as Gwalior, and we have found that in most cases our fruits have reached their destination in good and fresh condition, and have been highly appreciated.

If our fruits upon inspection and trial by the President and Committee of the Agri-Horticultural Society be found to be such as we represent them to be and to be worth sending to Calcutta, we should be perpared to forward a large number in the latter part of September and in October to any firm in Calcutta, who would kindly accept the Agency for their disposal.

In conclusion we would beg that our letter and proposal be laid before the President and Committee of the Agri-Horticultural Society, and that a report be made on the subject and also on the quality and condition of the samples of fruits which we would send at the next General Meeting of the Society.

On receipt of your reply we would at once, at our sole expense of course, forward to you a sample or samples of our apples. The pears will be ripe shortly in this month (August).

The enclosed notice will show you the rates at which we have hitherto sold our fruits to purchasers in the plains, the fruits being delivered at Bareilly, which is our nearest Railway Station, at our expense, but in sending large consignments to Calcutta we could no doubt be able to deliver them there at the same rates provided the demand was such that the fruits could be disposed of rapidly as the climate of Calcutta will not admit of their being stored for any length of time, especially during the months of August and September.

Read also a letter of subsequent date (20th August,) from Messrs. Wheeler Brothers from their Julna Estate:—

On the 6th instant, our partner, Mr. William Lee, addressed you from the Ramgurh Tea Estate, regarding the superb apples and pears annually produced in our extensive Orchards, and he suggested sending you samples to be placed before the Committee and duly reported upon. Your reply of the 13th August has been sent to us here, and Mr. Lee further writes to say that he has despatched a case containing samples of apples, pears, some filberts produced at our Ramgurh Estate, and which, we hope, will reach you by the 25th to be in time for your Monthly General Meeting. As we have a larger variety of apples in our Julna Orchards, we beg to advise having despatched by this day's parcel post a small box containing upwards of 40 different sorts of apples, and we feel confident that a more varied or finer collection of fruit has rarely if ever been witnessed in Calcutta. We shall be much obliged by your submitting the sample sent by Mr. Lee, from Ramgurh, and those advised by us, for the approval or otherwise of the Committee at the same time; and as our object in sending the sample is to establish the superior quality of our fruits in the Calcutta market, we hope the opinions of the several members of the Committee will be fully recorded and published in the Proceedings of the Society. Among the sample sent by us we may here mention that Nos. 3, 8, and 14 are Ribston Pippins, Nos. 5 and 10, are the Baldwin, an apple largely exported from America to the Calcutta market, No. 7, is the celebrated Fall Pippin or white Spanish Renlette, No. 9, the equally well known Reniette du Canada, No. 17, Adams' Pearmain, No. 13, Braddicks Nonpareil, No 22, Pine Golden Pippin, No. 26, Boston Russet, No. 23, the Dutch Mignonne; and we have also sent half a dozen genuine Golden Pippins and the same number of Pommed Apior the little Lady Apple. If you

could kindly arrange to allow the influential residents of the city to examine our samples we should be very thankful.

This collection of fruits was highly thought of by the Members present, the best ever shewn, as the produce of British India. Messrs. Wheeler Brothers add that they have not been selected on account of their size and appearance as specimens, but represent a fair average of our fruits; as far as apples and filberts are concerned We have thousands of larger apples at this moment in our Orchards. The very few pears we have sent are of our smaller variety, our pears are not yet ripe, and of these we have very fine specimens which will be fit to pluck in about three weeks."

BARLEY RAISED IN THE HIMALAYAS.

Submitted a letter from Captain J. F. Pogson, dated Koteghur, 18th July, of which the following is extract:—

"I have by this day's baughy post sent you two ounces of "*Wheat Barley*," and inspection will show that there are two distinct kinds, one being of the variety raised at Mirzapore by Mr. Nicholson from seed given to one of his servants, and the other being so very like *wheat* in colour and form, as to deserve its name of "*Wheat Barley*."

The zemindars of Kotgurh have grown this Barley, *i.e.*, like the samples sent, from ancient times, and although this place may not be the home of the two varieties of Barley, it has become as common as the other or husked kind, with which it is sown, as I have had to pick out the husked kind.

Thibet may be the home of both kinds, and a traveller from Nepaul may have brought the Barleys, (Mr. Nicholson's variety,) with him to Benares, which is much visited by Pilgrims from Nepaul. If this surmise be correct, both varieties of Barley should be obtainable in the bazars of Katmandoo, and their introduction into the plains of Hindoostan, under Government sanction and support, becomes a very easy and simple affair.

At Kotgurh, the present price of the Wheat Barleys (mixed,) is sixteen seers per rupee, and if the husked kind be picked out, the cost of labor, and reduction in quantity may bring it down to 10 or 12 seers per rupee.

If Nepaul cannot, *or may not* supply the seed, I shall be happy to execute all orders sent through the Society. Officials or Collectors of Districts, could have their indents executed through Major Parry Nisbett, the Deputy Commissioner of Simla, or if they preferred it, I would do the needful.

According to "Ures Dictionary:"—"The weight of the husk of Barley is one-sixth the weight of the grain, or in simpler language is maunds of English Barley, contain one maund of *husk*. Now, as the husk has no nutritive value, it must be admitted that, the price being the same, the purchaser of six maunds of "*Wheat Barley*," obtains one maund, or 82lbs. more of food for his money, than does the purchaser, of six maunds of the common Barley, or to put it in rupees, a saving of one in six results from the use of the "*Wheat Barley*." Good Barley contains two and-a-half per cent. of "Phosphate of Lime," the principal component of all *bones*, Indian bred horses and ponies, are deficient in bone, as compared with the Arab horse, Burmah pony, and Thibet pony, all being fed chiefly on barley. The Indian horse gets barley and gram mixed, but preferably only gram. The results is the high price of gram. Now if the Government fostered the cultivation of "*wheat barley*," two valuable results would follow, the first being the improvement in bone, of all horses, bred and raised for the mounted branch of the Army, and the second a very considerable saving in the cost of horse food.

The zemindars, or agriculturists interests may now be considered—First, all unsold "*Wheat Barley*," excepting that required for seed, would be available for food—2nd, the corresponding quantity of wheat would be placed in the market for export to London—3rd, a considerable quantity of gram now consumed by horses, would be sent to Europe, and as this might be "*white gram*," the zemindar would realise the difference in money value, which would not be insignificant—4th, with this *wheat barley* to hand, European distillers could produce very large quantities of extra superior whiskey and a glass of hot whiskey punch, would come within the means of the ryot in place of the poisonous 'Mudrack," of the Kullaul. Finally the Excise would be a gainer, and Rs. 24 per dozen and upwards would cease to be paid for imported Scotch and Irish whiskey, whilst an export trade in Indian whiskey would be called into existence, and become permanent."

PINUS LONGIFOLIA.

The Secretary mentioned that he had distributed largely the seed of *Pinus longifolia*, received in June last, from the Superintendent of the Botanic Garden, Saharunpore, and that there was still a good quantity in hand, for which he would suggest early application. This tree, it would be remembered, was brought to the notice of the Society by a Member (Dr. Geo. Henderson) in the early part of the year (*see* proceedings for February) as well worthy of cultivation whether for shade, ornament, fuel, or timber. A list of parties to whom the seed had been distributed was placed on the table, including managers of Tea Gardens and others in various parts of the country.

Letters were submitted—

1. From Secretary, Government of Bengal, on the subject of certain models of Agricultural Appliances from China, Japan and the Philippine Islands.

2. From Baboo Mohesh Chunder Bose, Berhampore, forwarding two instruments to add to the collection of Agricultural Appliances one of iron and another of silver, used for making incision in poppy pods.

3. From the Under-Secretary, Government of India, Agricultural Department, forwarding copy of a correspondence regarding the cultivation of *Rieana luxurians* in the Punjab.

4. From the Secretary, Agricultural Institute, Bijnore, returning thanks for supplies of seeds.

5. From the Deputy Commissioner, Peshawur District, stating in reply to inquiry, that the white gram alluded to in the recent proceedings is cultivated in the Logar Valley and the country generally round Cabul. It is sown in March and ripens in July and August.

6. From the Assistant Commissioner, Hurdui Oude, applying for some of Captain Pogson's seed barley, alluded to in the proceedings for June. Mr. Naber writes—"I am in charge of the Public Gardens, and we are just now trenching some land according to the wishes of the Commissioner, a portion of which has been turned up by experimental plough, in which I should like much to try this barley also in the garden. I see you have been discussing the white gram. I have grown it for several years; but always found both at this place and Pertabghur that it required irrigation to bring the grains to their proper size."

MINERALOGY.

THE Government of Bengal has made a definite offer of three lakhs of rupees for the Bengal Iron Works, and the liquidators propose to put up the property for sale at auction, in one month's time, setting upon it an upset price of three lakhs, and if no bid above that sum is made to accept the offer of the Bengal Government.

CHARCOAL IRON IN INDIA.

ARCHÆOLOGISTS have divided prehistoric times in every country into the ages of stone, bronze, and iron, according to the nature of the implement and weapons found in ancient dwelling-places and tumuli. Dr. Percy, the chief metallurgical authority in England, used to insist that the three ages could not possibly have succeeded one another in the order usually given - the age of iron must have come before that of bronze. It is true that the iron implements now discovered mark a degree of civilization higher, as a rule, than that indicated by bronze remains; but then iron is such a perishable metal, that the earliest weapons and utensils made of it may have long ago disappeared, while those of bronze remain This opinion, so much at variance with the current theory, Dr. Percy founded on a metallurgical argument—the extreme difficulty of making bronze, a mixture of two metals both very difficult to extract from their ores, and the ease with which malleable iron may be made from ores which occur in abundance nearly everywhere. As a matter of fact, at the present day bronze is only manufactured in the most highly civilized countries of the East and West, whilst every savage living in countries containing the ore (except the Americans) knows how to make excellent iron. From pure oxides, such as occur in many countries, iron can be extracted so readily, that it could hardly miss being accidentally discovered by a savage who had lighted a fire and made use of pieces of the ore as hot stones to boil his dinner.

In India we find the aboriginal populations everywhere expert in the manufacture of iron. In Kumaon and the hills generally, this work is left to the Dums; and in West Bengal and Chota Nagpur to the Aghurias, who, from their ugly features and their habit of working at night over the glowing furnaces, are said to have been the prototypes of the ghouls and ogres of fable. The methods of making iron in India have been often described by officers of the Geological Survey and others. A small clay furnace from 18 inches to three feet high is used, and the fire in it is constantly blown by pairs of bellows, of various construction working alternately and sending the air in by separate pipes or tuyers. Perhaps the commonest kind is the ordinary goatskin bellows, two of which are worked by a man sitting between them. Charcoal is first filled into the furnace and then lighted and blown till it forms a glowing, nearly white hot mass; when alternate layers of finely-broken ore and charcoal are placed on the top until as much as can be conveniently worked in the furnace has been added. An opening is made for the slag, or molten oxide combined with the impurities of the ore and fuel, to run out; and then a lump of soft spongy iron mixed with slag is removed and instantly welded into a compact mass. The whole process lasts about six hours. The iron thus obtained is of the softest and toughtest description, equal for making horse nails and such purposes, to the best Swedish.

The great drawback to the process is that it is so wasteful both in the matter of ore and fuel. We learn something about the amount of this waste from a sort of inter-provincial report on the native methods of making iron in this country, and on the prospects of the trade in competition with the cheaper English-made iron. The paper is circulated by the Bengal Government; it was printed at the North-Western Provinces Government Press; and though it bears no name either at head or foot, internal evidence shows that it was probably written by an officer of the Punjab Forest Department. It therfore deserves to be called inter-provincial. It seems that, on the average, only about one-third of the total iron in the ore is extracted by the native process, the other two-thirds being lost in the slag; and to make a pound of iron, about 13lbs. of charcoal are required. In the round-about process of making smithy iron employed in England (formation of pigiron, puddling, rolling puddled bars, piling, reheating, and rolling again) only about 20 per cent. of the iron is lost, and the total expenditure of coal or coke—much cheaper kinds of fuel than charcoal—is only about 18lbs. for a pound of iron. But for the superior quality of the native iron, the industry

would, doubtless, for this reason have been swamped long ago by the cheap supplies obtainable from England. Another objection to the native process is that only the very purest ores, carefully washed and sorted by hand, can be employed, because if inferior ore were employed it would be impossible to exclude the earthy matter from the spongy iron. The objection, however, is of little force in India, where labour is so cheap and where, as at Lohara in the Central Provinces, we have entire hills composed of stone which contains 98·6 per cent. of the pure oxide of iron. The objection to the Indian charcoal iron on the score of cost would doubtless disappear if, instead of the native process the English method of employing large blast furnaces producing cast-iron were introduced under proper conditions. The blast-furnace method, though indirect and to some extent wasteful in the matter of fuel, has the great merit that by fusing the iron it effectually frees it from the earthy matters of the ore, and of the ash when coal is used as fuel. None of the new direct methods, after which the Government of the Central Provinces has been striving for some time, can do this. The spongy iron must be melted either in the furnace or in a cast-steel-crucible, or else we must sacrifice more than half the iron to form a fusible slag as in the native process.

There is no reason why iron equal to the best Swedish should not be made out of Indian ores with charcoal fuel, after the Swedish and Russian methods. The cast iron thus produced could be made into the finest Bessemer steel, because the Indian ores are usually free from the elements sulphur and phosphorus, which, when in large quantity, are fatal to the Bessemer process as usually worked. Pig-iron manufacture by means of charcoal fuel, has just been given up as a failure by the N.-W. P. Government, which for some years carried on a smelting establishment at Dehchauri in Kumaon. Several good reasons are, however, given in the paper abovementioned for this failure. In the first place the furnace was too large to be worked by natives alone; and the pay of the European overseers was too great to be fairly debitable to one furnace, when these men could equally well have looked after several. The chief reason, however, was that half the ore had to be carried 28 miles from Ramgarh on men's heads or on the backs of mules. In Europe the owner of such a furnace would either have constructed a tramway by which to bring the ore from a distance, or he would have tried to work with the ore on the spot. There is plenty of ore at Dehchauri close to the furnace, costing next to nothing to raise; but it was considered too aluminous to work by itself, and therefore the silicious Ramgarh ore was added to it. The writer of the report thinks it a pity that the Dehchauri works were stopped so soon; certainly, before they were stopped, the experiment might have been made of using the ore found at the place, mixed with limestone and sufficient sandstone to make the slag fuse readily. The ore contains 38·3 per cent. of iron; and if 20 per cent. of silicious material were added to it, it would still have as large a percentage of iron as the bulk of English clay ores. A much smaller addition of sandstone would probably have been sufficient.

The manufacture of iron and steel is likely soon to be again revolutionized, as it was not long ago by Bessemer; and the new system will probably prove fatal to the production of charcoal iron in this and other countries. In the Bessemer process excellent cast-steel is made from molten cast-iron in a few minutes; the iron being run into a vessel lined with siliceous materials, and there getting its impurities—carbon, silicon, and manganese—burnt away by a blast of air which is forced through it. At the end of the process, enough pure cast-iron is added to convert the whole mass into steel, which is then poured into a ladle and cast. Steel can be thus made in enormous quantities, for each converting vessel will work off six or eight tons in fifteen minutes. Two impurities, however,—sulphur and phosphorus, of which phosphorus is the more deleterious, as it makes iron or steel brittle when cold,—cannot be removed by Bessemer's process, since white hot iron reduces sulphuric and phosphoric oxides as soon as they are formed by the action of the blast. For making cast-steel by this rapid process, therefore, iron ores as free from sulphur and phosphorus as possible soon came to be in great demand, while the inferior ores have been little used of late years. Recently, Messrs. Thomas and Gilchrist have succeeded in perfecting a process by which the phosphorus, and to a less extent the sulphur may be got rid of, no matter how much the cast-iron may contain. The Bessemer "converter" is lined with magnesian limestone, and the mouth of the vessel above the molten metal is filled with lime. When the phosphorus is oxidised, the oxide at once combines with the lime forming a compound which is not reduced by iron.

The Gilchrist-Thomas process has already come into extensive use on the Continent, where iron-masters are less conservative than in England; but before long we may expect to see excellent cast-steel made in England from the most inferior ore, and then it will be all over with the charcoal iron industry, except in the most remote countries of the world. India may yet rank, however, as one of the great iron-producing countries if either Government or that private enterprise which is so favourably spoken of now-a-days, would turn its attention seriously to the making of iron by means of Indian coal. There is far more wealth in the iron and coal deposits of the Central Provinces and Bengal than in all the gold fields of the Wynaad.—*Pioneer.*

AURIFEROUS REEFS ON THE NILGIRIES.

THE success of the prospectors of gold mines in Mysore and the Wynaad, and the growing belief that some of the companies already formed to work the "fields" will do well, have directed close attention to the character of the formation of the Nilgiri Hills, with the result that some gentlemen, who are probably not quite disinterested, have arrived at the conclusion, that whatever may be the fate of the industry of gold mining elsewhere, it may be undertaken with great confidence of success in Kotagiri, and possibly also in Koity valley. A few years ago, some Australians passing through the Nilgiri district, noticed the remarkable resemblance which the surroundings of Kotagiri bore to those of Ballarat, and other gold fields in Australia; but it was reserved for Messrs. Sherman, Griffiths, and Mackenzie, to make a careful investigation of the locality, with the result that their expectations of the presence of gold have been fully realised. A number of reefs have been discovered; and have been examined by Mr. Groves and other mining engineers, who have given it as their opinion, that the district is peculiarly rich in auriferous reefs. After having made careful assays of the stone which he himself had blasted from the reef, Mr. Grove drew up a very favorable report of the prospects of the field, and expressed his belief that one of the reefs would give about one and three-quarter ounces of gold, and sixty-two ounces of silver, to every ton of stone. The reefs have been laid bare in parts to a depth of over fifteen feet, but nothing beyond preliminary operations has been yet done. Only five reefs have been examined on the property, which contains about from seven hundred to a thousand acres, and these are found to run up the hill to the north of the valley. They vary greatly in thickness, and in the quality of the stone. One reef near the bed of the stream, is from forty to fifty feet in breadth; another, about a quarter of a mile distant, to the north is about ten feet broad, and is almost in the bed of one of the large streams that run down the mountains. From this stream rich alluvial deposits have been taken. A third reef is situated some hundred feet up the hill, towards Kotagiri, and it is believed to be a continuation of number two, already mentioned. This third reef is not far distant from a rapid stream which runs on the other side of the hill on which it is, and the quartz taken from it, could be run over the crest of the hill to the stream on the other side where a second reduction establishment could be formed. The quartz is white, but a good deal stained with a reddish tinge, and is charged largely with pyrites, in which iron, arsenic, copper, silver, and gold, appear to be combined.

Situated at an elevation of about 7,000 ft above sea level, Kotagiri is well adapted for mining operations; and possesses some advantages which none of the other Indian gold fields can boast of. Taking up a position about two miles west of Kotagiri, on the crest of one of the ridges of the surrounding mountains, and in the centre of what is regarded as the auriferous district, the land lies mapped out at one's feet. Southwards lies the richest part of the valley, at the depth of some hundreds of feet; and this valley is seen to be bounded by lofty and picturesque mountains, except to the east, where the hills gradually slope towards the plains, until a large high bluff standing out clearly against the far distant blue plains is reached. Still looking southwards, the huge hills forming the Kunda range which intervenes between Kotagiri and Coonoor, tower up; and on their steep sides, appear, here and there, the estates and bungalows of coffee-planters. To the north are Down-like hills sweeping away in graceful undulations. Four different streams running down the mountain sides, unite a little above the narrowest part of the valley, and the united body of water passes through it. It is believed that sufficient water power to work a 20 head head stamp can be safely calculated upon from year's end to year's end; and that by constructing a large reservoir for the storage of the monsoon rain, as much more hydraulic power as can possibly be desired, may be easily and economically secured. Local labour is at present abundant; and to the Burghers, if not perhaps to the coffee planters, in the neighbourhood, the establishment of a new industry would be welcome. The climate is salubrious, and the temperature is usually 3 to 5 degrees warmer than that of Ootacamund. The locality is thus well suited for the permanent residence of Europeans with their families; and visions of cosy cottages in the midst of flower and vegetable gardens with some of the features of English villages around them, are easily conjured up as one surveys the scene which now wears so placid an aspect. The valley is connected by a road, twelve miles long, with Coonoor; and it has a road of its own to Mettupolliam at the eastern foot of the Blue Mountains. These roads meet the present demands upon them fairly well; but they would have to be taken in hand, and their bridges considerably strengthened, to allow of their being used for the transport of quartz crushing and other heavy machinery. The Kolar gold mines have a great "pull" over the other gold mines in Southern India, by reason of their proximity to the railway and the sea. Against this advantage may fairly be set the disadvantage connected with their inability to use water in lieu of steam power; but as fuel seems likely to continue abundant, this drawback may be overcome. Fuel is not one of the strong points of the Neilgherries, as every one who has resided at Ootacamund or Coonoor, knows to his or her cost; and the proved existence of an abundant and perennial water-supply is likely

to have a good deal to do with the development of the auriferous resources of Kotagiri.

Hope tells a flattering tale to the gentlemen who have been looking beneath the surface of their property; and this tale is borne out by specimens. If—it is disagreeable to have to use this suspicious little word—if Kotagiri should prove to be a Ballarat even on a comparatively small scale a great stride may soon be made towards the solution of that painful question connected with "poor whites," which has proved too hard a nut for several successive Governments of India to crack. The Wynaad gold fields are to some extent handicapped by the Wynaad fever; whereas with ordinary care European and Eurasian settlers on the Neilgiris need fear no fever. But it is hardly worth while to anticipate just at present what may be the consequences of the discovery of payable quartz in the Neilgiris, or elsewhere in Southern India, for the British public, who are supplying the bulk of the funds for prospecting, are growing restless for want of results. They are being assured by specialists that it is idle to demand results so soon; but having to a great extent, rushed into the enterprise with their eyes shut they are not too ready to attend to those who urge them to be patient. It is well known that the prospectuses of a number of new Indian Gold Mining Companies are cut and dried, and are only waiting the announcement of good crushings from Kolar or the Wynaad, or, better still, from both, to be published. Among them we are not unlikely to find a scheme for developing the untold wealth of the Kotagiri valley.—*Madras Mail.*

THE DIAMONDS, COAL, AND GOLD OF INDIA.

MR. BALL of the Geological Survey of India, has compiled a little work entitled "The Diamonds, Coal, and Gold of India, their mode of occurrence and distribution." He does not profess to give the world anything that is new on these subjects, but he has been led to issue his present book by the "growing spirit of inquiry in reference to Indian mineral deposits." Three of the papers in this volume have been previously published. With regard to diamonds, the information he gives us may be looked upon as supplementary to that found in Mr. Emanuel's valuable book on precious stones, &c. They are found in India in "three extensive tracts, widely separated from one another, in which the diamond has been sought for from the earliest periods of recorded history." In this presidency diamond mines have been, or are, met with in Cuddapah, Kurnool, Kistna, and Godaveri districts. Another region where they are found is a portion of the area between the Mahanadi and the Godavery. The third great diamond tract is in Bundlecund. In 1869, we are told a Mr. Richardson, of Madras, applied to the Collector of the Cuddapah to work the mine paying a rent of one hundred rupees. The result was not favourable, although, Mr. Ball adds, there "are accounts of two diamonds having formerly come out of this field which were eventually sold for Rs. 5,000 and 3,000 each." In the Kurnool district, there are some eleven localities where, according to Mr. King, diamonds may be, or have been, found. The Nawab of Kurnool leases out certain diamond mines for Rs. 750 a year; so we naturally draw the inference that they are not very valuable. Diamonds are sought for in the Mahanadi ly, in the bed of which stream are also to be found pebbles of beryl, topaz, carbuncle, amethyst, cornelian, and clear quartz. The following description of the method of working will give our readers a fair idea of Mr. Ball's style of writing:—"In the centre of the Mahanuddy, near Jhunan, there is an island called Hira Khund, which is about four miles long, and for that distance separates the waters of the river into two channels. In each year, about the beginning of March or even later, when other work was slack and the level of the water was approaching its lowest, a large number of people—according to some of my informants as many as 5,000—assembled and raised an embankment across the mouth of the northern channel, its share of water being thus deflected into the southern. In the stagnant pools left in the former sufficient water remained to enable the washers to wash the gravel accumulated between the rocks in their rude wooden trays and cradels. Upon women seems to have fallen the chief burden of the actual washing, while the men collected the stuff. The implements employed and the method of washing were similar to those commonly adopted in gold-washing, save only that the finer gravel was not thrown away until it had been thoroughly searched for diamonds—at least I was given so to understand, but Tavernier's account of this part of the process is probably correct. Whatever gold was found became the property of the washer, as already stated. Those who were so fortunate as to find a valuable stone were rewarded by being given a village." We have not space to refer to all the districts referred to by Mr. Ball. He tells us that none of the attempt made by Europeans to mine for diamonds has turned out successful. He does not suppose that there has been any real exhaustion of the localities where mining is possible, but owing "to the facilities for peculation in consequence of the readiness with which a gem may be conveyed," it is doubtful whether Europeans can make the speculation pay. Mr. King says that for those content with a slowly paying occupation and a hard life involving close, personal supervision of the workers, it would pay, provided such persons possessed capital sufficient to last them some years.

We are inclined to believe that India will receive much more money for her "black diamonds" than for her white ones. India has coal in districts measuring 35,000 square miles, as will be seen by the following list, which Mr. Ball says was drawn up by his colleague, Mr. Hughes:—

Godaveri and affluents	11,000 square miles
Sone	8,000 „
Sirguja and Orissa	4,500 „
Assam	3,000 „
Nerbuda and afflents	3,500 „
Damuda	2,000 „
Rajmahal area	700 „
Unsurveyed	2,700 „
	35,000 „

The outturn of coal in India is annually increasing, but whether Indian coal will ever entirely supplant English coal is somewhat doubtful. As railways increase and our interval communications are improved, the demand for Indian coal will doubtless grow. Probably most readers of Mr. Ball's book will be tempted to turn in the first instance to the chapter on gold. They will be disappointed if they expect to find there any thing new regarding this absorbing topic, so far as South India is concerned. We are told what Mr. Smyth says, what Dr. Barwell says, and so forth, and there are extracts from William Abbot's monthly price list, and from the *Times Mail*, but we did not read the book for the purpose of being told what we had previously read, and consequently we must say that we are greatly disappointed with Mr. Ball's book. It is merely a compilation from various Government records that are accessible to everyone. Of what value can the following opinion be to any one:—"In the neighbourhood of Chaibassa the chief town of Singhbhoom, I have been especially struck with the auriferous aspect of the rocks. The earthy slates and shells with magnesian schists, and numerous small quartz reefs, are precisely the rocks which, judging from all experience, *ought* to yield gold." Had Mr. Ball wished it, he might have made his book really valuable and useful. There is a mass of information in various official records that he had available for his purpose. A man with his knowledge and opportunities ought to have produced a "standard work"—one to which people would refer during the next quarter of a century. As it is, we have got little more than what may be described as a "catch-penny" book,—one written to sell.—*Madras Times.*

THE SALT CAVES AND MINES IN THE PERSIAN GULF.

FROM a recent report by Assistant Surgeon Abder Rahem, it appears that in that part of the Persian Gulf lying between latitude 26° 10' and 27° 10' N. and longitude 53° 50' and 56° 30' E. is an extensive area, abounding in a large deposit of salt, which crops out at various places on the earth's surface, rising up into ranges of rocks of no little magnitude. The following are the principal places from which salt is obtained in this area:—Kowin, on Kishm Island, Hormuz, Larak, Pohal, near Khamir, Sir-bu-Na'air, Jabal Bostans, and Hameran, on the Persian coast. The salt-bearing rocks are of a reddish colour, from red ochre, varying from earthy consistence to stony hardness, which covers the salt deposit, and is more or less mixed with it, imparting to it a red tint. The ochre is associated, to a small extent, with specular iron ore. The association of the ochre with salt is so constant in the salt area that the existence of the former is almost a sure indication of the presence of the latter. About 16 miles from the Bassidore Station in a south-easterly direction, and three miles from the village of Kowin, on the island of Kishm, is a range of rocks bordering on the sea, and consisting very largely of rock salt covered in some parts by red ochre, while in others large masses of salt of stony hardness and reddish tint compose the surface and mass of this rock, giving it the appearance of a structure made of red bricks and mortar. A salt cave is situated in the western end of the range of rocks, and besides this there are several other places where briny water issues, and collecting in hollow ground close to these rocks, deposits beautiful crystalline masses of salt by spontaneous evaporation. It is stated that some forty years ago, the salt was largely procured by this method; numerous shallow pits were excavated, where, as the brine evaporated, it deposited salt, which was then collected for commercial purposes; but since the natives commenced to quarry the salt, the pits were neglected, as the process was tedious, and the salt obtained, little in quantity, and not good in quality for commercial purposes; at the present time, however, the streams of brine and some of the pits still exist, and yield a certain quantity of salt for home consumption. The working of these salt mines during the past thirty or forty years has given rise to large caverns in the bowels of the rock. In almost all these caves, from the trickling of the brine, stalactites of various shape and magnitude are formed, yielding snow-white masses of salt of saccharoid description. The salt is found in four principal forms. First, pure white masses, easily reduced to granules; second, red masses of stony hardness; third, saccharoid masses, from trickling of brine; and fourth, translucent and transparent masses of cubical forms. The granular form is the most valuable, and is generally of a pure white colour; the red hard blocks are principally used by the natives for salting fish. The salt is dug out by means of crowbars, and it is by no means uncommon during the working of the mines for people to be buried alive from earth-falls. The mines which yield the present salt are situated about two miles from the seashore, and the path leading to them winding between the rocks is

very difficult for the camels to traverse. The salt is brought on the beach by the camels, costing about 4s. for every *bahar*, or ton and-a-half, and, calculating the customs charges at 1s. 6d., and the cost of quarrying at 5s., the total cost of the salt on the beach would be about 10s. 6d. per ton and a-half. Recently salt of an excellent quality was quarried from the rocks, about 100 yards only from the seashore, thus saving the cost of carriage to the miners. The salt mines at Hameran are also extensive. They are situated about four miles from the seashore, and the salt is found in beds of about 4 ft. thick, with intervening layers of earthy material. The salt beds are hard in consistence, and broken by means of gunpowder, the masses being subsequently reduced to granules by wooden and iron mallets. Some of the specimens found were of a pale greenish colour, from an earth of that tint. This earth exists in isolated deposits and mounds, varying from earthy softness to stony hardness; the green tint being produced by the influence of manganese. The quarrying expenses at these mines are about 5s. each ton and-a-half, camel hire amounting to about 4s. 6d., and boat hire to Lingah being about 3s. Large quantities of salt are exported by native boats to Muscat, whence it is carried by merchant vessels to Bengal, Zanzibar, Mauritius, Batavia, &c. There is an average annual export of from 25,000 to 30,000 tons of salt from these mines, the best quality coming from the Kishm Island and Sir-bu-Nuair. The price of salt at Linga varies from 4 to 5 dollars, while at Muscat it is from 5 to 6 dollars per *bahar*, or ton and-a-half. There are, in addition to these caves and mines, certain springs in the rocks close to the village of Salakh, near Henjam, the waters of which are warm, and charged with salt, yielding naphtha of a reddish colour. It is highly combustible, burning with thick smoke. The natives use it for purposes of light, and also use it locally for rheumatic complaints.

DEEP BORING FOR GOLD.

THE diamond-drill has made a conspicuous success. We recently reported that in the Crown Cross United mine at Stawell, the diamond-drill was set to work at a depth of 1,322 feet, and on boring 375 feet further had pierced a reef of about 10 feet in thickness. The core has been tested, and is found to contain gold at the rate of 17dwt. 3gr. per ton, a prospect with which the company is so satisfied that it purposes at once beginning to sink for the reef. This work will occupy a year, and will cost about £1,000. The discovery is entirely due to the new and valuable instrument of which miners have recently secured the use. Without it, it is quite possible that the company would never have incurred the expenditure necessary to sink a shaft. This is not the only, though it is the most prominent instance of the usefulness of the drill as an instrument for prospecting. It is not long since that its use in a claim at Hepburn led to discoveries which improved the quotable nature of the claim to the extent of £10,000. At Stawell, we learn that the discovery in the Crown Cross United mine of a paying reef at a depth of 1,700ft. has infused a new spirit of enterprise into mining work. The discovery in itself of paying quartz at this great depth is of vast importance as giving an enormous extension to the area of our known workable ground, and it immensely enlarges our views of the permanence of gold-mining in the colony. But the great point of interest is that the discovery was made by means of an instrument which reduces the cost of underground exploration in a very great degree. It is quite natural that the utility of the instrument should specially strike the public mind when it leads to a positive discovery. But it is easy to see that it is equally useful when its use indicates at a small outlay the inutility of expending money in any certain direction. We have to count not only what it gives, but also what it saves. It is satisfactory to see the rapidity and enterprise with which companies are adopting these useful adjuncts to the art of the miner. The general use of the drill will give greater certainty and precision to mining work, and while it will often, doubtless, lead to eminently satisfactory discoveries, it will also tend to materially improve mining as a sphere of investment.—*Australasia.*

THE GARDEN.

WE may observe once more that one little islet of the Bristol Channel alone preserves the red peony. Holyhead Island has half-a-dozen rare species. The Jersey centaury, Pelisser's linaria, and several other southern flowers, have died out everywhere save in the Channel Islands. Sicily shares with them in the sand bird's foot. The Irish Arran and other Irish islands have many peculiar species; and a few southern types even reach. But and the western Highlands; for, as everyone knows, Rothesay has a climate almost as warm as Torquay. So, too with the peninsulas. The Lizard, with the most equable temperature on the English coast, is a perfect mine of wealth to the botanist. It has three peculiar southern clovers, and lots of other rarities. Penzance, at the very heel of Cornwall, has five or six peculiarities. The position of Kerry gives it a climate like that of Finisterre, with the appropriate flora. Wild Madder belongs only to a few headlands of Pembrokeshire, the Damnonian peninsula, and the south-west of Ireland. Torquay, on the promontory of Hope's Nose, shares a southern hupleever with the Channel Islands. Babbicombe has a species almost to itself. Corfe Castle, in the so-called Isle of Purbeck in Dorset, divides a Spanish heather with Cornwall and the West of Ireland. One kind of restharrow, after getting up from the Pyrenees as far as the Channel Islands, then positively takes a second spring to the Mull of Galloway. As to the number of Mediterranean plants which are found in Britain only in Devon and Cornwall, or in Kerry and Connemara, or in both, I spare you the recital of them. Even the more inland and moorland types, which each survive on one high common alone, answer to the same law; for south-western slopes. Thus, the chedder pink grows in a single basking hollow heated by radiation from two great walls of limestone rock upon the western flanks of Mendip; the purple lobelia loiters on a bright upland near the warm valley of the Devonshire Axe; the white sedum struggles on upon the edge of Malvern; and my hairy woodspurge here battles hard for life on Claverton Down, close to the steaming basin of the old Roman Thermæ at Bath.

NOTES ON ROSES.

EVERY one who is at all conversant with the character of our exhibitions for some years past, must have noticed the increased and increasing numbers of roses of this beautiful class. Do not be afraid, good reader—I am not about to ride off in an estatic frenzy upon their value and beauty; no Amadis of Gaul, descanting of the beauty of his fair Elisena—no, not even Don Quixote himself, when describing his Dulcinea, has used more extravagant language, or written more sentimental nonsense, than have some exceptional lovers of the Tea Rose. But there is without doubt an elegance and refinement, and a delicacy of colouring about them which is possessed by no other class of roses; they are essentially the ladies of the court of the queen of flowers, their delicate fragrance being a fitting pendant to the colour. Then again their permanence of bloom is a great feature in their favour; a bloom of the most exquisite hybrid perpetual a few hours after it has been cut has lost its beauty, the colour has flown, and it is only a shadow of its former self; not so the Tea Rose; at least, with many, indeed, most of them, there is such thickness of petal, such fineness of texture, that they retain their beauty for days; then the colours, being of a character less affected by light, are more enduring, and I have known instances where individual blooms have done duty at two shows some days apart.

These characters are not shared in even by their closely allied neighbours, the Noisettes, Maréchal Niel, that grand yellow rose and universal favourite, cannot be said to be a refined rose; while Gloire de Dijon, grand old flower as it is, or Solfaterre, or Madame Berard, cannot claim the same distinction. Several causes have, I think contributed to the great increase of the growth, and consequently of the exhibition of the Tea Rose, but the general reason is, without contradiction, the introduction of the seedling Brier, by Mr. George Prince of Oxford. I say, the introduction, because although it may have been used by others, and especially by the French growers, for the same purpose, yet he was the first who boldly, and as some thought rashly, entered upon it. The Brier had ever been considered the most appropriate stock on which to work them. The Manetti did not answer with a good many varieties, its vigour was too great; and many a novice who had watched the vigorous growth of his plants and wondered why they did not bloom has been disagreeably disenchanted in finding that his poor Tea Rose had been smothered by its foster mother.

Now the Brier seems to possess just the vigour that is required, and the seedling Brier possesses this advantage over the old form of growing on the standard or half-standard—that it can be budded low down, and consequently protected, whereas, in such winters as the two last those on the wild Dog succumbed to the frost. The tens of thousands of this class sold by Mr. Prince and the demand made on other growers for sale to supply them show how much the rose-growing public has appreciated this step. Another evidence of this increase of growth is seen in the fact that it is not now uncommon to see stands of twenty-four, eighteen, and twelve teas, whereas formerly twelves and sixes used to be the utmost that was attempted.

At the same time some of the old ideas on the subject of their culture (owing, indeed, in a good measure to the new method of growing on the seedling Brier) have been abandoned. We are told that they would not bear the knife well, and therefore in pruning all were so pruned simply to shorten the tips. Now this is all altered; it is generally admitted now that they will bear the knife as well as the hybrid perpetuals, and may be cut quite as hard. The last two winters have indeed taught us many a lesson, and this has been one of them. Tea roses have been killed down to the snow line or the mulching line, and all the frozen or half-frozen wood had to be cut away, but they almost immediately started into fresh growth, and although a little later this was no evil, as they often came in so early as to have their blooms ripened. With this, then, all necessity for putting fern amongst the branches for protection has ceased, and I would, even if the winter were mild, be inclined to cut them as hard back as I would a rose of any other class. Probably in the northern parts of our island, and in the Midland Counties, exception might be taken to these statement, for I believe growers have been discouraged from making the attempt, owing to their failure under the old conditions; but I am none the less inclined to think they too, if they were to grow on the seedling Brier, and mulch heavily, say to the depth of 6 or 8 inches, would find that they could manage their cultivation without their having recourse to glass or taking up the plants and laying them in by the heels.

Into the very vexed question of hybrid teas I must not at present enter; the present year's exhibitions will be conclusive as to their value in this respect, and, also as to garden roses; the French have sent us some over, and Mr. Bennett has added largely to the list. They are now both on their trial, and the result a few weeks will determine. But I think that few persons will view with regret the rule of the National Rose Society which excludes them from being shown amongst the pure bred teas and Noisettes; the introduction of foreign blood has not improved them in those two points, for which I contend the Tea Rose is pre-eminent—delicacy of colouring and refinement of flower.—*Wild Rose.*

HYDRANGEAS.

THERE are few species of this family of plants, but such as there are, are among the most beautiful of decoration plants. Every one is familiar with the common hydrangea, so common that it has with cottagers all over the country monopolized the family name, as it were, without the use of any specific designation whatever. It is the hydrangea hortense, the hydrangea of the garden of the botanists; but with greater fitness it might be called the cottage hydrange, as it is decidedly more generally cultivated in cottage windows than in gardens. Of late years, however, nurserymen and florists have given more attention to the culture of this plant than formerly. London florists grow it by the thousand for the supply of Covent Garden Market. They grow it in small pots, 5 or 6 inches in diameter, in rich soil, from cuttings that have been rooted in small thumb-pots; and by feeding the plants well with liquid manure, after they have filled the larger pots with roots, they obtain splendid foliage and a magnificent head of bloom to each plant. To follow up this system well, the amateur would require to be provided with at least a small frame in which to strike his cuttings and grow them. The cuttings should be taken from the growing points of the stems of an old plant, the strongest only being taken, and each cutting should have at least three pairs of fine leaves above the pot or soil, and be inserted to the depth of one joint in the soil, a clean cut being made across immediately under this joint, removing all of the stem that may be attached below before insertion into the soil. The cuttings must never be allowed to become dry nor be exposed to strong sunlight till they are rooted, else they will lose their foliage, and, though they may even root after the leaves have dropped, they are weakened and disfigured by the loss. As soon as they are well rooted they should be shifted into their flowering pots, either 5 or 6 inches diameter, according to the apparent strength and promise of the individual cuttings. They should then be gradually inured to air, which, by and by, they will bear in such abundance as the temperature out of doors may suggest. If they are rooted in early spring (and they may be done at any season except the dead of winter, if suitable cuttings can be obtained) or late autumn, it will be more necessary to give careful heed to this point than if they are done any time between these two periods in the summer half. The plant is very hardy, but is easily weakened when growing freely by sudden cold approaching to frost, or by frosty wind being admitted to it. The compost should be made up of rich materials, chiefly strong but friable loam, abounding in vegetable fibre, and further enriched by the addition of horse droppings, which should be put through a sweetening process before being used. In fact, the compost should be made before being required for three months; the horse droppings being used in the proportion of about one-fourth of the loam. The plants must be kept growing freely till they have quite filled the pots with roots, when they should be well exposed to sun and air, and kept supplied with water in abundance, each watering with pure water being alternated with manure water from cow manure or good guano, the latter in the proportion of about 4 ounces to the gallon, made up some hours before being used, in order to allow of it becoming clear, when it should be run off into watering-pots for use. A little iron-filings put into the liquid will give that peculiar blue tint to the flowers which is so much admired in hydrangeas.

Other species of hydrangea there are, but none so useful for general decoration, and for keeping up a successional supply for the conservatory or green-house as hortense; it is the queen of the genus for that purpose. The next in importance, simply because it can be treated in the same way, is *H. Japonica*, the most common form of which in gardens is that with silvery variegated leaves. The chief difference between the two species rests in the flowers, which in hortense are wholly monstrous, that is, each flower is accompanied by bracts or floral leaves, which, are popularly regarded as the flowers, which, however, really are only the small body in the centre of the bracts of pink or white or blue floral leaves, which give character to the floral cyme or head of bloom. In *japonica* the flowers in the outer branches of the cyme are accompanied by this bract, while the central flowers are naked, thus reducing the decorative importance of the plant somewhat. Nevertheless, it is a beautiful plant, and well worth growing for variety's sake when more than a few are wanted. As before said, it will respond to the same treatment as hortense, and deserves to be more frequently grown in the same way than it is.

The next most important species for decorative purposes is one of comparatively recent introduction, *H. paniculata grandiflora*. It is more shrubby than either of the two foregoing, which are also less hardy. In fact the present subject will endure our hardest winters out of doors, as has been proved in many parts of the country during the last and immediately preceding exceptionally severe winters. It survived last winter in the open air, and is now flowering or rather showing its panicles of flowers bravely. It is a grand acquisition to our list of hardy shrubs, and is no less valuable for pot culture for conservatory decoration. The flowers are creamy white produced in elongated panicles, forming most graceful objects in summer and autumn in the green-house or open air.—*N. B. Agriculturist.*

CULTIVATION OF VIOLETS UNDER GLASS.

THE present will be a good time to pot up the necessary number of plants for yielding a good supply of these ever acceptable and much sought after deliciously-scented flowers through the autumn, winter, and spring months. And the fact of their being had out of season—a circumstance which, like all garden produce, greatly enhances their value—renders them all the more acceptable. In order to attain success in this respect the plants should have been previously prepared for this purpose by thinning out the runners (which those planted out individually in April or May send out freely when they commence to grow) to four or five of the strongest, and those having the most solid crowns, and the points pinched out, and all the other runners cut out as soon as they appear, the object in view being to concentrate the sap into those left, from whence eventually the flowers proceed.

In the event of the abovementioned details not having been attended to, as described at the proper time, they should be observed when the plants are being potted, which should be in an admixture of good friable loam, decomposed cow-dung, and leaf-soil, with sufficient sand to keep the whole porous. If the plants are potted into three sized pots, viz., 24's, 32's, and 48's—they will come in very useful for the embellishment of the conservatory, &c. When the plants are being potted, let the young crowns be placed regularly round the edge of the pots, and the soil pressed firmly together and watered. The plants should then be taken to the frames allotted to them, and the pots plunged to the rim in sawdust. The frames should occupy a warm corner under a south wall, and be fixed in such a way as to allow of bottom-heat being applied when necessary by means of fermenting dung and leaves, and so that the latter are not exposed to view, and therefore not objectionable in that respect. This is easily managed by measuring the length and breadth of the frame, or frames, intended for the growth of the violet plants, and then taking out a trench a couple of feet deep, and a few inches narrow and shorter than the frames and having some oak posts 7 feet long driven into the ground about 3 feet 3 inches, and about 5 feet apart, the exact width and length of which should be identical with those of the frames. On those posts, which should be level, fix an oak plate, about 2½ inches deep and 8 inches wide, for the frames to rest upon, and a piece of inch board projecting an inch above the plate or frame-sill, nailed to the latter at the sides and ends, to keep the frames in position. The frame-work should be bound together by means of cross-pieces fastened to the upright posts about 8 inches below the bottom of the frames, to allow of a bottom of straight-edged slabs being made for the latter, which should then have sufficient sawdust put into them to raise the plants to within a few inches of the glass when plunged to the rims of the pots. This done, the sides and ends of the skeleton frame should be boarded up, and shutters made to fit between the posts in the back, and fastened by means of wooden nuts fixed to the former, so that they can be easily removed and replaced when necessary.

In the event of bright sunshine at the time the plants are potted shade them for a few days until the roots have taken hold of the soil, after which subject them to the full rays of the sun, and as the plants become well established in the pots by filling the latter with roots, weak liquid manure should be given them occasionally, which will enable them to throw up and develope finer blooms, and in greater profusion.

On bright days the sashes should be taken off the frames for a few hours to allow of the foliage getting dry, as also to maintain the plants (which should not be coddled) in a sturdy condition; and with this object in view they should be ventilated freely on all favourable occasions. On the approach of winter provision should be made for excluding frost from the interior of the frames, as well as conserving the heat therein that may have been imparted by the sun's rays or fermenting material underneath; and for this purpose it will be advisable to protect the ends and side of the frame and framework with a wall of dry fern, built up as follows, *viz.*, commence at one end of the frame, or range of frames, as the case may be, and make a row of holes in the gravel about 6 inches deep, 1 foot apart, and 9 inches from the base of the framework, and into each of those holes put a stout and pliable bean-stick sufficiently long to reach to within a few inches of the sashes; then pack the space between the sticks and the woodwork with layers of dry fern up to the top of the former, which should then be securely tied with strong string to a row of screws previously put in the frame within a couple of inches of the top for that purpose, and the same distance apart as the sticks. This done, the loose projecting pieces of fern should be trimmed with a pair of shears; thus completing a neat and effectual side and end protection to the frame from frost, which, together with a covering of fern and mats on the sashes at night during frosty weather will be sufficient protection for the Violet plants.

Violets may also be grown and flowered satisfactorily planted out in frames within a few inches of the glass, in about 7 inches of soil, placed on a hotbed made of three parts leaves and one of stable-dung (including the horse-droppings), and built upon half-a-dozen or so of faggots, to admit of drainage to the bed. But better still, and more satisfactory in the results, a hot-water pit, in which the floral results in quantity and quality are more in the hand of the cultivator.

In conclusion, I may remark that there is no flower that pays better for a little extra care and trouble in the cultivation than the Violet, of which the Neapolitan, Marie Louise, Belle de Chatenay, and The Czar, are the best to grow—especially the two first named varieties; but Belle de Chatenay (double white), and The Czar (dark blue), give variety of colour in addition to sweetness.

It would appear from Tennyson's lines—

> "Thick by ashen roots the Violet grows"—

that it was a shade-loving plant, and flourished especially under the shadow of the ash. This, however, is not the case, as conclusively proved by the profusion of flowers supplied by the Neapolitan and other varieties, which have been planted under sunny walls for supplementing the supplies from those grown under glass in the spring.

Although the Violet has always been a favourite flower in England, there is very little popular tradition connected with it. As an emblem of constancy it has been esteemed in France from a very early period; and this signification may perhaps have had something to do with its adoption by the expectant Buonapartists. And it is stated to have been the prize bestowed upon the troubadour in olden times, and to have been subsequently replaced by its representative in gold. A golden Violet was the prize instituted by Clemens Isaure at the floral games established at Toulouse early in the fourteenth century, which have been kept up with occasional interruptions, to the present day. Yet further back Athens was noted for its love of Violets, and the term "Violet-crowned Athens" is said to occur more than once in classical authors. And though the Violet is not mentioned in Holy Writ, its odour is spoken of in the Koran as "excellent above all other odours; it is as warmth in winter, and coolness in midsummer."

Byron, in his poem, "Napoleon's Farewell to France," makes the following allusion to the Violet:

> "Farewell to the France; but when liberty rallies
> Once more in thy regions, remember me then;
> The Violet shall grow in the depth of thy valleys,
> Though withered, thy tears will unfold it again."

We are told that when Buonaparte was finally conveyed to St. Helena that he gave a Violet to an English naval officer who accompanied him—an intimation, it may be, of his hope (which was never realised) of a speedy return. The revival, in a greater force than ever, in connection with the late Emperor, as manifested at his funeral, and at the mausoleum at Chislehurst, which is sometimes nearly hidden by Violets, is, no doubt, chiefly due to tradition. Its popularity, however, was, says Mr. James Britten, probably enhanced by an incident which happened at the time the late Emperor escaped from the fortress of Ham. A packet of Violet plants having arrived by diligence, the keeper was directed by Dr. Conneau to plant them in pots, and while his attention was thus occupied the escape was effected.

It is stated that the annual sale of Violets in Paris exceeds 6,000,000 bunches, realising a sum of more than 577,000 fr.—*H. W. Ward, Longford Castle Gardens, Salisbury.*

DENDROBIUM FORMOSUM.

OF all the splendid Dendrobes that have their habitat in the jungles of the hills of Eastern India, I think nothing can compare to the plant whose name heads this paper, and yet so little attention has been paid to it that it has been almost totally neglected both in India and Europe. Reputed usually as a Burmese orchid, it is common enough in the lower ranges of the Jaintia and North Cachar Hills, being generally found at an elevation of from twelve hundred to two thousand feet. Its foliage when kept clean, render the plant attractive enough, even when the sweetly scented-lilly-like flower is not out It is a pure epidendrum, and when in full vigor attains a growth of about eighteen inches in height. The stems are jointed at about every two inches, are longitudinally corrugated and generally covered with short bristles, the strap-like leaves springing from either side of the joints. The flower (which makes its appearance in April and May and again occasionally in September) is produced from the apex of the stems. It measures about four inches across the sepals and petals are pure waxy white; the tip the same, but stained at the bottom with canary yellow. If care and cleanliness are attended to, *D. Formosum* will yield a blossom from each stem, and when in full bloom the effect is very beautiful, the delicate scent diffused, with the chaste appearance of the flowers combined with the dense fleshy foliage make up a truly charming picture.

There are two varieties of this orchid, or at least botanists assert that there are, but I cannot say I have been able to distinguish any difference except from the conditions of growth *D. Formosum gigantium* is but I believe, the plant when it gets fair play, high up on the *bonak* tree on which it is usually found, for I have invariably found the specimens some forty feet from the ground yield better flower than those obtainable lower down. The plant requires 300 inches of water yearly and exposure only to the north-east sun. It is particularly liable to the attack of the large black ant from the quantity of saccharine matter contained in the stems, and from this pest it is necessary to guard it, which in an orchid can easily be accomplished by rolling a grummet of jute round the suspender and smearing the same with kerosine, which presents an effectual bar to all parasitical intruders. This orchid presents one of, if not the very best medium we have for hybridising, and from the robust nature of the lip and almost certainty of the pod forming, nearly any combination of variety in colour might be obtained. Crossed with *Arundina* we should have a flower rivalling in beauty the loveliest of the Amazonian Lelias, but the immense variety of the impregnating pollen available when the plant is in bloom will of itself suggest to orchid-growers the proper selection. I have this suggestion to make with regard to impregnations Instead of using the knife, except in the first instance of collecting the impregnating pollen, I think it more advisable to collect the latter in a quill, and gently blowing it into and underneath the stamen. When it is understood that in all hybridising we are endeavouring to imitate the gentle action of the legs and antennæ of the bee, and other natural hybridisers, we cannot be over careful in avoiding all roughness. The hybridising of orchids can only be carried out with time and patience, so that none but such as intend devoting those qualifications to the object had better attempt it, but to such who care to do so, I may mention that a hybridised Cymbidium sold in London in April last for 140 guineas, and a similar result is certain to attend on all successful efforts at hybridising, albeit the hybrid will not be ready for exhibition until two years from impregnation. This assertion may be disheartening to many, but it is better to out with the truth at once lest some might be misled. I myself took six years to get a hybrid between *V. cærulea* and *Plute maculata*, and then only partially was successful. The most energetic orchid-grower in your town, Mr. Lynam I believe, has not yet succeeded in raising a true hybrid; but if he will adopt the quill in preference to the knife, I think I can promise him a victory. If orchid-growers would take *D. Formosum* as their standard, I think we could in Calcutta rival the celebrity attained in England by that veteran hybridiser, Mr. Dominy, whose scientific success is the envy of the leading botanist here. *D. Formosum* is best grown on a clean block or virgin cork, and requires neither more nor other dressing, being an air plant pure and simple. Manure will, however, greatly stimulate its growth; and I brought one of these plants to great perfection by a bi-weekly watering of diluted stable refuse. A little water given when the blossom opens will preserve the flower for nearly three weeks, although the scent fades out at the end of the first ten days. Those specimens, of this plant that I have seen in dealers' hands in England get neither heat, light, nor water enough, and in consequence their real beauties are seldom fairly developed, hence one of the prettiest *Dendrobiums* is lost to the public. The heat required is between 60° and 80°, when the plant is in activity, but during the season of rest, if the temperature is as low as 30°, the plant will not suffer. Perfect drainage must be insisted, as I must reiterate in the case of all orchids.

OSWIN WEYNTON.

In Assam.

FORESTRY.

THE Eurasian Association is about to start a company to grow the Casuarina. Companies to grow this tree have uniformly failed hitherto, but there are conditions which negative failure if the cultivation is undertaken by the Association. As firewood is largely used by the railways, there ought to be no doubt as to the demand. The tree does not appear to be fit for timber, and is unsuited to localities away from the sea coast, and especially those of considerable elevation. A few Casuarina trees may be seen growing about Ootacamund, but they are stunted.

AT a meeting of the Committee of the Agri-Horticultural Society of Madras, it was stated :—The Rain-tree (*Pithecolobium saman*) in the gardens, the measurements of which were given in the Proceedings of 7th August 1878, and then believed to be under six years from the seed, continues, in spite of its having been necessary to amputate some of its largest limbs, to grow enormously. Measured on 30th July last it gave in girth 9 feet 4 inches at the ground, 6 feet 3 inches at three feet high, and 5 feet 9 inches at five feet high; in spread about 85 feet from north to south; and a total height of about 46 feet. A reference to the former measurements shows that the girth at 3 feet from the ground has increased in the last three years 2 feet 2 inches. The age of the tree is, if anything, over-estimated; but search is being made for traces of the receipt of the seed, which it is believed came from Ceylon about 1872. A casuarina tree standing alongside, which was the specimen of its order when that part of the ground was laid out at the Botanical Garden, and is therefore known to be about ten years old, now measures at 5 feet from the ground only 2 feet 8½ inches, though it is about 82 feet high.

SANDAL PLANTING IN MYSORE.

LOOKING at planting in its two aspects,—of the production of strong healthy nursery plants, and of getting these planted out so that there shall be no interruption of growth,—sandal-planting is not an easy operation. The seed, a ball of soft, sticky, albumen, the size of a pea, in a fleshy fermentible pericarp, is very liable to go bad; but in ordinary soil it germinates with difficulty, so much so that it was supposed at first that the seed required, as in Nature, to pass through the intestines of birds or animals; but here it was overlooked that a bird's gizzard would be certainly destructive to the seed, and the digestion of animals most probably so, while it is a matter of observation that sandal comes up naturally in many places where there are no animals to help it It is a fact that soaking the seed for one or two days in a mixture of cow-dung and water has been found to hasten germination; but this is observable in other seeds. The difficulty of getting sandal to germinate in the early days of forestry may be put down to bad seed and ignorance of the way to sow it.

As soon as the young sandal has come up its troubles begin; at first, during the rains, with a species of rot in which the root may be observed attacked by a fungoid-looking growth. The leaves turn yellow and drop off from below upwards, and the sandal seedling appears as a little stick with only the terminal bud left. If the attack is mild the plant makes fresh root growth, and terminal bud new leaves; but if not attended to, plants perish very rapidly in this way. I have seen a nursery of 20,000 seedlings destroyed in ten days during heavy rain The remedy is drainage. The foresters, as soon as the disease appears, "lift" the tile-pots, taking them out of the beds and standing them on one side, high and dry, with the air playing round the pots. When the heavy rain is past, the tile-pots go back into the beds.

During the monsoon, to some extent, but more usually afterwards, many plants are lost from grubs eating the fleshy cellular portion of the tap-root. Sandal has a tap-root like a miniature radish, and it is attacked in the same manner as that and other fleshy roots.

These dangers past, it was observed in the early nurseries that something was wrong during the dry season Here and there was a plant growing *à merveille*. One thought with horror of its tap-root for the next planting season. Elsewhere, in odd corners, a few plants pushed on steadily: the generality looked pinched and miserable, in different soils, variously manured, and properly watered. When the planting season arrived there was a small proportion of good plants left; and yet, was it not worth planting sandal even on these terms?

The remedy for bad germinations and subsequent poor growth in the nurseries has been found in humus, or the nearest thing to it, in the way of a vegetable manure, which the climate produces. The seed is sown on the tile-pot beds just covered with a mixture of sand and leaf manure. From then, till the plants are transplanted, a year afterwards, the beds are kept constantly *covered* with old leaves, dead grass, or any litter at hand. The leaves and litter, if properly watered, decay rapidly and require to be replenished at intervals of a few weeks. Last year this plan was tried in a few nurseries, and gave good results where persistently carried out. But it raised opposition;—to the careless it gave trouble, to the neat it looked very like a messy craze. During the present season it has been followed in 17 nurseries, in different hands and in different parts of the country. It is easy to account for its beneficial effect; as a matter of observation it leaves nothing to be desired in the appearance of the nurseries. The portion of each nursery under sandal is shaded with boughs so as to afford a broken half-shade similar to that in which sandal comes up naturally in thickets and hedges. Each tile-pot now contains a bunch of fine plants with the rich dark foliage of healthy sandal. There are this hot weather (1881) above a lakh of tile-pots stocked with sandal, and in many nurseries it would be difficult to find an empty pot.

Let us pass now to the planting out and management of the tap-root. In young plants the tap-root is usually longer than the height of the plant above ground. It is very sensitive to injury, and this was the cause of the failure of the early attempts to plant sandal. If cut so as to only remove two or three inches, *leaving ten inches above perfectly undisturbed in its pot*, the plant will usually die. The plan now adopted to keep the tap-root of manageable size is to have a layer of bits of broken tile strewn so as to lie flat at the bottom of the tile-pots, much as one pots plants in a flower-pot, and doing so may be presumed to afford the same advantages in the way of drainage By this means the tap-root is stopped growing down more than ten inches, the depth of the tile-pots; it divides and accommodates itself within the tile-pot; lateral roots develope, and we obtain a form of root suitable for planting.

Transplanting begins as soon as the ground is thoroughly moistened by the first rains: it takes usually about ten inches of rainfall to do this. The tile-pots are lifted, walked away to the newly filled pits One tile is gently removed and the cylinder of earth and root resting on the other tile slipped into the ground. The earth is filled in, and the remaining tile, gently pushed back from the roots it has protected and confined during the last year, is pulled out, and goes back with the return coolies to the nursery to be re-set, and begin its work again. Watering should be stopped in the nursery a day or two before the tile-pots are taken out, so that the earth cylinders may be as hard as possible, and the transplanting rules provide for a little watering, for a day or two after the plants are put out. It is worth noting that the best planting—the minimum of root disturbance—is during the driest weather [for the season]—a curious adaptation to the weak point of the climate.

Some one may ask why not use flower-pots instead of tile-pots? In the first place flower-pots are more expensive—all potters, cannot make them, and, secondly, many of the advantages of tile-pot nurseries would be lost, *i.e.*, the shape of the tile-pot cylinders giving roots with the maximum of depth and the minimum of width—the compactness of the nurseries and consequent saving of water for each bed is a honeycomb of 100 tile-pots in a space of 60 inches + 50 inches—the ease with which the tiles can be removed from the cylinders of earth and used again in the nursery next year. The system of planting from tile-pots has been already described in the pages of this journal. In Mysore, during the past season, two and-a-half lakhs of plants were put out from tile-pots

at a saving of fifteen rupees per 1,000 plants. Of this, 5,000 odd was sandal, and the precentage of hot weather failures among the sandal was 85 per cent. It must be remembered that this was the first year of sandal-planting on a large scale, and this figure will probably be much reduced in the future. As usual, nothing was spent on watering or weeding after the plants were put out. Re eated failure is not a very serious matter on those terms; Rs. 5-8 per 1,000 plants represents the cost.

Each tile-pot contains usually more than one sandal plant, sometimes as many as half-a-dozen, depending on how the seed comes up.

There is thus a survival of the fittest for rot, grubs, and the first hot weather to work on; and then, when space is required for growth with the first monsoon after planting out, all but the best plants in each pit are cut out.

A word in conclusion about sandal plantations elsewhere. We have heard about those of Madras, and would be glad to earn more; their forest reports always late, have latterly not been sent to Mysore. It is believed that the plantation on the Neilgherries cost considerably more than Rs. 30 per acre of 500 plants, and that near the Cauvery falls is really *in situ* sowing with a suggestion of English ploughs and elephants—costly enough, and impossible for work among hills or in existing forests. Rs. 30 per acre of 500 plants is now the maximum cost of planting in Mysore, but it is hoped that sandal may do with pits 2 feet instead of 3 feet cube, and then the cost of planting will fall to Rs. 16 per acre of 500 plants.

Sandal-planting has been begun, I believe, in the Nizam's Dominions and in the Central Provinces, to both of which places seed has been sent from Mysore. There are some sandal plants now growing in the Botanical Gardens, Brisbane, from Mysore seed. Possibly the existence of frost may mark the northern limit at which sandal can be profitably grown in India. A specimen of sandal from the Nizam's Dominions compared with Mysore wood, showed a denser structure, and was nearly scentless but no particulars of the elevation at which it was grown were received. Probably good sandal could be grown anywhere in Southern India between 1,500 feet and 5,000 feet elevation, and a moderate rainfall. The higher limit would be approximately the climate of Brisbane; below the lower in Mysore, the tree looks straggling and forced, but it does not lose its scent. There is now in the Bangalore Museum a specimen fully scented, which was found growing on the banks of the Cauvery at only 1,200 feet elevation. There is a large trade in sandal between Polynesia and China, which began about 41* years ago. The people of Western Australia find it pays them better to export sandal at £7 a ton than to till the ground, and the sandal trade has been credited with atrocities in the Southern Ocean and with the present backward state of Western Australia. This wood however, is inferior stuff. Indian sandal stands as far above all other kinds in the China market as does Indian opium. It is stated that the profits of the middlemen are enormous, and that £20 a ton is a common price for first class Indian wood in China. Be this as it may, is there any other wood in the world which will fetch a *steady nett* price at the place of production of £15 a ton?—*Indian Forester.*

THE CULTIVATION OF CASUARINAS.

AT the meeting on the 3rd ultimo, of the Madras Agri-Horticultural Society, there was read an article on "The Profit of Casuarina Cultivation, published in the *Madras Mail* of the 20th July last, as an extract from *The Eurasian and Anglo-Indian Advocate*, in which it is reckoned that 18,000 trees may be grown on six acres of land to produce 8 annas each in four years, at a gross expenditure of Rs. 1,400 resulting in a net profit of Rs. 7,600, or a return in four years of 550 per cent. The Honorary Secretary, who has had considerable personal experience in this matter, stated that such estimates are liable to cause much mischief by inducing people to speculate without the means. "The most successful casuarina planters in the neighbourhood of Madras, where the land is specially adapted to the industry, plant only 300 trees to the acre, and consider themselves very fortunate if, after being twelve to to fifteen years without return for their money, they can cut an average of anything over forty tons of firewood to the acre; or if, in other words, they get their wood to market so as to give a net return, at Rs. 6 per ton, of Rs. 240 per acre. Multiplying this sum by 6, we have a return of Rs. 1,440 for six acres, against the writer's estimated expenditure of Rs 1,400. Thus, the business is only really profitable when worked on a large scale; when the trees are allowed to grow for much more than four years; when there are very good acres to make up for those that fail; and when water is close enough at hand to allow of the expenses being reduced to the lowest possible amount." We have been informed that no area under 100 acres will pay Europeans, and that these 100 acres must be good land. Natives who plant small plots make profit because they use only the unpaid labour of their own families. Last year as an experiment, a correspondent of ours cut an acre of seven-year old trees—an average one. Its produce was just under 7 tons, and the net value of the wood was about Rs. 5 a ton, so the acre yielded but Rs. 35 after seven years' waiting for returns.—*Madras Mail.*

ON THE INFLUENCE OF FORESTS ON CLIMATE AND RAINFALL.

[BY FREDERICK S. PEPPERCORNE, C.E., NEW ZEALAND.]

THE rainfall of a treeless region, even when it reaches an average limit, is always fitful and uncertain, while the rivers rise rapidly and flood the surrounding country, as has been the case lately in Hungary, the South of France, and Spain. In the former country the destruction of its forests has been a crying evil, and its results are now being felt, while every traveller has loudly proclaimed against the ruthless waste of the Hungarian forests. Mr. Bonar says that—"The Wallacks find it too much trouble to fell the trees they destroy systematically; one year the bark is stripped off, the wood perishes, and the year after it is fired. In 1862, near Toplitza, 13,000 *jock* of forests were burned by the peasantry. If this goes on, a time will come when dearth of wood will make itself surely felt." And Mr. Crosse, when travelling in Hungary in 1876, says: "It is impossible to travel 20 miles in the Carpathians without encountering the terrible ravages committed by the lawless Wallacks on the beautiful woods that adorn the sides of the mountains. The great proportion of the forest land belongs to the State, hence the supervision is less keen, and the depredations more readily winked at."

If this be so, the "State" has much to answer for the future generations, and even to the present one, by its reckless disregard, since by a little foresight and skill, much might be done; and if the grand old forests of the mountains were allowed once more to re-assert themselves, we should hear less of calamitous inundations, such as that which destroyed Szegedin in 1879. Unless recourse is promptly had to some practical method for preventing the total disforesting of European countries, we must prepare to witness the depopulation of whole districts, such as has actually taken place in some parts of France and Spain, owing to the immense destruction of timber trees and forests.

All great irregularities, or partial dificiencies, or rainfall exercise, as is well known, the most detrimental influence on the progress and prosperity of the country where they occur. The conservation of the forests is therefore (or should be), one of the first duties of an enlightened Government, and the whole subject is one of paramount interest to all classes of the community, since not only the pastoral and agricultural interests, but also the great manufacturing industries of a country, are immediately connected with a due supply of water. The agricultural prosperity of India, Ceylon, Persia, China, and many other countries, suffers greatly from this cause at present, and unless aided by artificial irrigation, the consequences would be unspeakably disastrous; since in proportion to the increased area of bare soil, will be the increase of the heat and the prolongation of the drought of summer; while the annual rainfall must be more or less dependent upon the condensation and precipitation of atmospheric vapour occasioned by the masses of forests covering the uplands and mountains. These forests being destroyed, the solar heat that falls on the bare surface of an uncovered mountain, or on a great treeless plain is thrown off by radiation and reflexion, and thus raises the temperature of the superincumbent air; and the higher the temperature, the greater is the capacity of the air to sustain large quantities of vapour in a state of suspension; hence the loss is the probability of rainfall.

That this is not a one-sided view to take of the subject, is proved abundantly by the results which have followed the destruction of forests in other countries. Ancient realms formerly supporting dense populations, and proverbial for their fertility and prosperity, are now sterile wastes; and their mountain forests being cut down, the springs have dried up, the rivers have disappeared, while famine and destitution desolate the country, and the same effects are now being produced from the same causes in other countries which are being disforested with a recklessness which nothing but the most culpable ignorance of the invariable laws of Nature can explain but cannot excuse.

In Upper Egypt the rains, which about a hundred years ago were abundant, have ceased since the Arabs cut down the trees along the valley of the Nile, towards Lybia and Arabia, while a contrary effect has been produced in Lower Egypt from the recent extensive system of tree planting initiated by the late Khedive. In Alexandria and Cairo, where rain was formerly unknown, it has lately become more frequent, and the same effects have followed in Algeria, where the *reboisement* of the country has been carried out largely during the last 25 years, with the best results.

Professor Macarel, a French writer, observes on this point that—"Necessary as are the forests of a country to the individual, they are not less so to the State. All the wants of life are closely related to their conservation, and the existence is of itself of incalculable benefit to the countries that possess them, as well in the feeding of the springs and rivers as in their prevention against the washing away of the soil upon the mountains, and in the beneficial and healthy influence which they exert upon the atmosphere. Large forests deaden and break the force of high winds, that beat out the seeds and injure the growth of plants—they form reservoirs of moisture, they shelter the soil of the fields, and upon hill sides, where the rainwater checked in its descent by the thousand obstacles they present by the roots and trunks has time to filter into the soil, and only finds its way by slow degrees to the rivers. They regulate, in a certain degree the flow of the waters, and the hygrometrical condition of the atmosphere, and their destruction accordingly increases the duration of droughts, and gives rise to the evils of inundations."

The foregoing examples have been selected from a mass of facts, illustrative of the dependence, to a large extent, of the rainfall of a country, upon the preservation or renewal of its forests, whether it be on mountain ranges or on elevated table lands or less elevated tracts of country. And although the meteorological action of forests is as yet imperfectly understood yet the data hitherto collected are quite sufficient to point to the conclusion that trees, being the natural conductors of the electricity, as has been proved by the experiments of M. Graudeau, Professor of the "Ecole Forestriere" in France serves as intermediaries for the exchange of electricities with which the earth and the atmosphere are respectively charged.

An Italian writer on this subject states that—"Electrical action being diminished, and the rapid congelation of vapours by the abstraction of heat being impeded by the influence of the forests, it is rare that hailstorms or water-spouts are produced within the precincts of a large forest when it is assailed by a tempest"

It has also been asserted that the earthquakes which are common in some parts of Spain and Portugal would be less frequent and less violent if the elevated regions of those countries were clothed with forests so as to secure a regular and harmless conduction of the electric fluid or agent from the aerial to the terrestrial reservoir and *vice versa.* This is extremely probable, and one thing at all events is certain, which is that hailstorms, which are believed to be produced by certain specific electric action, become more frequent and destructive in disricts which possess no forests. On this point Signor Calvi, states in his *Hints on the Importance and Cultivation of Forests,* that—"When the chains of the Alps and the Apennines had not yet been stripped of their magnificent crown of woods, the May hail which now desolates the fertile plains of Lombardy was much less frequent. But since the prostration of the forests, these tempests are laying waste even the mountain soils, whose older inhabitants scarcely knew the plague."

In our vast Indian empire, the Government, until lately, permitted a wholesale destruction of the State forests, but now the forest question is being regarded as one of the first importance, and is being dealt with not by the several presidencies, but by the general Government, on behalf of the country at large, by the appointment of forest conservators, whose duties are to see that the trees cut down are replaced by others, so that the annual growth may be made to balance, as near as may be, the annual con-

* Forty years ago the sandal wood trade reached a development which is accounted for by the high value attached to this wood by the Chinese. Speculators fitted out ships and cut down the forests of the Melanesian Islands. The natives naturally resisted this devastation. They were answered by the rifle. In 1842 the crews of two English vessels landed at Sandwich Islands, one of the most luxuriant in the Archipelago of the New Hebrides. The islanders, when resisting the destruction of their woods, were set upon by the whites, who killed twenty-six, and driving a great number into a cave, suffocated them with smoke till not one remained.

sumption. The consequences of this reckless destruction of the Indian forests have already made themselves severely felt by the greater frequency and length of seasons of drought and famine, and with such data as are accessible in late reports, it cannot be doubted that these calamities are in a great degree due to the reckless denudation in years past of the forests.

Enough has now been said to show the calamitous consequences of denuding a country of its woods and forests and to show that writers have acknowledged repute who have made this subject their special study, are unanimous in connecting the occurrence of droughts with all their attendant evils, together with the outbreak of certain malarious epidemics with the reckless destruction and waste of forests.

During the last half century great attention has been paid to this subject both in France and Germany, in both of which countries the art of "Forestry has been largely developed, an art which comprises an extensive range of knowledge in various sciences—such as botany, chemistry, geology, and vegetable physiology. At present the area of the French State forests is put down at fully 3,000,000 of acres, to which may be added upwards of 5,000,000 belonging to "communes," corporations, hospitals, and other public establishments, the whole of which are under the supervision of the French Administration of Forests In the Vosges, the destruction had gone so far that the humidity had diminished, while the soil had become more arid and inundations more frequent. In the department of the Gard it did not rain in 1837 for more than nine months, and the supply of water from wells was most seriously diminished.

At Bergiers it was reported that the vast forest which once sheltered that place having been destroyed, the loss of the olive crop was the immediate result; violent storms and torrents of rain certainly fell from time to time, but these, from their violence, did more harm than good, as the water washed away the soil without penetrating into it. At the present regulations that have been put into force by a wise Government for the conservation and management of the forests are of the most stringent nature.

In Prussia Proper, out of 35 millions of "*hectares*"* eight millions are classed as forests, out of which nearly four millions are private forests, and in both cases the regulations for their management and conservation are sufficiently comprehensive.

In Switzerland the question of forest conservation has become of such national importance that it has been proposed to modify the constitution in order to enable the Federal Government to undertake duties which have hitherto been performed by the several cantons.

In Austria the management of forests has recently been transferred from the Finance Minister to a distinct department presided over by the Minister of Agriculture.

In Canada there has been a certain amount of legislation on this subject, but in France, Sweden, and Norway the most rigorous measures have been devised for the protection of the forests even of private owners. A tabular statement of the proportion of forests remaining in different countries gives the following results:—

	Per cent.		Per cent.
Great Britain ...	5·50	Spain ...	5·60
France ...	16·00	Portugal ...	4·40
Belgium ...	18·50	Denmark ...	5·50
Sweden ...	60·00	Holland ...	7·10
Norway ...	65·00	Italy ...	20·50
Germany ...	26·10		

In the Australian colonies of Victoria, South Australia, and new South Wales, the evil produced by a gradual diminution of the forests have begun to make themselves felt and with the destructive bush fires, have combined to render the climate, which is naturally a dry one, still more so from year to year. The indigenous timber in these colonies is disappearing with such rapidity that unless immediate steps are taken to conserve large tracts of existing forests, the consequences must inevitably be of the most serious description.

Of course there are large areas in all the colonies where there are no forests to preserve, and here it would be necessary to create forests by tree-planting on a large scale. This is no new suggestion, as some years back a proposal was made in Victoria, which met with the general approval of scientific men, that the fiery blasts of the hot winds might be tempered by the state taking in hand from year to year, the planting of belts of trees at intervals along the northern parts of the colony. This proposal was not acted upon, neither was a scheme of forest conservation, which seems to have been based upon sound and common sense principles, and therefore was ignored. It was proposed to let out timber reserves in areas of sufficient extent to enable the work of destruction and replantation to proceed *pari passu*. In each area, for example, not more than one-twentieth was to be cleared in any one year, and in the year following this was to be replanted with young trees, under sufficiently stringent condition to secure performance, and thus the forest growth would be secured, as from 20 to 30 years, it is said, is the average period required for the *eucalyptus* tree to arrive at maturity.

This would secure an object of immense importance in a climatic point of view, while the annual supply of timber would suffer no diminution, and the economical value of the forests would be maintained. If a beginning were once made under the auspices of the State, which is the proper conservator of woods and forests, it is highly probable that destructive droughts in future would be to a considerable extent mitigated, and what we see to be both sound as a matter of scientific inquiry, and which had been verified by observation and experiment, on a small scale, is capable of being done on a large scale, so as to produce very beneficial results.

Unless recourse is had to some such practical method as is here pointed out for preventing the total disforestation of the mountain ranges in Australia, we must be prepared to witness, at no very distant period severer droughts occurring more frequently, and of longer duration than before, to the utter ruin of pastoral and agriculture pursuit in all the colonies.

In South Australia the subject has, however, received some attention of late, and proposals have been made by Mr. Goyder, the Surveyor-General of that colony, to initiate and carry out a systematic course of tree planting. Mr. Goyder proposes to reserve a block of 200,000 acres of land, and to spend on it, in tree planting and management, £14,000 during the first year, and £10,500 during each of the following 11 years, thus making the total expenditure £130,000, when the whole of the 200,000 acres would be planted and fenced in. During the first five years, there would not be any revenue, but during the sixth, seventh, eight, and ninth years, the revenue from periodical thinnings he estimated at £35,000 per annum, until the end of the 21st year, when the colony would be in possession of 200,000 acres (or 310 square miles) of forest.

It is possible that this estimate of revenue may be a little overdrawn but the scheme is an excellent one, when it is considered that the forests of *eucalyptus* are vanishing in all directions, and it is to be borne in mind that in no case is the natural forest, or as it is colonially called 'the bush,' so valuable, commercially speaking, as a planted forest, carefully attended to. Probably, however, it would be found to be more advisable to make the areas smaller, and, in lieu of one block of 200,000 acres, to make four blocks of 50,000 acres planted in different localities, which would exert a more beneficial influence on the climate and rainfall of the interior.

If, on the other hand, the continuous denudation which has been continually going on for nearly 60 years in Australia, is still to be continued, then will the changes in the climate produced thereby entail on future generations evils of incalculable extent, which must prove fatal not only to the successful prosecution of all the pursuits of husbandry, but also to the future habitability of the country, for nothing less than this is really involved in the momentous question under consideration.

The whole topic of forest conservation and tree planting, and consequently of regular and well balanced rainfall, is one of such paramount importance in the colonies, that it needs only to be pointed out clearly in order to prevent the disastrous consequences which must result from further apathy or negligence. Through the continued alternation of very wet and very dry seasons, the productiveness of the soil will be gradually reduced, and large areas now covered with a luxuriant herbage and vegetation, will, in time, become as arid as the Central Steppes of Russia and Siberia, and like them become cheerless and barren deserts.

We are, in Australia, and New Zealand, much in the same position as the inhabitants of India, in this respect, that we are only beginning to feel the calamitous results of the wholesale destruction of our forests. And even in New Zealand the cutting down of the timber is beginning to tell on farming pursuits, though, fortunately at present, without doing any material harm.

Dr. Hochstetter in his valuable work on the geology and natural history of New Zealand, pointed out the fact that extensive districts which had formerly been covered with forests of kauri pine, were, when he wrote some years ago, totally destitute of this most valuable of forest trees. He also said that its extermination was progressing from year to year at such an alarming rate that its final extinction was as certain as that of the natives themselves, only in a much shorter period of time.

Dr. Hector also, in a very interesting paper showing the precentage of the forest lands in New Zealand to the whole area of the colony made the following estimate of the destruction of forests between the years 1830 and 1868:—

In the Province of—	Per cent.
Auckland	68
Taranaki	10
Wellington	20
Hawke's Bay	60
Nelson	16
Canterbury	10
Otago	12
Marlborough	12

This shows that the average annual destruction of the New Zealand forest during the 38 years terminating in 1868, was at the rate of about 23 per cent., while during the five years from 1868 to 1873, it was estimated that the following amount was destroyed, out of that which remained in the former year:—

In the Province of—	Per cent.
Auckland	27
Taranaki	11
Wellington	25
Hawke's Bay	30
Nelson	20
Canterbury	53
Otago	10
Marlborough	28

In other words, taking the average of the whole colony, 20 per cent. of what forests remained in 1868, had been destroyed in five years. It will be observed that at this rate of progress of destructiveness, very little, if any, of our New Zealand forests will be in existence at the end of the present century, and such being the facts of the case, with periodic droughts in all the Australian colonies of greater severity looming in the future, and which will be mainly attributable to the annually increasing denudation of their forests; with springs and streams drying up, with a grass famine staring the colonists in the face, and the country becoming unfit for pastoral or agricultural pursuits, it is surely incumbent on the Legislature to take some steps for the preservation of the State forests.

In such a case it is unquestionably the duty of the State to set the example. The most stringent measures will have to be adopted; every municipality, should have its "forest reserve" adjacent to it, if possible, and every encouragement should be given to landowners towards the planting of large numbers of trees on their estates.

Sir Julius Vogel said this in 1874, and a valuable state paper was published in that year, showing clearly the necessity of preserving the New Zealand forest, as well as the injurious effects following their destruction. He also pointed out that what is required, and in fact demanded, in the interests of the colony is a system of forest falling by selection and of planting, under State supervision, in order to repair the annual loss of timber.

Unless this is done, and should no steps be taken in this direction, the consequences must inevitably be most disastrous, to the future prosperity of all the colonies, some of which are beginning to suffer from the scourge of alternating disastrous floods and still more disastrous droughts due chiefly to the destruction of the forests.—*Australasian.*

* A *hectare* is equal to 2½ acres.

TEA.

THE quantity of tea exported from China to the United Kingdom from the 1st June to the 18th of August this year was 80,076,095lbs., as compared with 82,774,374lbs. exported in the corresponding period of last year. The quantity exported to the United States of America from China and Japan in the same time was 27,043,960 lbs. as against 25,762,483lbs.

THE number of coolies imported into Cachar for the tea gardens, was 1,527 as compared with 3,077 for the preceding year, a decrease 50 per cent. This decrease is not due to any falling away of the industry, but to the fact that the improving communications which now exist between the recruiting districts and the tea gardens, has led to a large number of labourers finding their way to the gardens without the intervention of the coolie contractor and his multitudinous following. This will speedily make the Emigration Act a dead letter, when the prices of labour may be expected to fall to more reasonable rates. The total number of "Act" coolies in the province at the close of 1879 amounted to 62,547, and at end of 1880 this number had fallen to 60,714, a decrease of 2·93 per cent. The population of the province exhibits a great change since the census of 1872 was taken. Then the numbers were 205,027, whereas there are now 334,326 people in the province. This increase is 63 per cent., or at the rate of 7 per cent. per annum. While the general population has increased so enormously, owing to the extensive immigration which has been going on for the past 25 years, the hillmen are decreasing in number, the figures for 1872 and 1881 being 30,000 and 22,379, a fall of 25·4 per cent. This seems the fate of aboriginal tribes all over the world; they become improved off the face of the earth before the advance of civilisation.

A tea-planter has written from Assam to the *Rangoon Gazette* pointing out what a splendid field for tea cultivation this province presents to speculators. Doubtless there are many parts of our hills from 2,000 to 4,000 feet high where tea and coffee would flourish luxuriantly. But we certainly require more liberal land laws before we can hope to attract capital and labour to Burmah. Every thing now is in the hands of the district officer, and he on the most flimsy pretexts has it in his power to resume land from the grantees. Then, again, Government have decided only to lease land in Burmah instead of giving, as in Lord Canning's time, the fee-simple where there are literally millions of acres of land available. Why should not land be given out and out to *bonâ fide* capitalists anxious to introduce new industries? Land Companies might then easily be brought out in England for taking up land in Burmah, just as they have been for Australia, New Zealand, and other English colonies. But capitalists will not put their money out on land which under the present system may be resumed at the whim of some interfering Deputy Commissioner, just as it is on the eve of becoming remunerative.

INDIAN AND CHINA TEAS.

THE following tables, compiled at the Industrial and Technological Museum by Messrs. Cosmo Newbery and F. Dann give the average results of a series of analyses of teas carefully drawn from the bulk.—

Season.		Percentage of mineral ash.	Percentage of extracts.	Percentage of soluble salts.
1880-81	Auction Sale Indian Tea, 15 samples =770 hf.-chests, avgs.	5·81	39·12	3 16
1880-81	Auction Sale Indian Tea, 46 samples =3,131 half-chest., avgs. ...	5·46	42·40	4·06
1881-82	Auction Sale Indian Tea, 36 samples =1,812 hf.-chts., avgs. ...	5·54	43·91	3·27
1880-81	Auction Sale Foo Chow Congous, 15 samples=1,904 hf.-cuts., avgs. ...	5·40	29·26	2 88
1881-82	Auction Sale Foo Chow Congus, 50 samples=2,880 hf.-chts. avgs. ...	5·40	31·30	3·60
1881-82	Auction Sale Foo-Chow Congous, 20 samples common=6,220 hf.-chts., avgs.	5 32	33·60	3·26 (First crop teas.)
1881-82	Auction Sale Foo-Chow Congous, 20 samples medium=1,152 hf.-chts., avgs.	5 40	35·20	3 48 (First crop teas.)
1881-82	Auction Sale Foo-Chow Congous, 10 samples good = 1,957 hf.-cht., avgs.	5·44	35 04	3·54 (First crop teas.)
1881-82	Auction Sale Foo-Chow Congous, 10 samples fine=957 hf.-chts, avgs. ...	5·50	34 32	3·52 (First crop teas.)
	Genuine Tea of lowest class contains	4 to 6	32	3

N. B.—The result in favor of Indian teas is too marked to need further comment. Many of the China teas will not pass the standard of a genuine tea.

COFFEE.

THE most astounding results are reported of the cultivation of coffee from the Bourbon seed. A Brazilian planter states that he has obtained 30 cwts. of coffee to the acre from this variety, only 4½ years in the ground. Locally 10 cwts. an acre is a highly profitable yield, but a ton and-a-half would beat gold into a cocked hat.

THE Americans are anxious to introduce Liberian coffee to the United States consumers of the beverage. Mr. E. S. Morris of Philadelphia deals in coffee of this description, and undertakes to dispose of consignments to the best advantage.

CINCHONA.

A CORRESPONDENT writes to a contemporary—have you been told of the new enemy of the cinchona tree that we have found out? The coolies taking off the bark about a foot up from the ground, and selling it in the villages. The wily native finds a decoction of it good for fever. I came across (this morning) one of my finest trees that had been robbed. You should give cinchona planters the hint to keep watch. It is not merely the loss of the bark, but the tree is liable to be injured if not destroyed, should they ring the trees.

THERE are few Government concerns that can compare results financially with the cinchona plantation and factory near Darjeeling. The latest report of the Government Quinologist, which deals with the year 1880-81, discovers no falling off in the prosperity of either. The profits of the year's working amount to Rs. 80,290 over and above the saving which the Government effect by the substitution of the febrifuge made at Darjeeling for quinine, which is itself estimated at four and-a-half lakhs per annum. The reason why there is comparatively so small an actual profit in rupees, and one so immense on the sale of the febrifuge is because the factory is debited with the bark used at actual cost, and not the price at which it would sell in open market. Our Allahabad contemporary is much pleased at the success of this Government undertaking. We are equally pleased, but in this very success we see a strong reason why Government should now retire from the industry. It is the duty and interest of the Government to undertake the initial and experimental stage in all such industries, a work which is generally beyond the power of private enterprise. This over, and the success of the new industry assured, the duty of Government is then to withdraw, and hand over its work to some company. This was done with tea, and will doubtless be done with cinchona as well, and we think the time has arrived when this ought to be done. When the profits on the manufacture of febrifuge and growth of bark amount in one year to more than the entire capital invested, it may safely be affirmed that the industry is a success, and if it be beneath the dignity of Government to make a profit by selling coals, it ought to be equally inexpedient to sell febrifuge. It is no doubt true that the sale of this medicine is presumably doing much good, but this would be equally true if it were made by private enterprise. We trust, therefore, that the Government cinchona plantations in Darjeeling and on the Neilgherries will soon be advertised for sale.

CINCHONA is not a new industry here, for as far back as the year 1865, a healthy movement was made by a private firm to plant different parts of the country with it, and it was carried out to a certain limited extent; but the next year and those following, it lapsed into disuse, and became neglected. It lacked encouragement and was never thought to have such a brilliant future in prospect, as it has now attained, and coffee was giving sure and quicker profits; so that until 1877 the few hundred *C. succirubra* trees which were left and had survived, and that without any care or attention, were simply regarded as curiosities, and samples of what the soil could produce, if it ever became necessary to encourage them. (I do not here allude to the Rev. Mr. Richter's cinchona garden, which has steadily been cultivated since 1863.)

IT is a fact worth noting that of the 1,080,209 lbs. Cinchona shipped from Ceylon to the date of the last Chamber of Commerce Return, during the current season, over 300,000lbs. were bought locally and shipped by Continental houses to Quinine manufacturers in Europe and the United States. One of these houses shipped over 200,000lbs. or one-fifth of the total quantity. There can be no doubt that this new element of competition has been to the advantage of the growers, whilst at the same time this new trade with continental ports will help to stimulate the manufacture of quinine in those countries.

CACAO.

CACAO IN BRAZIL.

BETWEEN the Rio Negro and the Xingu, the most important lowland crop is cacao. It is true, the trees will grow quite as well or better on the *terra firma*, but Brazilians prefer the *varseas* for their plantations because the ground is easily prepared and takes care of itself; besides, the orchard arrives at maturity much sooner. We hardly notice these cacao plantations from the river; the dark green of the foliage is so like the forest, and generally there are other trees near the shore. But for miles the banks are lined with them, mostly the orchards of small proprietors, who own a few hundred *pés* of cacao, though some of the estates have twenty or thirty thousand trees. In our wanderings about the lowland we often pass through these cacoas. They have a rich beauty of their own,—the dense foliage, twilight shade beneath, and the dark [illegible] leaf or five together with the fruit

growing, not among the leaves, but directly from the trunk and main branches, attached only by a short stem. The ground is quite clear and free from underbrush, and in the summer when the fruit is gathered is for the most part dry. The harvest months are July and August when the gatherers go every day to pick the ripe fruit from each tree and bring it in baskets to the house. There the oval, ribbed outer shell is cut open and the seeds are washed from the white pulp; then they are spread over mats and placed on raised stagings to dry in the sun; care being taken to turn them at intervals. Most of the seed is exported in this form; a little is roasted, pounded, and made into cakes with melted sugar for the delicious chocolate of the country. Unfortunately on the mazons the sun is a very uncertain drying agent; frequently there are heavy showers, and the sky is clouded for days to gether; so it often happens that the imperfectly prepared seed gets musty and half-rotten before it reaches the market. Much of the Pará cacao therefore, does not rate very high with the manufacturers. All this might be avoided by the introduction of a simple drying-machine, such as is used at Rio for coffee. Stopping at the *fazendas*, we frequently get a refreshing drink, made from the white pulp which surrounds the cacao seeds. Enterprising planters prepare from this pulp a delicious amber jelly, which if it were placed in the market would be much more popular than guava jelly. Even the shells are valuable; they are dried and burned, and from the ash is prepared a very strong brown soap—a necessity to every Amazonian washerwomen.

We could call the attention of cacao planters in Ceylon to these last sentences, from which it will be seen that the cacao pod is of value in more than one way.—*Ceylon Observer.*

SERICULTURE.

THE silk industry is reviving in Louisiana, the reports of the hatching of 1881 being very encouraging. Interest in the culture is growing and inducements are offered to silk workers to come from France and engage in the business. The first exports of silk from Louisiana were made as far back as 1718. The culture of silk is being revived in South Carolina and Georgia.

THE following particulars regarding the Japanese silk industry are contributed by a correspondent, who has recently returned from a tour in the silk-producing districts, to a Yokohama paper:—"During a visit made during the last few days to the silk districts of Busho and Jusho, I have been enabled to verify the fact that the education of silkworms has not had any very great success in those two provinces. All went well until the fourth stage; but at that critical period great heats occurred, which caused the worms to commence spinning, without being sufficiently nourished, and the cocoons thus produced were poor and light. The Japanese are greatly disappointed with respect to this, and talk of a deficit of at least 15 per cent. In fact, along the entire route, from Kumagai, Hunjo, Shinmachi, and Tamamura to Maibashi, one saw very poor samples of the cocoons of this district. A large proportion of them have rotted, for—in consequence of the bad weather—there has not been time to dry in the sun all the cocoons which it was intended to have reeled. This will naturally, largely diminish the product of these districts, and if one thinks of the haste of the Japanese to spin, as quickly as possible, those cocoons which are daily being spoiled before their eyes, the inevitable interference can be drawn that the *recolte*—in the above-mentioned district—besides being short in quantity, will also be very defective in the qualities of regularity of size and cleanliness."

THE following statistical remarks on the silk industry in the United States should be of interest to Japanese and foreigners engaged in the silk trade of Japan:—

With a rate of duty ranging from 60 to 120 per cent., there were imported into the United States last year $33,305,460 worth of silk goods of foreign manufacture. This is an increase of nearly $8,000,000 over 1879, and $13,000,000 more than in 1878. It is desirable that the United States should import none but the raw silk, if, indeed, it prove impossible to raise our own silkworms, and the duties have been maintained at their present excessive rates mainly with the view to protect the domestic manufacture. This is conducted chiefly in Connecticut, New York, Massachusetts, Pennsylvania, and New Jersey, and has proved very successful as regards certain classes of goods. A silk manufactory on quite a large scale was established in Baltimore about 1870, but it did not prosper, and the enterprise was abandoned. Our present silk manufacture, as will be seen below, is very small. Gov. McClellan in his last annual message, in adverting to the valuable work of the New Jersey State Bureau of Labor and Industries, said that his State consumed more than sixty per cent. of the raw silk imported into the United States, and that it was eminently desirable to have some action taken upon the recommendation of that bureau in favor of extending special encouragement to the culture of the silk-worm. The Jersey silk mills give employment to 13,932 hands to whom they pay wages to the extent of $4,047,745—$300 per capita, which is considered nominally good wages, considering that a good many of the employés are women and children. The gross value of the manufactured silk products in the United States for the census year 1880 was $40,975,285, the gross value of materials and supplies for this manufacture was $22,371,400; the net value of finished goods was $34,410,463; the number of silk factories in the country was 383; the capital real and personal, invested in this industry was $18,899,500; the number of looms at work was 8,467; the maximum number of hands employed during the year was 34,440, including 9,350 males over sixteen years of age, 16,341 females over fifteen years old, and 5,605 children and youths who received $9,107,835 in wages, equal to $264 per capita.

TOBACCO.

WE take the following from an old chronicle:—"I have been told that in the last great plague at London none that kept tobacconist's shops had the plague. It is certain that smoking was looked upon as a most excellent preservative, in so much that even children were obliged to smoke. And I remember that I heard formerly that Tom Rogers, who was yeoman beadle, say that when he was that year, when the plague raged a schoolboy at Eton, all the boys of that school were obliged to smoke in the school every morning, and that he was never whipped so much in his life as he was one morning for not smoking.

THE quantity of tobacco consumed in the world must be enormous. Some curious statistics relating to tobacco smoking in France appear in the Belgian *National*. It appears that there are 5,671,000 smokers, each person smokes an average of 9lbs. a year. For every fifteen smokers, eight smoke pipes, five cigars, and two cigarettes. The total consumption of cigarettes is estimated to be 294,000,000,000 per annum, that is, 800,000,000 a day, 33,000,000 an hour, 550,000 a minute, 9,166 a second; finally, if all these cigarettes were placed end to end they would reach 514 times round the globe. This is for France alone, and we imagine there are countries where more tobacco is used than in France, Germany for instance. France makes a considerable profit from the monopoly she enjoys in connection with tobacco, and there is no valid reason why tobacco should not be heavily taxed. It is clearly a luxury, and not a very good one at the best. The question of making this article a monopoly in India has often been discussed, and has invariably been laid aside on account of the difficulties attending the administration of such a monopoly, and because of its being looked on in India as a necessity of life. We do not see much difficulty, provided the several native Governments would likewise make its cultivation subject to such rules as control opium cultivation. Its universal consumption, which is urged against the proposal, is, in our opinion, the very reason why tobacco is a suitable article for monopoly. Excepting salt, it is the only article on which a tax would be of universal application, and it would enable the Government to lighten that on salt. This latter, although very light, is open to the objection of being a tax on a positive necessary of life.

SINCE the commencement of tobacco growing by the Government, and more recently by the enterprising proprietors of the Poosa Farm, with a view to prepare the weed for European consumption, much has been done. We learn that 13,723,660lbs. of tobacco, worth only £126,322, were exported from India in 1878-79. In the following year a less quantity was exported, but the total value had slightly risen. This would seem to indicate an improvement in the quality of the exports. The fact that the value of non-Indian tobaccos has been falling during the interval, puts the prospects of the Indian trade in a still more favourable light. The few who have really studied the subject know that, in the estimation of London agents and merchants, the Indian leaf only requires the labour of skilled curers to compete successfully with the produce of America and the Manillas. The native agents here are the persons who are chiefly responsible for the abominably bad way in which the leaf is prepared. This shows clearly that the general quality of Indian tobacco is improving. The recent withdrawal of the Spanish Government from the Manila monopoly should further advance this trade, and if only the native growers would procure good seed, and bestow more attention on curing, there is no reason why Indian tobacco should not be equal to the very best in the world.

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JOURNAL OF INDIAN AGRICULTURE, MINERALOGY, AND STATISTICS.

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NOTICE.

SUBSCRIBERS to the STATESMAN, FRIEND OF INDIA, *and* INDIAN AGRICULTURIST *are informed that arrangements have now been made by which these journals will for the future be published under the general superintendence of the undersigned.*

All communications regarding literary matter should be addressed to the Editor of the paper for which it is intended.

All communications concerning the general business of the STATESMAN AND FRIEND OF INDIA *Office, Advertisements, and Subscriptions to the* daily STATESMAN AND FRIEND OF INDIA, weekly FRIEND OF INDIA AND STATESMAN, *and* INDIAN AGRICULTURIST, *should be addressed to the MANAGER,*

WILLIAM RIACH.

13th June 1881.

CONTENTS:

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

All correspondence must bear the full name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We shall take no notice of anonymous letters.

ACKNOWLEDGMENTS.

REPORT on Cotton Cultivation in the Punjab, 1879-80. Lahore; 1881.

ANNUAL Report on the Lunatic Asylum, in the Punjab, for 1880. Lahore, Punjab Government Civil Secretariat Press; 1881.

CAWNPORE Experimental Farm Operations Report Rabi of 1880-81. Allahabad, N.-W.P., and Oudh Government Press; 1881.

REPORT on the Administration of the Meteorological Department for 1880-81. Calcutta, Government Central Press; 1881.

CORRESPONDENCE.

ON THE BARK OF THE *BROUSSONETIA PAPYRIFERA* AS A MATERIAL FOR PAPER-MAKING.

I.

TO THE EDITOR.

SIR,—You have done our English paper trade good service by directing attention to Dr. Brandis's memorandum on the above paper-making material in your journal for August last.

I do not believe there exists in the whole world a more valuable fibre for paper-making than this bark, and it possesses the great advantage that it requires no mechanical treatment, the stripping and cleaning of the bark being effected by hand labor, and, as Dr. Brandis remarks, its cultivation also is of the simplest character, "*Coppice-wood on a short rotation similar to osier beds.*"

The wonderful paper made by the Japanese for ages past (its introduction dating A.D. 610) is produced from this bark, and although the paper they make is not fitted for European requirements—merely owing to the peculiarity or fashion of its manufacture—a practical investigation of the bark itself can leave no doubt as to its value: it is, indeed, far too strong and fibrous for the ordinary papers used in England, if worked by itself alone, but its great value consists in the superior quality it would impart if used as a blend for mixing with and strengthening the materials now currently employed; used, in fact, as we paper-makers employ fine flaxen hempen rag material.

I believe I am correct in stating that it will be found some of the varieties of the silk worm (tussor and others) feed on the leaves of the Broussonetia, and thus two industries might be promoted simultaneously, as after the leaves had been utilised for the worms the branches would remain for cutting and furnishing the bark for paper stock.

Some years since on a visit to Italy I endeavoured to procure the branches cut from the white mulberry, which there furnishes the food for the silk-worms, the trees being pollarded and the branches cut down every season, but I failed, owing to the irregularly distributed growth of the trees, and the consequent cost of collection for so widely diffused a material, besides fuel being scarce and dear the custom is to use these shoots for pot-boiling.

This would not, or need not, be the case in cultivating the Broussonetia on a regular system, as planted regularly like osiers are in this country (and in Japan) they would be cropped continuously as Dr. Brandis observes "on a short rotation."

Although thus drawing attention to the Broussonetia it must not be supposed I relinquish my predilection for bamboo, the first being considered an "article de luxe," the latter an "article de necessité," and preferable in so far that it already exists in exhaustible quantities in the native forest at present as it were a waste product only requiring collection, whereas the first demands cultivation, and

although probably superior in quality would require years to furnish an adequate supply, while the bamboo can be used in its entirety, can certainly be produced at less cost, and is more generally adapted for most classes of paper.

The action of the French in Tunis and Algeria will most probably seriously affect our supplies of esparto grass in the future, and as we in England, are mainly dependant for this our chief paper material from Northern Africa, the time should be most propitious for stimulating enterprise in the production and export of paper-making materials from India.

The Crimean War was the stimulus to the jute trade, as previous to 1856 the imports did not amount to 30,000 tons annually; they now exceed 400,000 tons. In like manner the Confederate War in the United States inaugurated the use of esparto, as up to 1861 when my process of treatment was introduced I was the sole user for paper-making, and last year the importation exceeded 200,000 tons. It is said that a retrospect of the past is the truest guide to the future.

India can supply the world with paper material, *as cheaply, as abundantly*,, and *of better quality*, than that we now are compelled to use. I desire to impress the fact on those interested in Indian commerce, and shall be happy to communicate with parties desiring to entertain this branch of industry.

THOS. ROUTLEDGE.

Claxheugh, Sunderland, Sept. 12.

II.

SIR,—In my last communication referring to Dr. Brandis's memorandum in your August number, directing attention to the above bark as a valuable adjunct to our supplies of paper-making material, I now forward you the *St. James' Gazette* for the 21st September, drawing your notice to an article therein on "Silk-growing in Burma"* written evidently by one fully conversant with the subject.

I think you will do good service by publishing this article *in extenso* in your journal, and I need only remark that the "Burmese Mulberry Bush" the "poh-tsa-bin, the tree the silkworms eat" is the Broussonetia papyrifera, the tree referred to by Dr. Brandis.

"From small beginnings great things spring," and I trust that the notice I doubt not you will attract to this question in your journal, may, as suggested in my last letter, induce attention to the subject, and, that a stimulus may thus be given to two new industries simultaneously, *viz.*, the increased production of a silk, which, although it possibly may not be equal to Italian and French, or even Chinese, will bring good value in our Home market, while the bark from the shoots cut down every season when denuded of their leaves will form a valuable paper-making material when converted into "stock."

For some time I have given attention to this class of material, and having obtained some of the Broussonetia bark from Burma, after a long series of experiments, have matured a simple process of converting the same into a fibrous paper-stock of very high quality, this process also being applicable to several other indigenous barks which, although not of so high a quality as the Broussonetia, may still be utilised at fair profit for paper-making material.

I am satisfied that a new and wide field is thus opened to British Burma, the most flourishing province of our great Indian Empire.

THOMAS ROUTLEDGE.

Claxheugh, Sunderland, 28th September 1881.

* The article on Silk in Burmah will be found among our selections.—ED., *I. A.*

SULPHURIC ACID FOR ASSISTING GERMINATION.

TO THE EDITOR.

SIR,—In your issues for September and October there are some statements with regard to the use of sulphuric acid in promoting the more rapid germination of seeds or fruits contained in shelly capsules, such as nuts, &c. The tea seed is contained in a shelly capsule, very much resembling a nut, and if a few days could be gained in the germination it would be of some benefit to planters.

If you happen to know the proportion of sulphuric acid to be used or the solution, and will kindly inform me, I should like to try the experiment with some tea seed, and will let you know the result when the seeds germinate, if you should care to hear.

CHARLES P. BRUCE.

Tokankata, Kalaigaon P. O.
October 15, 1881.

NOTE.—See an Editorial Note elsewhere.—ED., *I. A.*

The Indian Agriculturist.

CALCUTTA, NOVEMBER 1, 1881.

ADMINISTRATION OF THE CENTRAL PROVINCES.

THE Central Provinces administration report for 1880-81 is to hand, and appears much earlier than these reports usually do. The area under the Chief Commissioner is as follows in square miles :—

	British.	Native.	Total.
Cultivated	... 24,108	5,440	29,548
Culturable	... 25,733	12,949	38,682
Unculturable	... 34,367	10,445	44,812
Total	... 84,208	28,834	113,042

Thus out of the whole culturable area only 43·3 per cent. has been brought under the plough. This was to be expected from the paucity of population, which, over all the province, is in the proportion of only 81 to the square mile.

Details regarding four crops are given very fully, and give us a fair idea of the state of agriculture in the several districts. We summarise these details thus, the figures being per imperial acre :—

	Average Rent.	Produce in lb. Min.	Max.	Average.
Rice	... Rs. 0 9 0½	245	680	461
Wheat	... „ 1 8 7	364	768	594
Cotton	... „ 0 15 10	17	128	54
Oil Seeds	... „ 0 13 1	100	440	231

These figures are striking. They are all low, very low, and the discrepancies, especially in the produce of cotton, are great. It passes comprehension why the cultivators in Raipore continue to grow cotton year after year, with an out-turn of 18lbs. per acre. During the year the price of cotton in Raipore averaged Rs. 20 per maund, so that the gross value of the out-turn was only Rs. 4-6-3 plus the value of 36lbs. of cotton seed. On the experimental farm at Nagpore cotton was tried with the result of producing 90lbs. after the land was ploughed with the American plough, and manured with ten tons of *poudrette* per acre. Three acres were cultivated, and irrigated twice, yielding 103lbs. cotton and 301lbs. seed per acre. Prices of food-grains were very much lower than during the previous year, and the general condition of the people was better in consequence.

There are now 19,666 square miles of forest as under :—

First class reserves	...	2,535
Second class reserves	...	16,850
Unreserved	...	281
Total	...	19,666 sq. miles.

This is regarded as satisfactory, but it should be remembered that the more these forests are reserved, the higher becomes the price of firewood, and this again re-acts on the manure supply, and leads to a larger quantity of *copla* being used.

We are told that the Charwa Agricultural Company has collapsed. This company started with a great flourish of trumpets, and took up land in the Hoshungabad district, intending to carry on agricultural operations on a grand scale. The report is silent as to the cause of the failure, and we should like to have known something about its working and its collapse. There is room for many such companies, and much good might be done by wealthy companies taking up extensive grants, and sub-letting the same to settlers, helping them by financing on reasonable terms. The company could do this at rates and on terms much under those of the ordinary money-lender or village *bunia*, and still secure a good return for the funds invested.

The revenue assessment is classified in a very clear and detailed manner in the last administration report. It

is as follows: On cultivated land, it ranges from 2as. 4 pies per acre in Sumbulpore, to 11as. 4 pies in Nagpore, the average being 6as. 10 pies. On culturable land, not under cultivation, it runs from 1 anna in Mundla, to 9as. 2 pies in Nursingpore, the average being 3as. 4 pies, or as near as may be one-half of the other. Over the whole area of settlement, the annual charge runs from 6 pies in Sumbulpore, to 6as. 5 pies in Nagpore, the average being 2as. 5 pies per acre. This is the custom all over India—to charge less on land not under cultivation during any given year. It is also followed by most zemindars in exacting rent. We do not think it is an equitable system. As well might the tenant of a dwelling-house be exempted from payment of rent during the season he and his family spend at the coast. It would be much more in accordance with reason, if a rate was charged irrespective of whether the tenant chooses to cultivate or not, as the land is as much out of the landlord's hands, so far as re-letting is concerned, when the tenant does not cultivate, as is the dwelling house of the family whose members vacate it for several months every year.

The Government of the Central Provinces do not seem to have done much in the way of irrigation. We find the following statistics to represent the irrigated land under the Chief Commissioner's government—

Land irrigated by Government	... 214	acres.
Do. by private individuals	... 836,297	"
Total	... 836,511	acres,

that is to say, out of every hundred acres, private individuals have provided for 99·97. Of the total under cultivation, which amounts to 13,844,031 acres, only 836,511 are irrigated. This is only 6 per cent. of the whole. Surely something more might be done by Government.

The farmers are comparatively rich in draught cattle, as we find they possess no fewer than 5,670,178 cows, bullocks, and buffaloes. They have, however, only 777,801 ploughs, and as this is one plough to every 18 acres under cultivation, there is room for improvement. The influence of the railway and of other means of communication is clearly seen in the price of food-grain in various districts. For instance, in Bilaspore the average price of rice was 12as. 3 pie per maund, while in Hoshungabad it was Rs. 4-8-0. The rent of rice land was 6as. per acre in Sumbulpore, and Rs 5 0 0 at Nimar. There is much room for improvement in the agricultural attainments of the ryots, the average produce in lbs. per acre of various crops having been as follows:—

Rice	410
Wheat	529
Goor	481
Tobacco	199

The outturn of tobacco in the Punjab being 800lbs. per acre. The soil is good, but the rainfall is variable, and often deficient, hence the urgent need for Government to step in and do something towards improving the irrigation of the provinces.

NOTES FROM A COTTAGE GARDENER.

I.

Sowing Seeds.

(Communicated.)

THE condition in which the ground ought to be to receive garden seeds, is one of those subjects on which much difference of opinion exists; for we often see a successful result from two causes, widely differing from each other in their origin; and the sowing of seeds by hand is often done in a manner diametrically opposite to that in which nature performs the same operation. The latter mode is simple enough. Seeds ripening in the summer or autumn of each year sow themselves, and either fall on, or are scattered over the ground at the time when its extreme dryness precludes the chance of its vegetating then; even if it did, the hardness at the top would prevent it obtaining nourishment there. But many seeds that ripen in summer do not grow until the following spring, even when they fall on ground apparently favorable to their growth. This wise provision of nature prevents the plant vegetating at a time when it is sure to perish by the weather likely to follow. This is one of nature's modes of sowing seeds: let us see how far we imitate it.

That of many of our garden products, whose origin, if not tropical, are certainly from a more temperate region than ours, *Scarlet Runner Beans* are large, and apparently robust seeds, yet they will perish if placed in cold, damp earth. Other seeds are similarly influenced by the same causes, in proportion to their capabilities.

But many of our garden vegetables are either indigenous plants improved, or plants from those parts of the continent different but little from us in the general conditions which regulate the growth and well-being of the plant. Carrots, celery, the whole of the cabbage tribe, and various other plants, are only improvements on seeds of an unpromising description; and, consequently, their seeds are more hardy than others. True it is that carrot seed sown too soon perishes in the seed leaf, but this is often from the attacks of insects, and, after all, it is likely we sow carrot seed earlier than it would be done if left in a state of nature; for the seed does not easily part from the stem, and if left alone would, in all probability, hang until the proper time for its dispersion by the wind, or other causes; whereas, in an artificial condition, it is cut and harvested; on this point we, therefore, see the difference there often may be between the natural and horticultural mode of sowing seeds, and the want of success in the latter way may be often satisfactorily accounted for, as seeds refusing to vegetate and prosper when sown at a contrary time of the year to that suited to them.

In regard to the depth seeds ought to be buried, there is much difference of opinion; but the general rule of covering them with an amount of earth, five or six times their own thickness, is on the whole a correct one for everything sown in an artificial way, as almost all garden seeds are. Beans and Peas may be even deeper than that; but seed coming up with weak cotyledons, as carrots, can scarcely be covered too lightly. In fact, they would do without any covering, if we could depend on the seeds remaining on the ground undisturbed. Radishes are a robust crop, and will bear as much covering as *Kidney Beans*, which are much larger seeds.

Sowing thickly or thinly on the ground is not so important an object, as the after treatment of the crop. Many seeds are so plentiful and cheap, that a little extra seed is not a serious affair. But the welfare of most crops depends on their being immediately thinned as soon as they can be handled. Where this is impracticable, do not sow too thickly, for the greater part of crops are the better by not being too thick on the ground.

II.

Potatoes in the Darjeeling District.

The seed that was imported last year by Government has now been distributed amongst the planters and others, throughout the district. The variety on the whole seems to be pretty good, and will improve the quality of the potatoes in the district immensely. This year Government planted this seed first, to ascertain the most suitable way of planting them. Their recommendation is, to plant them in September, and again, in March; should this mode be carried out many years in succession, this new seed will be found to deteriorate considerably; and in all probability be lost sight of in a very few years. Experience tells us, that it is impossible to get two crops of really good potatoes in one season. But, to plant good seed in September, one can rely on a good out-turn, and if these same seed be planted again in March, the quality is very inferior, so much so, that a really good eating potato never can be got from them after.

The elevation recommended is 4,500 feet; this is all very well; we have good potato fields at 6,000 feet, and we have good ones in the plains, so it is impossible to know the most suitable elevation for a potato. The cost has been very large to Government by all accounts, and in their letter they admit it has cost them thirty rupees per maund. And as the same seed can be bought in England at eighteen shillings per maund, there must have been some oversight on the part of those who had a dealing in this matter, to allow the cost of transit to be so heavy.

NATIVE AGRICULTURAL EXPERIMENTS.

(Continued from page 290.)

Experiments towards the introduction of improved implements.

1. PLOUGHS.

I have purchased this year, from the Madras and Cawnpore Government Farms, a number of ploughs, and experimented both in wet and dry lands towards their introduction in this locality.

1. NAWAB PLOUGH.

This plough I purchased from the Cawnpore Government Farms, it resembles the country plough, consists of the working parts made of iron in the improved fashion, having mould-board and share, so as to loosen and at the same time invert the soil, and to this working part, an upright handle, and a rigid beam, to which the cattle is yoked, are attached. This plough is very light, weighing only 22lbs., costs Rs. 6. It can be conveniently carried on the shoulder; moreover, the management of this plough requires only a little more intelligence and special instruction on the part of the ploughman; it ploughs in the wet land, about ½ of an acre to a depth of 4 to 5 inches, in a day of 6 hours.

This plough, I think, can be best substituted for the country plough in the wet lands.

2. KAIZAR PLOUGH.

I have purchased this plough also from the Cawnpore Government Farms; it is constructed after the model of the light American combined plough, has no wheel or coulter, and is attached to the yoke by a rope fastened to the ring at the end of the beam, is very light, weighing only 28lbs., costs Rs. 6. The adjustment of this plough is rather difficult on the part of the ploughman here. It ploughs about ¼ of an acre in friable soils, but in clayey, wet lands fails to work.

3. THE LIGHT AMERICAN COMBINED PLOUGH.

I purchased two samples of this kind, one with an upright mould-board, and the other with somewhat elongated mould-board.

The one with an upright mould-board weighes 48lbs., costs Rs. 9, fails to work in clayey, wet lands, but works in loose, friable soils.

The other weighs 56lbs., costs Rs. 12, works tolerably with the ordinary cattle in wet lands, as well as in dry lands, but however the draught is not less to the light iron plough, and at the same time the work done is not so good as that done by the light iron ploughs.

4. LIGHT SWEDISH PLOUGH WITH ONE STILT.

This plough is an iron plough manufactured in the Madras Government Farm after the Swedish model, weighs 72lbs., costs Rs. 20. This plough works well with somewhat better breeds of cattle both in dry and wet lands. It ploughs in the wet lands about ½ of an acre, to a depth of 6 to 8 inches, and in dry lands more than ½ an acre in a day of 6 hours.

I have also purchased 3 more sample ploughs from the Madras Government Farms, one of which is a large Swedish plough, and the other two B. F. I. of Ransome's Head and Jefferies, but as I have received them long after the ploughing season, I have not experimented them as to their utility in this locality.

II. REAPING KNIFE.

The reaping knife used here in cutting down the ripe paddy plants, &c., is in the form of a semi-circular arch having serrated edges, is very light, weighing only ¾ lbs. with the handle. Therefore the plants are cut down by the expense of much force, by the aid of serration in the edge; moreover, the knife in cutting the plants jerks and gets higher, and catches only a very few plants. A large portion of the straw is thus left waste in the fields in the form of stublets.

I purchased from the Madras Government Farm a sample knife which has the form of a curve at the base and lengthened at the apex.

This knife is heavier weighing 1½lbs. It catches more plants and cuts closer to the ground. I have some knives made here of this sample, and experimented with them.

A man with this knife cuts down paddy plants in an area of ¼ of an acre, leaving the stublets only to the height of 2 or 3 inches, whereas with the ordinary knife cuts down the same extent leaving the stublets to the height of 6 to 12 inches.

Coolies not being trained to handle this improved knife, some of them stupidly sometimes jerk the knife as they do with the ordinary knife, and cut the artery of their left hand, but I think if the coolies become accustomed they won't be liable to such mistakes, and the work will be facilitated.

III. WINNOWING MACHINE.

Cleaning the seed from the admixture of unfertile grains, chaff, dirt, &c., and selecting the good ones for seeding purposes, seems to be very essential, because, owing to the drought and submersion, and imperfect cultivation, a large percentage of the grain in the produce are only imperfectly developed ones, and these, when sown without separation, only the plants of a like nature germinate which die sooner or later from casualities, or yield a very inferior crop.

The ordinary process of winnowing followed here is the exposing the seeds to the wind, which operation effects only an imperfect separation and is very precarious

The process of separation by the wicker-works called Moram and Salladi, made of bamboo slippers, cleans the seed well from the admixture of unfertile grains, dirt, &c. This process, however, being very slow and tedious, is only used by women in husking the paddy.

In May last I applied to the Madras Government Farm for a sample of the winnowing machine. The then superintendent replied that the Government didn't allow the manufacture and sale of the implements and tools in the Government Farm. I then applied to the Cawnpore Government Farm for a sample of the winnowing machine and obtained from thence a machine at a cost of Rs. 30.

I experimented and found that by the assistance of this machine 3 men clean about 40 kulums of seeds in a day of 8 hours' work, but a complete separation of the seeds from the impurities is not effected in a single process, and it requires to repeat the process more than once. Moreover, the working of this machine requires the application of great force on the part of the workmen.

In January last I again purchased from the Madras Government Farms a winnowing machine of Dray Taylor & Co., London, for Rs. 80.

I experimented and found that by this machine 3 men clean about 80 kulums of paddy seeds in a day of 8 hours' work. A complete separation from the impurities is effected in a single process.

As to the amount of advantages in the selection of seeds for seeding purposes, I have not experimented this year, as I have received these machines long after the sowing season.

CATTLE.

I am thoroughly convinced as to the vital importance of keeping the cattle under my direct management by the results of the experiments I have made in my experimental village.

Throughout the year a regular shed against the inclemency of the weather, good and wholesome food, containing all the essential ingredients, sanitary arrangement, and medical assistance, are all indispensable requisites for the well-being of the cattle.

Under the present state of circumstances, none of these the cattle could get from the Porakudies, because—

1. Merasdars invariably employ other coolies in conducting the harvest, who cut the ripe paddy plants close to the ear, leaving a large portion of the straw in the form of stublets. Again these Porakudies during the period of their own starvation, sell for their food whatever they have in their hand, and leave the cattle miserably to starve and die.

2. The Porakudies who are so ignorant as not to feel the want of proper sheds for themselves, can never be expected to provide sheds for the cattle under their charge.

3. It is impossible to inculcate the principles of sanitation and proper medical aid to the semi-savage Porakudies, and I think if the Merasdars could restrain themselves from giving the cattle to the Porakudies, it will materially improve the sanitation of the miserable Porakudies themselves.

Therefore, if the Merasdars pay a little attention at the time of harvest, and cut the plants closer to the ground and preserved them without giving into the hands of the Porakudies, sufficiency of straw can be had throughout the year.

A little additional experience in purchasing the oil-cake bran, or inferior food-grains, &c., to form an admixture to the general food, he paddy straw will not come even to the sum of money which the Merasdars annually give, for the purchase of the cattle, or *Mattu Varagum*.

The erection of permanent buildings for the cattle, of course, involves considerable expense on the part of the Merasdars, but however, this would never exceed two years' cattle purchase money, and the Merasdars can conveniently afford to have a portion of their capital laid out in the construction of permanent sheds for the cattle.

The following table shows the account of the cattle for the villages of Aroon and Thathangoody for the year 1880-81 :—

The number and valuation of the cattle on the 30th June 1880.	The number and valuation of the cattle died during the year.	The number and valuation of the cattle purchased during the year.	The total cost of feed, attendance &c. of the cattle during the year.	The number and valuation of the cattle sold during the year.	The number and valuation of the cattle on the 30th June 1881.	The value of the manure obtained during the year.
Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.		Rs. A. P.	Rs. A. P.
87 625 0 0	7 78 12 0	12 250 4 0	536 1 0	... ...	12 640 0 0	50 0 0

The above account is ledgered as follows :—

CATTLE.

Dr.					*Cr.*			
To valuation on 30th June 1880 ...	625	0	0	By valuation on 30th June 1881 ...	640	0	0
„ food, attendance, &c.	536	0	0	„ the number sold ..	...		
„ number purchased	250	0	0	„ Manure ...	50	0	0
„ „ died ...	78	0	0	„ Balance .	795	1	0
Total ...	1,183	1	0	Total ..	1,185	1	0

The total cost of cattle keep for the year 1880-81, for both the villages, is Rs. 795-1, and the yearly expense under the Porakudi system for the past 13 years, as given in the table, mounted to more than Rs. 450 besides the Varum.

In the year 1880-81 out of 42 bullocks, 12 bullocks were employed in ploughing by light improved ploughs, cutting and other purposes, and their extended labour reduces their cost of keep very much.

In the Arachoors Bingah of my estate, which consists of 4 full villages, extending about 1,000 acres, and situated within 3 miles from my residence, I refused to sanction money for the cattle purchased, and purchased the cattle myself, to make up the number lost by death, and kept a portion of them under my direct management, and gave the rest to the Porakudies.

I allowed to those Porakudies whom I permitted to carry on the cultivation operations with the cattle under my management, all their inams and wages, as usual on the Porakudi system, excluding the straw.

Thus, for the year 1879-80 I had about 150 cattle under any direct management, and for the year 1880-81, their number was increased to about 250, and as a consequent result, the mortality of the cattle under my management is greatly reduced, while in those of the Porakudies ranged in the usual percentage.

Moreover, the working capability and valuation increased in the same way, while in those of the Porakudies decreased.

It suggests to me that the institution of the Government Farm and School of Agriculture in Madras, may perhaps be an ample means for the diffusion of sound agricultural principles abroad in the country, if the agricultural people be properly educated.

Most of the people engaged in agriculture in this country are scarcely able to understand what the Farm Institution is doing for the improvement of the country.

Moreover, they are so governed by custom, habits, and religion, that any step towards the improvement seems to them incomprehensible and impossible.

Therefore, I am of opinion, that the desired effects of the institution of the Government Farm and Agricultural College in Madras will only be produced, if Government Farms be opened in the districts, and placed under the charge of students trained in the institution, who will be able to conduct experiments and demonstrate the benefits arising from the adoption of rational principles of agriculture ; get, and supply the necessary improved implements, and train men practically for engagement under large landholders, &c.

2ndly. The chief difficulty in bringing about changes, in the agricultural practices of the country, lies in the unwillingness of the Porakudies. The object of rational agriculture being to economize labour, the Porakudies are afraid that they will be thrown out of service, and oppose the introduction of salutary changes. In such cases, the Merasdars are obliged to dismiss them, and also to eject them, which, however, they cannot do without the intervention of Civil Courts. The procedure is costly, and the delay long and unavoidable. The best course would be to invest the Collectors of the Districts, as before, with summary powers to inquire into such cases, and eject the Porakudies, without putting the Merasdars to inconveniences, and pecuniary losses.

KRISHNA SAWMY MOODELLIAR,
V STREEVAS ZAR, Agricultural Manager.

EXPERIMENTS IN THE SHAHJEHANPUR DISTRICT.

(BY PUNDIT AJUDIA PROSAD.)

DURING the course of the last year, your department sent me seeds of different kinds for experimental cultivation in my farms. Each particular kind was accompanied by a request asking me to report the result of the trial. As it would be a rather tedious and lengthy task for me to report the result of each separately, I hope I would be forgiven the liberty I have taken in submitting the results of all in one report.

This report may be divided into the following different heads.

I. Grain. (a) Indigenous. (b) Foreign.
II Roots. (a) do. (b) do
III. Vegetables.
IV. Fodder crops.
V. Cultivation of things which do not, properly speaking, fall under any of the preceding heads
VI. Miscellaneous remarks.

I. The cultivation of grain can be classified under two general heads, *kharif* and *rabi*. I treat of each of these separately.

Different kinds of rice were sown in the former season, but owing to the want of grain no good results were obtained. Although there was some outturn, still on comparing with that of better and former years, it was merely insignificant. There would have been a difficulty in obtaining even this little had not the Assamees wisely listened to my proposal of throwing *kacha* dams across the Gomtee, which enabled them to water their rice in the severe and protracted drought, and thus to ensure a meagre rice harvest in the Indalpur Gomtee valley. This laudable example was, I am glad to say, followed by the other riparian villages in the vicinity, and they also were rewarded with a shadow of success.

Of the remaining *kharif* grains the result was rather better, though not equaling that of past years. The reason for this is that these grains do not require so much of water as rice, and so the drought did not have so baneful an effect upon them In addition to this, it may as well be stated that this part of the district is peculiarly suited to *til*, *bajra*, *mong*, &c. No or very little crops having been obtained towards Tilhar and Shahjehanpur, *Juar* is not generally cultivated here, but as I stated in my report last year, I tried it and experimented with nearly forty beeghas of land The result was, I am sorry to say, very bad. This may in a greater part be attributed to want of rain. To remove this doubt, I intend giving it another trial this season.

Of foreign *kharif* corn only maize was tried on my farms with seed received from the Agricultural Department. I was apprised

by Circular 6A of that department of the despatch of five kinds of American maize to my address. The names of those are :—

(*a*) Golden dent corn.
(*b*) Adams extra early corn.
(*c*) White flint corn.
(*d*) Yellow Canada corn.
(*e*) Tuscarora corn.

By some mistake only 3 kinds reached me, two bags containing Canada corn and Tuscarora corn having been replaced by bags of two of the other varieties. Two kinds of Jaunpur maize were also received by me. All this grain was distributed equally to four of my farms, *viz.*, at Indalpur, Hetinagar, Dhondwo, and Karkya. The American maize occupied 36 beeghas of land in all the above farms, but unfortunately it did not germinate all well, only a few struggling plants being found here and there. This miserable little number of plants even was not destined to prosper, as rats immediately attacked it, and many were eaten up root and all. Seeing the fate the remainder were likely to suffer, in farm No. 2, I got them transplanted, and they were then watered nearly six times. They thus yielded a few seers of seed, which was not as good as the original. In the other three farms the plants were allowed to remain in the same fields, they received every care and were weeded, but did not produce any crop. The two kinds of Jaunpur maize was tried over nearly 30 beeghas in all the four farms, just after germinating, the plants were very healthy and promising, and remained so up to the time they flowered. But immediately the flowers appeared, the plants were attacked by myriads of large insects with black wings, who ate up the flowers and also the hairy flocks of the cobs. Thus no grain was formed in the cobs generally except in a very few instances, which have been very carefully preserved.

In the *rabi* season no foreign seeds were tried, and the South Australian wheat was given up owing to the many and successive failures which occurred in attempting it. Country wheat was tried largely as usual in all the farms. In this part generally Katha wheat is sown, which is small, hard and red in colour. I got two superior country kinds called Samharea and Moondea, the latter so-called because its ears are void of whiskers. These two kinds are large, soft and white, and are in every respect better than Katha wheat. The respective average produce obtained from each of the three kinds is herewith given. The average outturn obtained from Katha wheat is 1 maund 7 seers per beegha, that from Moondea is the same, whereas that from Samharea wheat is 1 maund 13 seers. These fields were not watered; my object was to find the wheat which with ordinary culture would pay best. I accordingly proceeded entirely on the native plan, and am glad to say that Samharea wheat is the species which has appeared to me best hitherto.

Gram was a total failure this year. It did not germinate nicely, in the first place owing to the dryness of the land and yielded very poor crops in a few places, but such spots are rare.

Barley and Gojae, though not equalling preceding years, were, seeing the other *rabi* crops, tolerably good. It may here be not out of place for me to state a fact which shows the immense advantages upon which a cultivator can surely calculate if he uses the light English plough Kaisar. I tried Barley in 22 beeghas of land worked with the native plough; the outturn was very wretched indeed, an average of 20 seers per beegha only being obtained. A little plot of three beeghas of similar soil was worked with the Kaisar in the rains and then sown with barley. Both the plots were exactly similar, and an uniformity of condition was maintained between them as far as practicable. The outturn from this latter field amounted on the average to 2 maunds per beegha. Thus the result of the experiment is another addition to the already numerous proofs obtained which show the decided superiority of the Kaisar over the native ploughs.

II.—Roots (*a*) Indigenous.

Carrots were tried on a plot of land which received manure at the rate of ten maunds per beegha. This manure was prepared, as I last year stated in my report, by storing up cow-dung mixed up with cattle urine and dead leaves. The field besides received five waterings. The outturn amounted on the average to 2 maunds per beegha. The liberal outturn which this crop gives as well as the comparative ease with which it can be cultivated together with the good stead in which it stood to people in the last two years of drought, has, I am glad to say, stimulated many cultivators here to try it largely. There was, and still exists to some extent, a prejudice among the higher classes of Hindus against eating carrots, because its Hindi name Gajar (*Gajar*) commences with the letter Ga (*Ga*) which is also the commencing letter of the word Gai (*Gai*) cow. This prejudice is gradually giving way, and leads men to expect that in time it will be totally erased. Onions were tried experimentally as a field crop in a plot of land which was manured just like the carrot field, but received only two waterings. The outturn amounted to 3 maunds per beegha. In this part the climate appears suited to its cultivation and as a small quantity of seed gives large crops, I should strongly recommend its trial. The people here with the exception of Hurdea, Moroos, and malees, are prejudiced against its cultivation. The Hindoos generally do not eat it, and consider it unholy.

Turnips.—Some turnips were tried by me as a garden crop, and yielded very fine roots. The people are generally prejudiced against eating and sowing them as against onion.

Turmeric.—I tried turmeric in a plot of land this year. The average outturn amounted to 3 maunds per beegah, the roots being weighed just after being dug out of the ground and washed. This, I am told, is not a very good return as turmeric yields an outturn nearly equal to carrot. I wanted much to try it largely, but unfortunately here the prejudices of my countrymen stood rather awkwardly in my way. It may not be out of place for me to describe the prejudices which prevail in this part of the country, and I believe all over the N.W.P. about cultivating this root. It is used in almost every Hindoo worship, and when mixed with lime forms the red substance which is applied to the forehead (roli). Here no class of people whatever will ever cultivate this thing except the particular class of Moroos termed Hurdeas who derive their name from the Hindi word (hurdea) turmeric. The Moroos will never sell the seed tubers as they consider it unlucky, and likely to result in the death of their families or some other misfortune. If any one of their class comes to a village and chances to have no seed, they all give him a little, and with that he commences business, and is in two or three years enabled to gather seed enough. Besides these Moroos, other people consider it unlucky even to sow the seed into the ground for another man. My *malee's* answer was characteristic when I asked him to sow for me last year—"Neither my father ever did so, nor my grandfather before him, and I will also never do so even if you dismiss me." Should any Moroos other than Hurdea, ever cultivate it, his caste people would ex-communicate him. This prejudice does not prevail towards Pallia in the extreme north of the district, and the lands beyond the Gogra in the Lukhimpore district in Oudh. There, every class of people and almost every cultivator cultivate it as a field crop. They prepare the land just as it is prepared here for the sugar-cane, and when it is ready to receive seed, two ploughs go in front, and a man walking behind, lays the tubers in the furrow, about a foot apart. The field is then harrowed. When the plants grow up, they are weeded twice. If the rains are favourable, no irrigation is necessary. This crop needs no watching as, owing to the peculiar smell and taste of the leaves, no animal will graze them. The tubers when they are boiled and dried form the *huldee* of commerce. Those which are kept for seed are stored up in a pit dug in moist ground, and are taken out only when about to be sown. Seeing the comparative ease with which this can be cultivated, and the good outturn which it yields, I can safely recommend its cultivation to every cultivator. The seed tubers which are sown do not rot, but remain adhering to the end of the stem. The Moroo cultivators separate it from the stem when weeding the field, and those who try turmeric largely, separate it when they dig the crops out of the ground. These seed tubers are sold to the cloth dyers (*rungrej*) who use it in dyeing cloth.

(*b*) Foreign roots.

Ground Nut.—I tried a little of this from seed received from the Agricultural Department. The climate seems favorable, and I have, I am glad to say, succeeded in getting seed enough for the next year. The rats did it great injury. The produce does not equal the original in quality.

Mangold Wurzel.—I received through the Director, Department of Agriculture, six seers of seed of two species of this root. I

tried it largely as a field crop, but owing to some defect in the seed, it did not germinate properly—only a few stray plants came up here and there. These were properly taken care of, and yielded roots not at all inferior to those exhibited at the late Lucknow Exhibition. Some which were weighed were nearly five seers. I tried to make seed but could not succeed. I may as well remark that the leaves of mangold wurzel are fit to be eaten by the poor classes as vegetable, so it will not simply be a fodder crop, but will help poor people greatly in times of scarcity.

Carrot.—Two kinds of carrot seed were received from the Department of Agriculture. The seed came rather late, so that it was sowed fully one month and-a-half after the country kinds. The produce was, therefore, less than that of the latter by six maunds per beegah. I am sure the results would have been equal had the English species been sown as early as the country one. I should, therefore, strongly recommend an early supply of seed. The roots of the English kind were larger and better flowered than those of the country kind, and were much liked by the Moroos and other cultivators, who wish to try them. I am going to supply them with a little seed next season.

III.—Vegetables.

Cauliflower.—I stated in my report last year that the Moroos and other cultivators here hold that the climate of the locality is not suited to cauliflower. I gave it a trial last year and succeeded. This year my success has been a special one; large flower heads were produced which were exceedingly well flowered, and were no way inferior to those raised at Shajehanpore. In order to know whether they would ensure a sale in the market, I sent some there; these were eagerly purchased. This fact, I am sure, will stimulate Moroos to try its cultivation.

Cabbages.—I got some cabbage seed through the Agricultural Department, and tried it here. This was entirely a new experiment. I am glad to say I was rewarded with success; the heads were exceedingly large and pleasant to the taste. Natives are generally prejudiced against using it, but as I had a very large quantity I used up as much as I could and sent some to the market, where it fetched a high price I am sure this will be a very good industry for the Moroos and other vegetable cultivators. I tried to make some seed, and have succeeded in getting a very small quantity, the productive capabilities of which, as compared these of the imported seed, I will try next year. The Moroos want seed, and I will let them have some.

Pumpkin.—Mr. Stoke of Shahjehanpore very kindly procured me a few long pumpkin seeds from Azimgurh. I sowed them here along my garden wall, and when the plants came up trained them so that they spread on the wall. They fruited immensely and for a very long time. The majority of the pumpkins produced here were about four feet long. This would no doubt be a great help to the poor classes when corn fails, as the plant requires but little care and continues to afford food for a time longer than the pumpkins cultivated here. I have got a very large quantity of seed which I will distribute freely this year.

IV.—Fodder Crops.

Reana.—The present was my second trial of this fodder, but I had no better luck this time than last year. I am disposed to think that this would do as a garden crop, but is unfit for the field, as it requires very careful treatment, and is very delicate.

Sorgho.—I got 20 seers of sorgho seed from the Department of Agriculture last year, and I tried it here in two places. The plants were healthy and juicy. The general cultivators here do not prefer it to their own chari, as they urge that their own kind affords fodder for their cattle during the winter months, and also supplies them with grain to some extent. The sorgho grain on the other hand is bitter. I, however, prefer it owing to the peculiar property of fattening animals, and increasing the quantity and quality of milk in them. I have besides another point in view. At the late Lucknow exhibition, I saw a sample of sorgho *rab* exhibited by Mr. Harrison of the Agricultural Department. I am going to try to press sorgho juice and make *rab* from it. If I succeed, I am sure sorgho will be adopted almost universally by the cultivators here.

Lucerne.—I received some seed from the Agricultural Department, and tried it As regards the quality of enriching the soil this grass is said to possess, I cannot give any opinion just now, but hope to be able to do so next year after sowing some crop in the plot lately occupied by the grass. As regards the utility of this as a winter fodder, I agree, but at the same time I can safely say that though it may do for large farmers and big landed proprietors to attempt it, still for an ordinary cultivator it would never do.

Fodder crops are, as a rule, only useful in places where pasture is scarce. This part of the Shahjehanpore district, namely, the Khotar pergunnah, abounds in jungles, and consequently in rich grazing lands. Fodder crops, therefore, unless they possess some peculiar advantage, or require little or no labor in raising them, can never be adopted by the cultivators generally. These crops, specially sorgho, will be an invaluable boon towards Tilhar, Katra, and Jellalabad, where there are no grazing lands.

V.—Under this head I have to treat of four things :—

Sugarcane, Tobacco, Cotton, and Inga Dulces.

Sugarcane.—Hitherto, for the last six years my farming career was nothing, somehow or other, but a series of failures. This time, however, in sugarcane I have, I am glad to say, to boast of something having the semblance of success. I tried 48 beeghas of sugarcane in my three farms last year.

Farm No. 1	...	...	20 beeghas.
Do. " 2	...	...	18 "
Do. " 4	...	...	10 "

Of these three farms the sugarcane of Nos. 1 and 2 was pressed by the two Behea Sugar Mills purchased from the Agricultural Department. In both of these farms, the quantity of juice pressed amounted to 20 tirhas. A tirha means 13 matas, which latter is an earthen pot of about three-and-a-half maunds capacity. In working the native kolha night and day, the following number of men are required :—

2 Pindhas (men who beat the cane-bits into the mill with mallets).

2 Mothas (boys who supply handfuls of cane bits to the mill.)

2 Jhokhas (firemen who feed the furnace and regulate heat.)

These laborers are paid in juice which they convert into *rab* or goor and sell for themselves. The rule being that in each tirha after pressing twelve matas for the master, they take the thirteenth to themselves, and partition it among themselves, according to the rate given below. The Pindhas get half, and the Mothhas and Jhokhas divide the remaining half equally among themselves.

In working the Behea Mills, Pindha is not required, and his share goes to the master. I arranged with the laborers in a different way, and paid them one rupee cash for each tirha, which they distributed among themselves. I should here like to show the profit I obtained by using the Behea Mills in pressing my cane instead of employing kolhus.

All the juice pressed by the Behea Mills amounted to 20 tirhas as I said before, and for each tirha, one rupee was paid to the mill laborers, thus :—

		Rs.	As.	P.
Amount paid to laborer for pressing 20 tirhas	...	20	0	0
Oil, for oiling the mills ...	...	0	4	0
Total	...	20	4	0

In using the native kolhu, as I stated before, for every 12 matas, one mata of juice is given to the laborers, each mata yields 20 seers of rab worth Rs. 2 on boiling, thus—

		Rs.	As.	P.
For pressing 20 tirhas, 20 matas ought to have been paid to the laborers, and these were worth ...	...	40	0	0
To carpenter for looking after the kolhus and keeping them in repair	...	6	0	0
Khundwree or chopping sugarcane into bits @ 1 anna per diem ...	...	5	0	0
Total	...	51	0	0

Taking away 20 rupees, 4 annas from Rs. 51, the saving obtained by using the Behea Mills simply in the labor wages is Rs. 30

12 annas. But the juice pressed by the Behea Mill gives an excess of 5 seers of rab, worth 4 annas per mata. Therefore, for each tirha the excess is worth $\frac{12 \times 4 \text{ Rs.}}{16}$ = 3 Rs. 4 annas, and for twenty matas this becomes Rs. 65; adding this to the saving in labor, the total profit on the Behea Mills is Rs. 95,12 annas, and therefore on each mill singly it amounts to Rs. 47,14 annas. I this time experimented upon the respective working rates of both the Behea and the country mills, yoking bullocks of average strength to both. It was found that the Behea Mills could with ease press 6 matas of juice in night and day, and if worked hard could turn out 7 matas. On the other hand, the kolhu when worked extremely hard could not produce in that time more than four, whereas at an easy rate of working 3 matas were all that could be expected.

I should now like to touch briefly on the difficulties I met with in manufacturing rab, and should be extremely thankful if any remedy could be pointed out :—1st. There is generally a great difficulty in procuring cane enough to supply the Behea Mills, as the working rate being very fast. I find a difficulty in getting men enough to cut the cane in the field, to scrape and clean each individual stalk, as well as to remove the crown top. If there is any machine which could scrape the cane and separate the leaves quicker, and at the same time be of a moderate cost, I am sure it would be adopted very generally and would be a great boon to the cultivator.

2nd. After pressing the juice, boiling it is another great difficulty, owing to the rude pan used here. This pan is made of circular bits of iron clumsily soldered together. The space between the edges of these is not quite closed and constantly leaks, to prevent which (chorousee) a mixture of ord flour, bael fruit and chopped flax is applied over the parts leaking. This prevents leakage for the time being, but the leak is liable to spring up a new. If it springs up, as it generally does when the juice is in the pan, the loss can be easily conceived; I myself this year having lost about 6 maunds of rab owing to this leaking. If any better kind of pan could be introduced, I am sure these difficulties could be removed. I saw the pan invented by Messrs. Thompson and Mylne, of Behea, at the Lucknow Exhibition, but that sort of thing would never do for a man working on a large scale, a s it is too shallow; we want something which will boil at least 4 maunds of juice at a time. In cleaning juice I could not, I am sorry this year, use lime and clay as prescribed by the Agricultural Department, but I tried some of the native receipes, which are wild sorrel, buttoa grass, castor seed, and buttermilk. These things are thrown into the pan when the juice swells up and the rab is on the point of being formed. Half a chittack of each of the first three is used in cleaning 4 maunds of juice, while of the last one seer is required for the same quantity of uice.

Tobacco.—Of this seed of three kinds, *vi.*, White stem, Oronoko and Connecticut was received by me. Half the seed of each kind was tried in Farm No. 3, where it somehow failed to germinate, the remaining half was kept for some time and was then sown. It yielded a crop, and a good deal of seed has been raised which will be distributed among the Moiooa who like it exceedingly. The leaf will be cured for the native market.

Inga Dulces.—Two seers of seed was received from the Agricultural Department. It was sown in Farms Nos. 1 and 3. It germinated, but owing to severe illness prevalent in the village in which Farm No. 3 is situate, no proper care was taken of them and almost all died. Some trees in Farm No. 1 are living and are flourishing. These trees will make a good hedge, and would be useful in gardens, but here in the field they would be of little use.

Cotton.—As I stated in my report last year that people in these parts think that cotton cultivation never succeeds here, so I determined to test the truth of this belief of theirs, and tried cotton in four farms of mine. Country cotton was tried as well as three of the foreign kind of which seed was received from the Agricultural Department. Generally very rich land was chosen everywhere for the experiment. In Farm No. 1 country cotton failed entirely as well as the Egyptian cotton. Bamiah, New Orleans and Upland Georgian were the only two that succeeded. A table showing the outturn of cotton without seed obtained per acre in all the different farms is subjoined below.

Farm.	New Orleans in lb per acre.	Upland Georgian in lb per acre.	Bamiah in lb per acre.	Country cotton in lb per acre.
Farm No. 1 ...	82·12	41·25	Nil.	Nil.
" " 2 ...	292 12	211·25	Nil.	Nil.
" " 3 ...	Nil.	Nil.	Nil.	86·00
" " 4 ...	168·75	82·50	Nil.	156·50

Bamiah failed entirely everywhere, no outturn was obtained, only a few plants in each farm yielded a little which was yellow and bad looking. New Orleans appears to be the best. It has, as the table shows, not only surpassed all the remaining imported varieties, but the country one also. Farms Nos. 2 and 4 have done the best, the reason being that in the former the experiment was tried on a flat of exceedingly rich gowhanee land, whereas in the latter an old cattle compound which had been tenanted by cattle for about 20 years and was lying vacant for nearly the last six, was the area experimented upon. I am no doubt sure that New Orleans and Upland Georgian cottons are better than the country kind for the following reasons :—

1stly.—In these two varieties, every five seers of produce obtained from the field yields 1 seer 12 chittacks of cotton and 3 seers 4 chittacks of seed, whereas an equal weight of unginned country cotton will yield only 1 seer 8 chittacks of pure cotton and 3 seers 8 chittacks of seed. Thus there is an increase of 4 chittacks of cotton in every five seers.

2ndly.—The American kinds possess the great advantage of yielding a crop in the second year too. I have allowed the plants to remain, and they are now laden with flowers and pods which foretell a good harvest presently. The village people talk of cultivating these varieties, and I have promised to supply them with seed.

The cotton dressers (Behuas) complain that they find it very difficult to separate the seed of these two varieties from the cotton, as the fibres being larger and softer than those of country cotton, do not pass out easily between the rollers of the gin, but get wrapped round them. This is surely a great difficulty, but can easily be removed if a better sort of gin could be obtained.

II. Under this head I shall treat of two things—(*a*) irrigation: (*b*) cattle.

Irrigation.—Six years' experience as a farmer has shown to me clearly that cultivation can never succeed unless there be an ample supply of water with which to irrigate fields. Deep ploughing and manuring, though exceedingly beneficial in the presence of water, are comparatively of little or no use when that general solvent is not present. People generally assert, and I concur with them, that no kind of water is so useful to crops as well water. The reason for this in my opinion is, that well water contains in solution a great deal of mineral substances taken from the different strata with which it came in contact while percolating through the mass of ground. In sugarcane cultivation specially, people say it is impossible to get a first rate crop without the application of well water, although there may be an abundance of river or tank water. The difficulty of obtaining well water is particularly felt in these parts of the Shahjehanpore district, *viz.*, the Pewayan and Khotar Pergunnahs, owing to the sandy nature of the subsoil and the absence of a solid stratum (Nagasan) which renders it difficult to sink *kutcha* wells. I myself once saw a painful sight. Three brothers were making a *kutcha* well near their sugarcane field, one was inside excavating mud, while two from above were drawing it up in baskets. All of a sudden the earth in which the excavation was made sank down and covered the man who was underneath. One of his brothers went in to assist him and the mud falling in for the second time covered him too. One of these two poor men died and the other was saved, though severely hurt. Besides the danger with which making *kutcha* well is here thus attended, it often disheartens and ruins the poorer class of cultivators. Sugarcane is a crop on which cultivators almost entirely build their hopes, and if to irrigate such a field a man tries to sink a *kutcha* well, and if, as often happens,

fails in two or three attempts, he being a poor man can persevere no longer and his crop is ruined. The construction of *pucca* wells would remove this difficulty entirely. I am making one in farm No. 1, but this will not be able to supply even the whole of the farm with water, not to talk of the whole village.

Cattle.—I had collected nearly two hundred cows to improve the breed of cattle, and feeling the want of a bull of superior breed, asked the Department of [illegible]ture and Commerce to supply me with one, which it ve[illegible] supplied me in February last. I heard from gentlemen who had experience with regard to these bulls that they did [illegible] cows when brought to these parts. I am glad to say that [illegible] adopted a peculiar plan with the bull, in virtue of which he has up to the present served more than twenty-five cows. I have freed him from all restraint, and let him go loose among semi-wild kine. The result is that it is in exceedingly good health. Seeing that powerful animals were required to work the kaisar plough and the Behea Sugar Mills, as well as to drag garries, I collected twenty buffaloes, and their male young ones I employ in doing the above works.

In these parts cattle are subject to a peculiar disease called (*joak janna*) in which the animal suffering gets a lot of leeches (*jonk*) inside his stomach which injure him and ultimately cause his death. This distemper makes dreadful havoc in the herds of cattle. I myself lost this year nearly 60 cattle owing to it. Besides the above, the hoof and mouth disease prevalent everywhere in India do immense injury to owners of cattle by destroying their animals. Could any remedy be prescribed for the above diseases, I am sure they would be a blessing to the people here.

EDITORIAL NOTES.

A RECENT return from the Officiating Secretary to the Chief Commissioner, British Burmah, gives a mass of interesting information regarding the material progress being made by that comparatively young province. The late census having upset all preconceived ideas of proportions, the population is found to be much larger than was supposed, and the returns, hitherto accepted, of cultivated area are about 15 per cent. below the truth. These discoveries necessitated a revision of the statistics of the province. The following may now be accepted as pretty near the truth :—

Population, about	... 3,700,000 people.
Total area	... 87,220 square miles.
or about	... 56,000,000 acres.
Cultivated area, about	... 3,900,000 „
Area growing rice	... 3,300,000 „
Computed total yield of paddy, or rice in husk, about	... 2,361,000 tons a year.
Average yield of paddy per acre about	... 32 baskets or bushels,
equal to	... 1,000 lbs.
Number of cattle, including buffaloes which are used largely for agriculture	... 1,453,000 head.
Number of carts	... 225,000
Mixed fruit-trees	... 130,000 acres
Danee palm (used for thatching and also for extracting sugar)	30 600 „
Tobacco	... 20,230 „
Plantains	... 17,100 „
Vegetables	... 17 000 „
Areca nut	... 14,100 „
Cotton	... 10,900 „
Pulse	... 8,900 „
Sugarcane	... 5,000 „

It is a curious commentary on the recklessness which has characterised our former dealings in timber, to be told that 80 per cent. of the timber now shipped from Burmese ports comes from outside our frontier. Cutch to the value of £200,000 is exported annually ; but, notwithstanding all these, and many other industries, the report rightly adds that the cultivation of rice is the foundation on which the prosperity of Burma must rest. Mr. Hough, acting Settlement Officer under the Chief Commissioner, in looking forward to what the new Agricultural Department may be expected to accomplish, says.—

It seems to me that one of the great wants of this country is a *plough* and more especially, for these elevated and dry and hard soils which are rapidly coming under cultivation through the eagerness of the people to possess, and cultivate land. These soils, as compared with the temporarily submerged tracts are most assuredly deficient in 'lasting power," and their capabilities will never be enough developed unless and until they are properly ploughed. There is no such thing as a *plough* in Burma. Can we not persuade the people to adopt one? I think we can. The experiment has already been attempted by myself in the Prome district, althoug certainly on a very humble scale, but, so far as it went, it was a success, and gave good hope for the future. The ploughs with which I worked were the 'Kaisar' plough and Cuick's patent plough. To introduce a suitable plough into Burma should be amongst the new Department's most earnest endeavours.

He also adds :—

In order to put the scheme into practice, the first step would appear to be the creation of an experimental farm, the managers of which shall work *amongst the people and with them.* I mean that the farm should be established in the midst of a purely agricultural community, and not within the limits of Rangoon or any other large town in the province. It would, in my opinion, be desirable to locate the farm at a spot where lands fairly representing the great classes of land in the province are easily accessible, I mean hill, upland, and plain. An abundant and constant supply of good water is also essential. A spot fulfilling all the above conditions can, I think, be found near to the town of Pegu, and the projected railway thither would place the farm within easy reach of headquarters. The Superintendent or Director of the farm will of course be a person with previous experience in such experiments, and I would suggest that his principal native assistant be a Burman Extra-Assistant Commissioner, who shall [illegible] pay for duties which will probably be at first somewhat distasteful to him. It is necessary to have in such a venture a Burman official of rank as "right-hand man" Minor assistants might at first be selected from the Veterinary Instructor's (Mr. Frost's) pupils

This is very much to the point. Very much time and no little outlay have been wasted on the experimental farms in India from a want of anything thoroughly practical in their working. Our aims have been good, but we have signally failed to produce crops equal to those produced by the ryots, either as to quantity or quality. It may be that, instead of aiming at agriculture of a practical nature, we have made our farms more like schools and colleges. What we want is a farm which shall be worked among the people, we should follow, as far as may be, the agricultural customs of the people, improving gradually on them, and showing the surrounding farmers what can be done by slightly improved modes of cultivation. Looking at the richness of the soil of Burma, and at the generally favourable climatic conditions under which agriculture is followed, we may predict a great future for the province

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THE report on cotton cultivation in the Punjab for 1879-80 has only recently been issued, and includes what is known as the cotton year, that is, from 1st July 1879 to 30th June 1880. We cannot understand why there should be so many official years. Every department or [illegible] seems to have its own mode of reckoning the year. For many reasons, the ordinary calendar year would do for all purposes, although the financial year, from 1st April to 31st March, is peculiarly well adapted for agricultural purposes, including as it does both crops, *rabi* and *kharif*. Over the whole province the results of cotton cultivation have been better than those of the previous year, and very much better than those of 1877-78. The following table shows the statistics for those three years :—

	Acres.	Outturn.	Per acre.	Acre Value.
		cwts.	lbs.	Rs.
1877-78	... 6[illegible]	3[illegible],180	64	11-13-10
1878-79	... 80[illegible]	6[illegible]	[illegible]	13-4-[illegible]
1879-80	... 800,[illegible]	[illegible]	[illegible]	15-0-[illegible]

This is of course cleaned cotton [illegible] although the outturn of 1879-80 was much better than [illegible] preceding years, it was very light compared with that of other countries, America,

for instance. The outturn of cotton in the Unit[illegible] States runs from 250 to 300 lbs. per acre. That this very small outturn is due to inferior modes of cultivation is proved by the fact that in many districts, and even in portions of the same district, the production was very much higher. In the Delhi division, for instance, the following results are reported :—

Gurgaon district	...	[illegible]2 lbs.	per acre.	
Kurnal do.	...	107	„	„
Delhi do.	...	330	„	„
Average	...	105	„	„

The lowest outturn was in the Kangra district, and this was to be expected, as the Kangra country is high and cold, compared with the other cotton districts. The faulty nature of the cultivation is proved besides by the results of certain experiments made. The out-turn of cotton is reported as having been very good. As usual the tehsils of Peshawur, Doaba Daudzai, and Hashtnaggar are stated to have yielded most largely, as a great extent of the country lying in these tehsils is 'abi' or irrigated land.

The returns as to cost of cultivation per acre are very absurd, ranging from Rs. 2-8 in the Kangra district to Rs. 42 in Ludhiana. These figures are clearly unreliable, and the vast discrepancies are doubtless caused by mistaken ideas on the part of the returning officers as to what constitutes cost of cultivation. To arrive at correct data a return should be issued with a line for every possible head of cost, and each detail should be given separately. An attempt was made to obtain correct data, and five districts made returns which are as follow :—

		Irrigated and manured.			Irrigated but not manured.			Unirrigated but manured.			Unirrigated and not manured.		
		Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
Umballa	...	37	6	6	27	12	8	25	7	0	16	1	0
Ludhiana	...	42	6	0	33	15	4	21	12	4	11	7	4
Jullundur	...	20	12	0	14	10	0	14	8	0	13	8	0
Hoshiarpore	...	33	14	0	21	7	0	13	7	0	9	10	0
Dehra Ghazi Khan	...	28	4	0	12	5	0	...			4	8	0

From this it would appear that the average cost of irrigating an acre is Rs. 12 11-1, a sum either absurdly in error, or a disgraceful over-charge. The average ruling prices in 1879-80 was Rs. 20-7-7 per cent., or 4·38*d* per lb. It is worthy of note that during the year no experiments with exotic seed were made. We presume, however, that a judicious system of interchange was tried. Exotic varieties have often been tried, but experience has shown that if we wish to excel in cotton cultivation, we must turn our attention to improving our indigenous varieties; and this can perhaps best be attained by careful selection every year, which in a few years will result in our crops being raised from what might be called pedigree seed.

The Directors of the East Indian Railway, in their report for 1880, gives some interesting details of the working of this the first year under the new proprietary. For purposes of comparison of individual items of goods traffic, the report is not so useful, as during 1880 all materials carried on revenue account were credited to traffic, and the amounts debited to each departmental account. Thus, in the goods carried, there was an enormous increase, although, for the reason stated above, this increase was largely nominal. The following table shows this :—

			1879.	1880.
Goods carried	...	Tons	1,816,001	2,561,049
Minerals „	...	„	748,618	910,060
		Total	2,564,619	3,471,109

[illegible] per cent. The cost of carrying a [illegible] 241*d*., and the average amount [illegible] ·322*d*. The difference of goods traffic, [illegible] account materials now being charged, was as follows:—

			Tons.		
			1879.	1880.	Increase.
Railway Materials		...	15,452	522,317	506,865
Coal	...	...	24	51,297	51,273
			15,476	573,614	558,138

Keeping out this item, th[illegible]ease in tonnage of 1880 over 1879 was 348,352, or 13·5 [illegible] cent. On the other hand, the increase in receipts fr[illegible] goods was only £1,256,719 against £1,229,471 in 1879, an [illegible]ase of £27,248, or 2·2 per cent. During the year several reductions were made in the tariff, which accounts for this apparent discrepancy. Looking at the passenger traffic, we find progress being made. The following are the numbers of passengers carried :—

					Percentage.
			1879.	1880.	1880.
First	class	...	43,894	43,563	·5
Second	„	...	133,424	145,782	1·8
Intermediate	„	...	563,619	592,119	7·3
Third	„	...	7,028,184	7,300,364	90·4
	Total	...	7,769,121	8,081,828	100

This shows the value of the third class passenger. That the directors know his value, is shown by the consideration they show him. We learn from this report that they are increasing their locomotives and third class carriages, preparatory to reducing the third class rate from 3 to 2½ pies per mile. The cost of carrying a passenger one mile is ·135*d*., and the present rates are 2·25*d*., 1·125*d*., ·5625*d*., and ·3435*d*., for 1st, 2nd, intermediate and 3rd class, respectively. Owing to the preponderance of third class passengers, the average amount realized is ·375*d*., leaving a profit of ·24*d*. per mile for each passenger. This is exceedingly cheap travelling, and were it not for the large number who travel, the rate would have to be higher. The entire management of the line continues to reflect the highest credit on the officials here.

We have lost no opportunity for years of advocating the immediate construction of the through railway from Calcutta to Nagpore, by Midnapore, Sumbulpore, and Raepore. The proposal is now occupying the attention of Government, and we hope soon to see a beginning made. "The proposed railway would run from Nagpore *viâ* Raepore to Burrakur, or thereabout, and would form the much wanted missing link in the direct line of communication between Bombay and Calcutta. It would tap the Warora coal-fields, and it is calculated that the mineral traffic would compensate for the very limited passenger traffic to be expected from the sparsely populated country through which a considerable length of the line would run. Who the promoters are is not stated." This remark about the "sparsely populated country" is quite correct, but we must not run away with the idea that the line would on this account not pay. The population is scanty, it is true, but it will certainly increase when the want of communication is supplied. The soil is the finest in India, and if it is not cultivated more extensively, it is solely because of the impossibility of getting the crops to market. Three or four years ago vast tracts of ripe wheat were allowed to rot in the fields, because the cost of cutting and transporting it was more than it would have realised in the market. The distances to railway stations and other large centres of populations are so great that buyers cannot afford to purchase the grain at anything like reasonable prices. This will all be changed by a railway connecting the rich agricultural districts around Sumbulpore, and westward towards Raepore, with Calcutta on the one hand, and Bombay on the other. Besides grain, the soil produces good cotton, and there is a ready market for that fibre at Calcutta. At present, all grain and cotton from this district of Sumbulpore for Calcutta have to be conveyed a [illegible] week's journey to the river, and are then floated down to Cuttack or [illegible], thus [illegible] a long and [illegible]sive journey. [illegible]

stationed at Sumbulpore, and who was compelled to visit Nagpore, came to Calcutta as the most convenient way of reaching Nagpore. He was thirteen days en route ere he reached the steamer at Cuttack. A railway through this district would lead to its being more generally cultivated, and in the course of time much more densely populated. Besides the benefit such a line will confer on the country through which it passes, we must not overlook the advantage Eastern India will obtain by being placed nearly a day nearer to Bombay. We presume this will be a trunk line, and on the broad gauge. If so, the distance to Bombay will be about 300 miles shorter by it than by the present line *via* Allahabad.

ANOTHER industry which might be developed in this country, is that of paper making. The quantity of paper used in the world in these days is enormous. The following is the annual production of paper of the leading countries:—

	Tons.	lb. per head of population.
United States ...	207,000	10
United Kingdom ...	180,000	11
Germany ...	203,000	10
France	132,000	7
Austria ...	9[illegible],000	6
Italy	50,6[illegible]0	4
Russia ..	32,4[illegible]0	8
Spain ..	30,600	1

The increase in the use of paper is so steady that there is little fear of the trade being over-done, and the sources of supply for raw material are becoming more and more unequal to the demand made upon them. India has within herself sufficient raw material to supply the world with paper stock. Mr. [illegible]'s interesting memorandum on this subject points out a vast number of [illegible] more or less suitable for paper making, but we need [illegible] only one, the bamboo. Mr. Thomas Routledge, of Sunderland, England, who has given much of his time, attention, and skill to this subject, has placed the question beyond the experimental stage. He has made large quantities of paper from bamboo and other fibres mixed, and also from bamboo fibre alone, and has had several magazines at home printed on those papers. The result is all that could be desired, and Mr. Routledge tells us that he has satisfactorily demonstrated the cheapness of the fibre for this purpose, although he imported his paper stock under very unfavourable circumstances as to cost. There can be no doubt that in the bamboo forests of India and Burmah we have a source of paper-stock to fall back upon which will prove inexhaustible. No cultivation is required, only a little care in forest conservation. The paper stock is made of the young shoots about a year old, and by cutting down a forest in divisions, an endless supply might be obtained. All that is wanted is a pulping mill alongside of every bamboo forest, on a river if possible, and where clean water is available. The fibre could then be extracted, bleached, dried and pressed for export, leaving in the meantime the mills of England to finish the article. By-and-by India could take up this part of the industry as well.

COLONEL A. HARCOURT sends the following note to a contemporary:—"I think the theory, that an abundant mango season is a sure sign of an unhealthy year, should be received with hesitation. It is better, in making such forecasts, to go by past experiences; and in so far as I can recollect, a good mango year in the Punjab has not been an unhealthy year. In 1873 the mango crop in Upper India was at any rate an average good one, and throughout the Punjab the year was healthy. In 1874 (I was then at Hoshiarpur) there was an undoubtedly excellent crop of mangoes, and there was little sickness; while in 1875, the crop was defective (in Hoshiarpur) and cholera prevailed everywhere. Again in 1878 the mango crop was an extraordinarily good one, the trees between Umritsur and Pathankot being bowed down with fruit, and in the Punjab there was little sickness; while again in 1879 [illegible] and the year was one of the most unhealthy on [illegible] crop is good, and hitherto in the Punjab the general health has been decidedly satisfactory. As to the flowering of the bamboo, I have not made any observations, for the bamboo is not a common tree in the Punjab. But I think there is another indication of a coming healthy and unhealthy year, and that is, the presence or absence of hornets and wasps. I was in Kurnal (Punjab) in 1873, and wasps swarmed everywhere. In 1874 at Hoshiarpur (a healthy year) the hornets and wasps were such a [illegible] that it was [illegible] to use the verandah at all; whereas in 1875 (an unhealthy year) hardly a wasp or a hornet was to be seen. I do not remember whether in 1878 (a healthy year) wasps and hornets were troublesome, but in 1879 (a year of great mortality) there were very few of these insects. This year in the place from which I write wasps are in great abundance everywhere. There are very few hornets, and the health of the district is excellent. The conclusions I myself have drawn are, that when there is a healthy year in the Punjab the mango crop has been above the average and wasps have abounded, while in unhealthy years the mango crop has been defective, and wasps have been remarkable by their absence. It may be that Nature has given us guides as to what years may not be healthy seasons, and forewarned we might to some extent forearm ourselves, for it is quite notorious that what may be done with comparative immunity in a healthy year is attended with dangerous results when disease is hanging about.

THE China opium question is a constantly recurring one. On the one hand we hear of Imperial mandates forbidding the cultivation of the poppy. These reports come from Chinese official sources. From Consular reports, and from the observations of the few travellers who are permitted to visit the Celestial land, we hear on the other hand that cultivation is going on apace, and that while it is forbidden by Imperial edicts, it is certainly encouraged by the local governors, for the sake of the revenue it brings into the treasury and the [illegible] it puts in the way of those [illegible]. The latest utterance on the subject is from Acting Consul W. D. Spence, writing from Ichang, who states:—

"[illegible] cultivation in the West is free and its product is [illegible] of revenue to the exchequer, of pelf to [illegible] and everybody [illegible]. In these provinces there is no [illegible] and poor, lettered and unlettered, governing and [illegible]. The amount produced is rapidly increasing, [illegible] and from it are sent [illegible] eastward, in contraband channels at present. No Indian opium is consumed anywhere. It is hardly the province of a Consul [illegible] to draw morals from the facts which come to his knowledge, but I think it only right to say that so long as China not only [illegible] state of things, to say as many do, that England forces Indian opium upon her, and compels her people to [illegible] themselves is perilously like nonsense. The [illegible] people who [illegible] which must command respect preach times [illegible] throughout England, in season and out of season, are preaching what the actual state of things [illegible] pure delusions. In judging of the present attitude of this country towards opium production within its own borders, and in drawing reasonable conclusions therefrom, men who [illegible] prejudice and who are guided by intelligent discretion not by blind zeal should give more weight to the [illegible] of China than to their words."

We take this to be pretty near the truth. The real aim of the Chinese [illegible] is to get rid of the competition of the Indian drug, that they may be able to increase the excise duty on the home-grown article, and in time they will no doubt carry their point.

SIR J. R. LONGDEN, Governor of Ceylon, in his budget for 1881-82, referred particularly to the rapid strides which had been made by Colombo. Its breakwater was specially spoken of as a great work, and one which could not fail to improve the business of the port. The increase in railways, too, was noticed, although we scarcely think [illegible] went beyond the region of the common-place when he pointed out the benefits which were sure to follow [illegible] of those useful works, and in the next breath [illegible] to pledge himself to any further extension in the meantime. [illegible]

proposes to have a water-supply; the iron piping has been received from England, and the municipal council now only wait a decision as to the reservoir, the site of which has not yet been decided on. The population of the island has increased at the rate of 1½ per cent. per annum during the last decade. The Governor takes up the subject of coffee-leaf disease, a vital subject to Ceylon planters, [illegible] mentions with commendatory remarks the experiments made thereon by Mr. Ward. Mr. Ward's report, he says, "exhausts the subject, as far as it can be carried out in Ceylon," and "although Mr. Ward has not been able to suggest any mode of treating the disease which shall absolutely eradicate it he has at least given to the world in the life history of the Hemileia the true data upon which a mode of dealing with the disease may hereafter be founded, and in the meanwhile such remedial measures may be adopted as may enable the coffee to withstand the strain of the disease." We fail to see the slightest reference to Mr. Schrottky's cure, either in the speech or in the Ceylon journals of recent date. The export of cinchona bark increased from 15,000lbs in 1876 to 1,161,989lbs in 1881. Tobacco, India-rubber, and other valuable products are also being grown in increasing quantities, and Ceylon will shortly cease to depend, as it formerly did, almost exclusively on its coffee industry.

The report recently issued by the Secretary of State for India shows that, during 1879-80, the accounts showed the receipt of interest at the rate of eight per cent. on the seventeen and a-half millions sterling invested on irrigation in this country. In Madras, the receipts were as high as twenty-eight per cent., in the North-West Provinces five per cent.; in the Punjab four per cent., while in Bengal the interest was only one half per cent., and in Bombay there was a loss. We believe that the large returns for Madras are accounted for by the fact that irrigation there, on certain lands, is compulsory. The lands are assessed as "wet," and a proportion of the revenue set down to the irrigation account, whether the ryot wants water or not. In Bengal, on the other hand, the system is supposed to be voluntary, the cultivator taking water or not as he pleases. It is obviously possible to do a thriving business with roaring returns on the Madras plan. If the seller is allowed to fix his own price, and to compel every one within a certain area to purchase, whether he wishes to do so or not, he can hardly become a bankrupt. There is more than one store-keeper in Calcutta who would undertake to make, not twenty-eight, but two hundred and eighty per cent. if allowed to sell beer, in the way that the Madras Government sells water. Permit him to fix the price that seems to him fair, and to make all drink, even the teetotallers, or—for he would not be too harsh—to pay without drinking the beer, and he would do well in his trade. We would see him for some years driving in state every evening, after which he would retire, to boast at home of his great business aptitude, which had enabled him to gather a large fortune in a short time. His self-complacency would be as well founded as that of the Madras Government in the Irrigation Department.

Reuter has told us that the "cotton corner" has been successful, and that the manufacturers have been unable to extricate themselves from the net which had been woven around them. At a meeting of Lancashire spinners held at Manchester on the 16th September, an attempt was made to meet the machinations of the "corner" by closing the mills for a part of each week, and thus reducing the demand for the raw material. The cause of this failure is principally the existence of contracts as to time, which makes it imperative that the spindles should be worked full time. Even had this difficulty been got over, the victory would have been purchased at the cost of much suffering to the work-people, who would thus suddenly have found their earnings reduced. The cotton spinners must find a more effectual mode of fighting the cotton ring. It appears that a considerable deal of annoyance was felt at the meeting because of the fact that many of the brokers, hitherto considered neutral, had joined the ring, and it was considered, and correctly too, that in thus acting they had forfeited the confidence of the purchasers. The only effective way of meeting this class of trading, or rather speculating, is for the consumers to become their own buyers. This must be done by co-operation. The spinners might appoint a good buyer, who should be in their interest and in their employ, and whose duty and interest should be to purchase as cheaply as possible. It would be advisable that this agent should purchase at New Orleans, and by purchasing for a number of spinners he could consign in shiploads, and thus secure the most favourable terms as to freight. The middleman or broker would thus entirely be got rid of, and the expenses attending this purchasing agent should be met by a small charge per bale, a charge which would practically be almost *nil*.

The Advance Report of the Ontario Experimental Farm for 1881 gives details of some experiments in feeding grade shearling wethers of the various breeds, embracing Cotswolds, Leicesters, Oxford Downs, and Southdowns. The lambs were got by pure-bred sires of the above-mentioned breeds, and out of common mixed-bred Canada ewes. They were dropped about the middle of March, and weaned July 1st. The exact date when the weights and measurements were made is not given, but it is not especially material, as these were all taken at one time, and simply for the purpose of comparing the various breeds with each other. The measurements were as follows:—

	Heart Girth, ft. in.	Flank Girth, ft. in.	Length. ft. in.
Cotswolds ...	4 3	4 0½	4 2
Leicesters ...	4 1	4 1	4 0
Oxford Downs ...	4 0½	3 11	4 0
Southdowns ...	3 11½	3 11½	3 10

The Cotswolds averaged 199 lbs; Leicesters, 198; Oxford Downs, 177, and the Southdowns, 157.

* * * * * *

Farming in New Zealand, according to statistics lately published, seems to promise a fair opening for moderate capitalists who are not above work. A 100 acre farm of well watered land within a moderate distance of a railway station, and with the necessary buildings on it, will require a working capital of £471. The annual working expenses are estimated at £270 13s, and the returns £713 10s leaving a profit for the year of £492 17. Of course so satisfactory a result, with so small a capital, will not allow a margin for the losses consequent on a want of experience.

Not long ago we called the attention of our readers to the fact that the German Government had requested the Italian Government to interfere to prevent the wholesale massacre of song birds which takes place in Sicily, specially at the time of their annual migration. It appears from the accounts given in the German papers that the French are no less sinners in this way than the Italians. It is well known that the birds of passage gather in great masses on the coast of the Mediterranean just previous to taking their flight into southern climes, or immediately after their homeward flight. The most common means adopted is to construct an erection called *le poste* which is a single chamber of brick work, roofless, about 12ft square, in one wall of which apertures are provided for several guns. At a distance of a few yards are planted a dozen or so of pine trees, to the upper branches of which are fixed dry boughs and artificial perches, and to these are suspended cages containing decoy birds. Most of these birds have had their eyes barbarously gouged out as they have been kept in dark rooms to train them to sing, and the idea is that they would, if exposed to the light, become wild and restless, and lose their song. In this way thousands and thousands of birds of every kind are massacred, and the markets of Europe supplied with these delicacies. But the laws of nature cannot be violated with impunity, and it is instructive to find that the farmers in the south of France are loudly complaining of the increasing plagues of insects, worms, and every kind of vermin which are ruining their crops. In one place it has been found necessary to pass the most stringent laws for the protection of swallows, as the mosquitoes had multiplied to such an extent owing to their destruction.

Our Railway contemporary says:—

"Freight is now being carried from Chicago to Liverpool, via New York for [illegible] cents, and via Montreal for five cents per [illegible]

hundred pounds; the most preposterously low rates ever known. The oppressed farmer of the West would promptly refuse to haul a load of wheat 30 miles at the rate for which railway, a canal, and steamship lines are carrying it half way across the continent, and entirely across the Atlantic ocean, a distance of over 4,000 miles. Would legislation, even of the most communistic stamp, ever compel a reduction to such rates as the railways are now voluntarily affording the public?"

Railways confer such incalculable benefits on a country, that our wealthy zemindars should contribute largely to their construction in their own neighbourhoods, from other considerations than a direct return in the shape of dividends. The price of food-grains would be cheapened, and the general condition of the people ameliorated. This would in time tell on the value of their property, and in this way, apart altogether from dividends, they would obtain good interest for their money. The charge of five annas per cental for carrying grain a distance of over four thousand miles, a considerable portion of which is by rail and canal, is equal to fifteen shillings per ton, or for the quarter of wheat, three shillings and fourpence. From Delhi to Calcutta the charge is eight shillings per quarter, and it is thirteen shillings per quarter from Calcutta to Liverpool. It cannot be too often said, that, until both of these rates are materially lowered, India cannot hope to do much towards supplying the people of the United Kingdom with wheat.

MR. A. B. HEWLETT, H.M's Consul at Canton, in a communication to the Indian Government, dated 22nd June 1881, says:—

The opium crop gathered this year is reported to have been generally above the average, and in some places, such as Honam and Kuldja, appears from the accounts of travellers to have been unusually abundant. The consumption of native opium is undoubtedly extending, especially among the lower classes, who cannot afford to indulge in the more expensive Indian article. The bulk of the native drug brought to Canton comes from Yunnan by sea by way of Pakhoi. Szechuan and Kueichow opium also reaches the Canton market, coming down the north and west rivers. In former years, and as late as 1874, Szechuan opium was brought here by the coasting steamers arriving from Shanghai. But the difficulty of transport down the Yangtsze and the rapacity of the officials at the numerous *likin* stations on that river, made the traffic so burdensome that it was discontinued for some time. Of late, however, an amicable arrangement was arrived at between the governments of the provinces where the opium was grown and those of the provinces through which it was to pass, that there should be a single and uniform charge made at the barriers, and that of a trifling amount compared with the former exactions. As to the Szechuan opium which comes overland, I am informed that it is brought the whole distance to Canton, and here sold publicly without paying any customs duty, or in fact any kind of governmental charge other than the *likin*, which is said to be comparatively light.

This is the way the Chinese Government refuses to draw a revenue from the "misery of the people," as we were told the other day by the Chinese gentleman who visited our Viceroy.

A RECENT return issued to Parliament gives some interesting details as to the land under cultivation in Ireland during the current year, as compared with 1880. Notwithstanding the disturbed state of that unfortunate land, the acreage under cultivation has risen from 5,081,084 to 5,191,361. This increase was evenly distributed over the country, as the following statement will show:—

	Acres.	%
Leinster	36,104	2·57
Munster	27,304	2·20
Ulster ...	35,210	2·02
Connaught	11,659	1·68
Total ...	1,10,277	2·17

The whole soil of Ireland is thus accounted for —

Cultivated	5,191,361 acres.
Under grass	10,091,688 "
Woods	338,858 "
Bog, marsh, and mountain ...	4,694,953 "
Total ...	20,316,860 acres.

THE anti-opium meeting at the Mansion House, addressed by the Lord Mayor and other celebrities, shows that the movement is not losing, but probably gathering strength. The only way to take the wind out of its sails would be for the Government of India to hasten to give up its monopoly, and let the industry and trade, under strict fiscal laws, pass int private hands.

THE *Rangoon Gazette* has an article on the growth of cotton in Burmah. It seems a good deal of damage has been done to the trade by the monopolies of the Burmese King. Of the cotton grown on both sides of the frontier, amounting to 7,000,000 lbs., about one-tenth is grown on the British side, and the *Gazette* sees no reason why the proportion should not be greatly increased. "There is any amount of unoccupied land in British territory similar to that in the neighbourhood of Meingyan where cotton is grown most extensively," and a paternal Government might do something to encourage the cultivation.

At present, cotton is considered not worth attention, and agriculturists take no pains with it. In most cases it is only sown as an auxiliary amongst other crops, or allowed to grow on sufferance as a weed which it is too much trouble to root out. In British Burmah there is scarcely an instance in which it is attended to for its own sake. A man who has a plantain garden scatters in it a few handfuls of cotton seed and takes no more care of it. If any crop results, so much the better—the fibre is gathered and sold; but no means whatever are taken to bring about a successful result. Now, this is not as it should be, and Government might be less usefully employed than in endeavours to put things on a better footing. The poor figure cut by Burmese cotton in the European markets is justified by its inferior quality, for it suffers from all the most important defects which can be alleged against it,—shortness of staple, yellowness in colour, and heaviness of seed in proportion to fibre.

In view to improvement, the writer proposes that Egyptian and other seeds of fine quality should be imported at the proper season, and bonuses offered to those cultivators who produce the best results.

SOME years ago the Chinese made an attempt to master the cotton spinning and weaving industries, and failed through their desire to exclude the European barbarian. They have now found out their error and propose to make another attempt. This time they will leave nothing undone to ensure success. If they succeed—and we see no reason why they should not, seeing the native of India has succeeded—it will be a heavy blow to the Manchester industry. Judging by the energy and enterprise displayed by the Chinese when they turn their attention to mercantile pursuits, we have reason to suspect that, the initial difficulties mastered, they will in time make cotton manufacture a powerful industry in China. Of recent years the trade in English and American cotton piece-goods has received a shock from the grossly immoral practice of over-sizing, sizing in fact not for the purpose of facilitating the process of weaving, but clearly for the purpose of cheating the ultimate consumer. The industry in India has fully established itself, and not only are all the mills kept at work constantly, but an ever-increasing demand has sprung up for articles of local manufacture. We even learn that some of the more enterprising Bombay manufacturers are considering the propriety of commencing an export trade to Africa. This is meeting Lancashire on her own ground in earnest, and if only the Chinese succeed as well, the manufacturers of Lancashire and Glasgow will have to look out for new markets, which may be found in regenerated Northern Africa.

A CORRESPONDENT writes to the Lahore paper:—In your issue of the 7th ultimo, appears a paragraph anent experiments made in England by Mr. John Tindall on the properties of sulphuric acid for hastening the germination of seeds. The properties of vitriol, as an agent for imparting vitality to wheat seed, and also as a preservative against the charcoal-like appearance of the ears of the corn, are well known to some of the agriculturists of the South of France. The latter say that wheat seed, scalded with vitriolated water, produces a healthy crop, and some of the seed, which sometimes,

would indubitably rot, if it was sown dry, has its powers of germination restored by the action of vitriol. I have no doubt that if tea or any other seed were treated similarly, a good percentage would be saved every year to the planter or to the cultivators.

I saw the scalding process some 25 years ago, and if my remembrance does not deceive me, the operation is as follows :—First of all put in a basket the quantity of wheat you wish to sow the next day. Raise to boiling point enough water to scald your seed. Remove the vessel from the fire and pour in the boiling water the vitriol stones ; stir the water with a stick, froth or scum will be produced, I believe, and the water will rise in the vessel ; do not be afraid ; no explosion will take place.

When the vitriol stones are dissolved, which ought to be done in a few seconds, pour the water on the wheat in the basket. As the water is poured on the wheat, free escape must be allowed.

I could not prescribe the proportion of vitriol stones, but I think half pound of stones to a maund of wheat should be sufficient.

As the process is simple and cheap, native cultivators ought to be induced to try it.

We observe with satisfaction that the Punjab Government has decided on leasing out the water power of the canals in the province. The amount of power available is great, and is at present not utilised. On the Bari Doab Canal there are 26 sites, at which water power is available to the extent of 200 horse-power, and the new railway about to be constructed between Umritsur and Pathankote will pass within a few miles of all these sites. On the Western Jumna Canal, 4 sites of 200 horse-power are available, and 8 with an average of 150 horse-power. This then represents a total of 7,200 horse-power, which it were folly not to use. It seems to us that the power available is much more than this, as the standard for one horse-power has been fixed by the Public Works Department at 15 cubic feet falling one foot per second, whereas the acknowledged standard is fixed at 8·8 cubit feet falling one foot per second. This latter being admitted, the horse-power will show a total of about 12,000. The rates fixed upon are from Rs. 60 to Rs. 150 per horse-power per annum, commencing at the fourth year, the first three years to be free. These are liberal terms, and when the public have experienced the cheapness and convenience of this power, they will not grudge the increasing rates, which at their highest are very low. This example might with advantage be followed on other canals, and as we pointed out on a previous occasion, all those canals fed by the sub-Himalayan streams have many falls at very convenient distance.

The cultivation going on in the low land at the Salt Lakes does not seem to make such progress as is to be desired. The principal crops grown are vegetables and fruit for the Calcutta market. This is a species of cultivation that pays well. In and around the large towns of England are extensive market gardens, from which three crops a year are sometimes raised, and the occupation is so profitable that the cultivators can afford to pay most exorbitant rents. Calcutta is tolerably well supplied with vegetables, but it seems impossible to obtain a perennial supply of certain kinds, and each sort comes in but once a year in its season. Now, in this climate, there is no reason why peas, lettuces, &c., should not be in season all the year round. During the rains, it is necessary to give the young vegetable shelter from the heavy rain and excessive heat. There are, again, other table supplies which ought to be very much cheaper than they are. We would particularise potatoes, which are now selling at two annas the seer, a price ridiculously high, and equal to one shilling and nine pence per stone of fourteen pounds. At home they are not above a fourth part of this price There is great scope for potato cultivation in our neighbourhood, and if only the engineers can keep out the water from the reclaimed plots, they ought to grow root crops in great luxuriance. These have hitherto been found not to succeed, principally on account of wild pigs and rats, but surely these can be got rid of.

Nobody knows precisely where the potato came from originally. It has been found, apparently indigenous, in many parts of the world. Mr. Darwin, for instance, found it wild in the Chonos Archipelago. Sir W. J. Hooker says that it is common at Valparaiso, where it grows abundantly in the sandy hills near the sea. In Peru, and other parts of South America, it appears to be at home, and it is a noteworthy fact that Mr. Darwin should have noted it both in the humid forests of the Chonos Archipelago and among the Central Chilian mountains, where sometimes rain does not fall for six months at a stretch. It was to the colonists whom Sir Walter Raleigh sent out in Elizabeth's reign that we are indebted for our potatoes. Herriot, who went out with these colonists, and who wrote an account of his travels, makes what may, perhaps, be regarded as the earliest mention of this vegetable. Under the heading of "Roots," he mentions what he calls the "Openawk." "These roots," he says, "are round, some as large as a walnut, others much larger. They grow on damp soils, many hanging together as if fixed on ropes. They are good food, either boiled or roasted." At the beginning of the seventeenth century this root was planted, as a curious exotic, in the gardens of the nobility ; but it was long ere it came into general use. Many held them to be poisonous, and it would seem not altogether unreasonably so either. The potato is closely related to the deadly nightshade and the mandrake, and from its stems and leaves may be extracted a very powerful narcotic. In England prejudice against it was for a long time very strong, especially among the poor.

The following are the rates of consumption of various articles in Australia, showing the quantities used per head per annum, the calculation being the mean of 1878-80—

Tea	... ...	8·05 lbs.
Coffee, Chocolate and Cocoa	... ...	1·09 „
Sugar	... ...	82·2 „
Rice	... ...	15·61 „
Dried Fruit	... ...	7·10 „
Spirits	... ...	1·43 gall.
Beer (imported only)	... ...	15·0 „

Compared with the consumption of the same articles in the United Kingdom, the difference is striking. These are—

Tea	... ...	4·66 lbs.
Coffee (alone)	... ...	0·97 „
Sugar	... ...	48·56 „
Rice	... ...	7·05 „

Unless Australia turns its attention to growing tea, this consumption opens up a fair future for trade with India. We do not think Australia will ever do much in tea growing, as the climate is not suitable, except perhaps towards the north, and even there the rainfall is deficient. This opinion receives weight from the recent success of the tea syndicate in introducing tea into Australia, and it is to be hoped that the efforts recently made will be followed up by a judicious nursing of the new trade.

The *Times of India*, which first drew attention to the ring among the owners of various steam lines running between Bombay and England, now tells us that the line of steamers chartered by the leading native piece-goods merchants of Bombay has commenced running. The first steamer left Liverpool on 10th instant, and subsequent steamers were to start from Glasgow, taking their dead weight there and coming round to Liverpool for their light freight. Thirty-six of the leading native merchants form the committee, very stringent regulations have been agreed to, and it is confidently expected that the scheme will prove a success. The market value of vendible commodities can never be permanently enhanced by artificial combinations. We are not aware of any combination among ship-owners in Calcutta, and yet freights now stand abnormally high. For instance we hear of £4-10 being paid per ton for tea to London. As a ton measurement of tea only contains about 900lbs., it follows that this freight is equal to nearly 1¼*d*. per lb. Taking the average value of tea in Calcutta at 15*d*., this is a charge of 8½ per cent. on the value of the article, a charge much too high. Freights for tea per steamers from China average £3 10-0, and it must be evident that India is handicapped in the trade.

"It appears that a draft of a treaty was being drawn up between the Chinese Government and Sir Thomas Wade, accord-

ing to which China agreed to open three more ports to foreign commerce, provided she were allowed to levy any duties she pleased on imported opium. The treaty was sent to England for approval, and the Chinese Government, in the belief that there would be no difficulty in the matter, opened the ports in question at once. The English Government, it is said, refuses to enter into such an arrangement; and the Chinese Government will therefore very probably close the ports again."

England naturally objects to the extinction of her opium revenue, and does not see why China should assume that she will agree to whatever terms she proposes. It is true that the extinction of the Indian opium trade is not explicitly arranged for in so many words, but the moment China is allowed to levy any duties she pleases on imported opium, the trade in the Indian drug will be ruined, because a prohibitory tax would immediately be imposed. This paragraph shows the true reason for Chinese objections to the Indian opium trade. So long as it is carried on as at present, China cannot levy any duty she pleases.

THE following is the produce per acre in Australia of various crops:—

AVERAGE PRODUCE PER ACRE

Year ended March 31.		Wheat.	Oats.	Potatoes.	Hay.
		Bushels.	Bushels.	Tons.	Tons.
1871	...	10·1	15·0	3·3	1·1
1872	...	13·5	18·8	3·2	1·4
1873	...	16·5	19·6	3·5	1·3
1874	...	13·6	15·7	2·9	1·3
1875	...	14·6	18·5	3·5	1·3
1876	...	15·5	21·9	3·4	1·3
1877	...	13·2	19·9	3·3	1·2
1878	...	12·4	19·4	3·1	1·2
1879	...	8·8	17·6	2·7	1·2
1880	...	13·3	24·0	4·0	1·5
1881	...	9·9	17·6	2·7	1·2

VEGETABLE WAX is obtained from the carnauba palm (*Corypha cerifera*). The lumps, as imported from Brazil, are about 3 lbs. or 4 lbs. each and bear the shape of the pan in which they have been melted; it is of light sulphur colour, with a lustre between that of wax and resin, and rather brittle. There were imported into Liverpool, in 1878, 80 tons; in 1879, 13 tons; in 1880, 40 tons; and the value has ranged between 35s. and 85s. per cwt.

It is shown, in a recent report of Her Majesty's Consul at Pernambuco, that the export of this wax during 1875-76 amounted to 18,668 kilos, valued at £758; in 1876-77, to 171,980 kilos., valued at £6,957; in 1877-78 it fell to 89,182 kilos., of the value of £3,168; and in 1878-79 to 1,542 kilos., valued at only £61. By far the largest portion of the wax finds its way to this country. It is shown that the decrease during the last year was due to the famine and drought which so severely crippled all industry in the province. It is not a little remarkable that, at a time when roasted date stones are proposed as a substitute for coffee, we should also learn that the stones or seeds of the Carnauba palm, when roasted, are used in Pernambuco as coffee.

IN the vicinity of Preston an experiment has been in the course of trial which we should like to see instituted elsewhere. Some time back the agent of a neighbouring estate divided a few acres of land into small holdings of five perches each. These were offered at reasonable but fairly remunerative terms to the Preston operatives, it being optional with tenants to rent one or more plots. Some forty at once came into occupation but a great many more applied, showing how thoroughly the experiment suited local requirements. Market-gardening on a small scale seems to have been the chief method of cultivation adopted by the operatives, and in this they have already achieved a considerable measure of success. The other day a competition took place among them for trifling prizes presented by the owners of the land, and the degree of skilled husbandry shown on the plots is said to have been quite surprising. Encouraged by this success, those who started the enterprise are about to parcel out several more acres in the same way, and in time, therefore, quite a little colony of operative gardeners may spring up in the neighbourhood of Preston, with the very best results, no doubt, to the health and morality of the amateur gardeners.

THE cultivation of new products such as Liberian Coffee, Tea, Cacoa, and India-rubber, has been largely extended and has been so successful that the enterprise has attracted the attention of even the villagers, to whom every encouragement in such cultivation is being given. There are still large extents of Crown land available for the cultivation of new products in the Western Province, and there is no doubt that, when better means of transport are secured to the Districts selected, these lands will be sold greatly to the advantage of Government as well as of the purchasers. In the development of these new resources new roads are especially required. In the Kalutara, Kegalla, and Ratnapura Districts there is already a large and steadily increasing area under cultivation of some new products, and the roads for which the planters have applied, if they can be openedin an inexpensive manner, will, I consider, be productive to both planters and the Government. A through reconsideration of the Road Ordinance of 1861, and a more liberal adherence to its provisions in favour of minor roads, is however necessary before much progress can be made in the matter of district thoroughfares.

THE acreage now under sugar cultivation in all India may be estimated (moderately) at no less than 3,750,000 acres, inclusive of the production of the Native Feudatory states. The approximate extent of cultivation in the several presidencies and provinces is ascertained to be as follows:—

Bengal	...	...	1,400,000
Native Feudatory States	...	...	750,000
North-Western Provinces	...	...	703,163
Punjab	...	...	391,630
Oudh	...	...	203,538
Central Provinces	...	...	107,805
Assam (excluding hills)	...	...	85,738
Bombay	...	...	49,849
Madras	...	...	33,000
Mysore	...	...	14,737
Hyderabad, &c.	...	...	5,594
British Burmah	...	...	4,271
Scind	...	...	4,058

GOOD rice is sold at Madras at eight measures per rupee, while here in Bangalore the commodity is retailed at 12 seers for the same sum. Comparing these figures, it is but natural to assume that grain is cheaper here than in the benighted city; but when it is borne in mind that two Mysore seers are equal to one Madras measure, it will be seen that this is far from being a correct impression, as the equivalent of 12 seers is 6 Madras measures, so that in reality rice at Madras is cheaper by two measures or 4 seers as compared with the seer-rate at which the commodity is retailed in Bangalore. According to another calculation, a Madras measure is said to be equivalent to 1¾ seers (Mysore computation); but dealers in rice aver that this is a miscalculation, for from practical tests conducted by themselves they have found that the proper equivalent of a Madras measure is fully two seers. Among the natives in the Province, raggi is computed by rupee weight, a seer weighing eighty rupees.

FROM a report relating to our colonial possessions, and dealing specially with Gambia, we learn that the trade in cola nuts, ***Sterculia acuminata***, is an attractive feature in the commerce of **the Gambia.** The cola nut is the product of the Sierra Leone district, **and the** trade in it, both at Sierra Leone and the Gambia, **is almost** entirely in the hands of women, to a large number **of whom it** affords the means of livelihood, and in many instances **the acquisition** of comparative wealth. The nut is largely **consumed by the** natives of the Gambia. **It is of bitter taste, and produces no exhilarating effect, but it is said to possess the power of satisfying for a considerable time the cravings of hunger. For this purpose, however, it is much less used than it is as a luxury. The trade in the article is rapidly increasing. In the year 1860, the import was about 150,000 lbs.; in 1870, 416,000 lbs.; and in 1879, about 743,000 lbs.**

A THOROUGH test is about to be made in America of the theory that large areas of arid country in the centre of the Continent can be made valuable for agriculture by means of artesian wells. The propriation made by Congress has been placed in the hands of scientific commission, and the sites for the wells will soon be selected. If a steady flow of water can be obtained from such wells, it will not be long before millions of acres of desert land will be converted into fruitful fields. The soil of the vast arid belt lying on both sides of the Rocky Mountains is by no means absolutely sterile, as its appearances seems to indicate. All it needs is plenty of water to make it productive.

THE proposed railway from Burrakur on the E. I. Railway by way of Raepore to Nagpore will be of immense importance, not merely because it will give us a more direct route from Calcutta to Bombay, but because it will traverse one of the finest grain-producing tracts of India, where the earth's abundance has been wont to rot because there was no means of conveying it to market. It is said that the scheme has been taken up in a practical way at last, and it cannot too soon be carried out.

THE millet seed is excellent food for fowls in winter, and if much of it is used an ordinary flock of fowls will get their living upon the manure heap and around the mangers. Millet makes a very nutritious feed without the seed, and all kinds of stock eat it greedily. The straw is coarse and rank, however, and feeds much nicer after being run through a threshing machine. In regard to the amount that can be grown on an acre, land that will produce 30 bushels of wheat per acre will grow 4 tons of fodder and 10 or 12 bushels of seed.

MR. K. F. NORDMANN, Executive Engineer, has been deputed to "reconnoitre" the country for a line of railway from Raepore to Vizagapatam. It will be his task to ascertain which of the following routes is to be preferred—(1) that starting from Purvatipory and passing *viâ* Rayaghada through either Bundisor or Dadpore east of the Nawagarh hills to Raepore, or (2) that starting from Salur and passing through Nawagarh west of the above hills to Raepore.

THE sheep-breeding farm at Nirayama-cho, Isu province, is progressing fairly. This month five or six catties of wool have been obtained from each of two rams and eighteen ewes which the farm borrowed last year from the Agricultural Bureau. Its quality being good, it is quoted at forty sen per catty, which price should give a good profit to the projectors. They are said to intend to establish another farm of the same description.

WE understand that the Mysore Dewan has been pleased to create three new scholarships of Rs. 10 each for native youths who are willing to prosecute their studies in the Agricultural College at Madras. With this object in view, proceedings we hear have already been passed, and a young man by name Seenapah, of Honganahulli Malur Taluk, has been granted one of the scholarships, and has joined the College.

FROM careful estimates which have been made at the French vineyards, it appears that no extraordinarily large output of wine is expected for the present comet year. The total anticipated yield for the 75 departments where the grape is cultivated is 32,004,816 hectolitres. It remains to be seen whether the quality of this wine will justify the popular belief in the influence of comets upon the vintage.

THE Cosmos Fibre Company of Dusseldorf is said to have invented a machine which is capable of perfectly cleansing the bark of China grass (*Boehmeira nivea*) of all resinous and woody matter. The inventors intend applying for the reward of £5,000 recently offered by the Government of India for such a machine.

THE Chief Commissioner of British Burmah has offered a reward of Rs. 250 for the best translation into the Burmese language of a Handbook of Agriculture (other than rice cultivation) for Burmah, by Mr. Martini. Translations may be forwarded to the Chief Commissioner till the end of November next.

DR. GILBERT and Mr. Lawes, whose work, in connection with the development of scientific agriculture, is well known, have we see, received by the decree of Emperor of the Germany the gold medal of merit for agriculture.

OFFICIAL PAPERS.

SETTLEMENT OF THE BAIGAS.

From Major A. BLOOMFIELD, Deputy Commissioner, Balaghat, to the Commissioner, Nagpur Division,—(No. 1288, dated 10th May 1881).

I HAVE the honour to submit as follows, regarding the Baigas of this district, with a view to further action being taken towards putting them in a satisfactory manner on a fair way to earning an honest livelihood.

2. The recent census has enabled me to ascertain the exact number of the comparatively few who still remain in this district. The following table contains in a simple form the result of the enumeration :—

Caste.		Men.	Women.	Boys.	Girls.	Total.
Binjwars	...	180	156	157	178	671
Nahars or Nahrotias	...	284	291	298	266	1,139
Bharotias	...	147	172	164	113	596
Total	...	611	619	619	557	2,406

NOTE.—There are a few mistakes in the translation in the name of tribe. There are thus, roughly speaking, about 600 families and 2,500 individuals.

Divisions.

3. They are divided into three Ghots or tribes, *viz*.—

(1) Binjwars,
(2) Nahrotias or Nahars, and
(3) Bharotias.

These are distinct tribes in every way; they neither intermarry nor intermix in any way, and are seldom, if ever, found living together in one village. The Binjwars appear to be slightly Hinduized, and observe sundry petty rules of castle, as if, apparently, they desire to distinguish themselves from the other two tribes, between whom and themselves there is, in physique, language, &c., but little difference. They will not eat the flesh of the ox bison, nilgai, *e.g.*, rats, ant-eaters, squirrels. and many other things which are readily devoured and much appreciated by the other tribes.

Location.

4. The three tribes are not only found in separate villages, but in different parts of the district. The appended list of villages in which the Baigas were living at the time of census shows that they inhabit—

NOTE—In the villages marked thus * they were not regular residents, but merely temporary sojourners for the time, making Tikur, &c.

(1) The Binjwars in the Paraswara and Man taluks, or, in other wards, the hills and ghats overlooking the upper reaches of the Wainganga river.

(2) The Nahrotias, the central hills of he Sanka taluq, the Dhansuwa pargana, the Saletekri and Bhanpur zemindaris, and further north towards the Mandla border. Before pressure was first brought to bear on them to stop their Bhewar, they were to be found nearly all collected in the central ranges of hills called—

Waijhari	...	Dhansuwa Pargana.
Khandaparh Tipagarh Dukri	... ...	Sanka taluk.

the hills of the Hatta pargana, and the hills of the Bhanpur and Saletekri zamindaris. When the Bhewar was stopped in the Khalsa, they mostly went further east into the zamindaris, and since the dhya in the zamindaris has been stopped, they have been coming slowly back into the plain villages, near around the old haunts and hills of themselves and their forefathers. Within the last month or two, several families have emerged from the Bhanpur zamindari to settle in our most promising Baiga settlements of Karwahi* and Bhuddhutola.

* These are in fact one mauza.

(3) The Bharotias in the northern parts of the Bhanpur and Saletekri zamindaris, the hilly villages of Bhimlat, the Bhalsonghat range, and the hills of Raigarh Bichia. In these places and along the banks of the Bhanjar river, within the borders of the Mandla district. Since the stoppage of the Bhewar, most of them have gone over the border into Kanarda, where most of them would finally settle, were it not for the Begar that is exacted from them in lieu of land rent or axe tate.

Mode of living.

5. In the days of Bhewar cutting, the Baigas lived comfortably on the produce of their clearings, aided to some extent by the numerous roots, fruits, &c., of the jungles in which they lived. How they have managed to live since the Bhewar was stopped is really difficult to understand. The fairly good condition in which they now are shows

that they certainly have not starved. They certainly have been very hard pressed; some have borrowed grain from their neighbours and got considerably into debt, a state quite new to Baigas, and most have managed to keep body and soul together by selling minor forest produce in the bas sars, and subsisting chiefly on jungle roots, fruits and herbs, and fish from the hill streams. A few have managed to earn a little grain by assisting in trifling matters the cultivators of the neighbouring villages; and some malguzars have tried to give them work, but have found it difficult to discover anything they can put their hands to.

6. Before entering into the subject of the settlement of the Baigas, I ought perhaps to note a very marked difference in the character of the three tribes of Baigas—a difference which should be borne in mind in arranging for their settlement.

The Binjwars are the most civilised of the three tribes; several families living in the marginally noted villages of the Man valley have long been regularly settled as plough cultivators. Some of those in the villages marked† were so when I first came into the district in 1868.‡ They evidently take more readily to the plough, and have no great objection to live in the same villages as other cultivating castes.

† (1) Pondi.
(2) Gudma.
(3) Soukar.
No. 1 is the oldest settlement of the kind.

‡ Vide my letter of 1872 quoted further on.

The Nahrotias come next to the Binjwars. Up to 1870 the only one of them who had at all taken to plough was Ganu, the head of the Baiga village of Goara. About that time the pressure against Bhewar cutting had begun to tell. Mntira Pujari (also a Nahrotia) of Jaldidhar took to the plough in addition to a little Bhewar cutting, which at the time he frankly told he must cut, even if I cut his throat for it. Next, in 1871, § the Raudarparhi Baigas, headed by the late Banjar Pujari, willingly volunteered to assist me in the tracking of the celebrated elephant, and on its being killed by Mr. Naylor and me, received the Government reward of Rs. 200. With this and some encouragement, and the good land of Karwahi, they were induced to come down from the rocks of Khaudarparhi and take to settled plough cultivation, forming the nucleus of the most promising of our Baiga settlements. Since then the Nahrotias have been gradually taking to the plough.

§ Vide my letter No. 193, dated 26th March 1872.

The Bharotias are the wildest of all. I believe that not one of them has yet taken to the plough, and all who have come to me steadily maintain that they can never bring themselves to it.

7. My predecessor in his report No. 1596, dated 14th June 1880, showed what had been done for the Baigas up to that date. It amounted to this: 44 families were provided with bullocks at a cost of Rs. 1,254-8-0, and about Rs. 500 were expended on grain, implements, and so forth. Thus it seems that about Rs. 1,830 have been expended and 44 families have been provided with bullocks at an average cost of about Rs. 40 per family. It must not, however, be supposed that these families are permanently set up, for bullocks will die, crops fail, and wild men be improvident as well as unsuccessful in a calling entirely new to them.

Name of village.		Number of families provided with bullocks at one pair per family.	
Goara ...	...	8	Nahrotias.
Karwahi	...	24	
Jaldidhar	...	6	
Maldhar	...	4	Binjwars
Baigunagar	...	2	Nahrotias.
Total	...	44	

NOTE.—I do not believe this is quite correct; enquiries are being made.

8. During the current year, Rs. 787 have been expended in the purchase of 71 bullocks, which have been distributed as shown in the appended list B. About 12 pick-axes and 13 phaoras, old and much used, belonging to District Funds have been given, and about Rs. 200 to Rs. 350 will be expended in the purchase of seed grain to be distributed chiefly to those who have been recently supplied with bullocks. In this way the expenditure this year will amount to about Rs. 900, and 31*-families of Baigas will be so far provided. Thus on the whole there will have been a total expenditure of Rs. 2730, providing for about 75 Baiga families at an average cost of about Rs. 40.†

* Exclusive of the 12 people supplied with 1 bullock each to replace deaths among those formerly given.

† This is leaving a margin for grain, &c.

9. The figures I have given above in paragraph 2 show that altogether there are about 600 Baiga families. Of these, about 75 have been provided with bullocks at Government expense, about 40 families have cattle of their own, and about 485 families remain to be supplied. This, at Rs. 40 per family, represents a cost of about Rs. 19,400.

Including those in the Man valley.

Binjwars; Nahrotias; Bharotias.

10. It may perhaps be urged that the fruits of the present system, which has now been under trial for nearly 10 years, are so small that it does not promise much success. This I venture to submit is not the fault of the system, but of the way in which it has been managed. I have not the slightest doubt that if the system be properly and steadily followed up, it will prove a complete success, and not many years will elapse before all the Baigas, even the Bharotias, will have become settled cultivators, quite happy and contented with their lot. Even now there are not wanting signs to show that the Bharotias are watching the progress made by the Nahrotias.

11. The only question is the expense that will have to be incurred to bring about this end, and this seems a proper place in which to insert a few words in favour of the Baigas, to show that they are in all respects worthy and deserving of all that may be expended on them.

12. The damage done by the Baigas has certainly been very great, for aided by the dhya cutting Gonds they have, with a very few exceptions, at periods more or less remote, closely shaven almost every hill in the district. In very rare places indeed is there a hill to be seen that has not a closely cropped appearance, with here and there a tuft of trees, or a single tree, showing what the jungle once was. New arrivals in the district, and those who are not well acquainted with the Baigas, naturally feel indignant on seeing these devastations, and vow vengeance and reprisals in the way of burning crops, summary ejections, and so forth. But they entirely forget, if indeed they are not ignorant, of the rights which these Baigas might in all justice claim. For generations untold, probably from the time when the ancient Britons were yet clothed in their original garments of skins, the ancestors of these Baigas have lived, died, and been buried on the slopes of these hills and in the fastnesses of these jungles They have supported themselves, their families, and their aged parents without the aid or interference of the State, or poor laws, or anything else, thereby setting a good example to the more civilized poor of the British Isles, and other countries. They have managed their own affairs without the aid of judge, jury, police or any Government officials; until the last few years they have escaped the grasp of inexperienced Extra-Assistants, and over-officious Police subordinates.

13. Surely then these Baigas might fairly claim absolute occupancy rights of the land they have held so long, or even be considered sub-proprietors of their holdings. They have not, however, in their wild ignorance, put forward any claim whatever. They have quietly bowed to whatever authority has been set up over them, and have never refused to carry out any orders that have been issued to them although they have frequently failed to act up to them. The stopping of the Bhewar cutting was the very taking of the bread from their mouths, yet although trusting to the negligence of native subordinates, they have in places continued to cut Bhewar, they have hardly so much as grumbled; they have given no trouble at all, but have quietly and cheerfully submitted to their fate and with no State aid worth mentioning, earned a hard though honest livelihood in their own quiet way. Had the Southals or Bhils, or the tribes on the Assam borders, been treated in this way, there would have been a very different story to tell; bloodshed and jungle fighting would have been the order of the day.

14. This being the case, I cannot doubt that you will agree with me that the Baigas are entitled to all credit and consideration at our hands. I do not advocate that they be allowed to return to their former wasteful mode of living, but (1) that by steady and continuous effort they be induced to take to regular cultivation, and (2) that they be assisted in every possible way to add to their earnings by any other means that may be most available.

15. I do not think it would be necessary to incur a very large expenditure in any one year, but I do not feel quite confident that a steady continuous pressure, coupled with unchanging kindness and an annual expenditure of about Rs. 2,000 in the direction already commenced, will have the desired effect. The Baigas should in every way be encouraged to bring all their troubles direct to the head of the district, and they will soon learn to be so confident in him, that they will ever be more ready to follow his advice.

16. It can hardly be expected that for some years to come the Baigas will be able to support themselves on the produce of their ploughs alone, and I would therefore assist them in aiding to their earnings—

(1) by working in the 2nd class reserved jungles, cutting timber and bamboos for floating down the rivers to the Madgi Station of the Nagpur and Chattisgarh line;

(2) by cutting and removing creepers which are now doing much damage

(3) by bringing minor forest produce to the local markets;

(4) by reserving to them the right to fish in the small streams above the ghats, of which the fisheries now yield no revenue to Government.

16. (a). There seems to be some difficulty in inducing the Baigas to take to working in our forests. They are not perhaps generally steady workers, but in this case it is not perhaps the work they so much object to, as the forest subordinates under whom they have to work! Under European supervision, as has been proved during the sleeper operations* in the Banjar reserve, Baigas will work very well, but they have no

Working in forests.

* In 1870-71.

confidence in forest subordinates. I am trying to get over the difficulty by giving them contract work, but cannot yet report any result.

17. The creeper cutting work I propose to do by contract, allotting to each collection of Baigas a tract of forest in which to clear creepers from all good trees. It will be worse than useless to clear away all creepers, which now furnish to the surrounding agricultural communities a continual supply of valuable fibre.

Creeper cutting.

18. I have endeavoured to encourage the Baigas not yet settled to the plough, to support themselves as much as possible, by the collection of minor forest produce. Tikur, Bychandi, and Chironji, and light bamboo work are the most important items in the Baiga's trade. I have prohibited the forest subordinates from levying any duty from the Baigas resorting to the markets with produce of this kind, for not only could they ill afford to pay the duty, but the trouble given to them in its collection prevented them to a considerable extent from resorting to the markets at all. The forest duty thus lost to Government, amounting generally to about 3 to 6 pies per head-load, is in the year something very trifling.

Gathering minor forest produce.

19. The Baigas of several villages have recently complained to me that the Dhimars of the surrounding villages have endeavoured to frighten them from fishing in the streams passing through the jungles in the neighbourhood. As these Dhimars have no rights whatever in the fisheries, which are trifling, and bring in no revenue to Government, I have given the Baigas written permission to fish, and prohibited the Dhimars from interfering with them.

Fishing.

20. It now remains to notice briefly the places I would select for the location of the Baigas, with a view to provide them with land suited for the plough. It may here be observed that my predecessor, Colonel Plowden, in his report on this subject, strongly condemned the places* where the Baiga settlements have already been commenced, and recommended in lieu the land of Chakarwa away in Bhimlat in the Upper Banjar Valley. But he was not well acquainted with the Baigas and their habits, and was ignorant of the circumstances which led to the selection of those places. The great desideratum is to get the Baigas to leave the hills and settle down somewhere in the culturable valleys. Before they have tried their hands at the plough they are naturally and rightly doubtful as to their ability to support themselves by plough cultivation. They consequently cling tenaciously to the jungles and hills they have known from their childhood, and whi.. they look to as their great reserve of all the necessaries of life. As this reserve it may be noted has been proved to be a never failing; for during the famine year of 1868-69 when the cultivators of the plains where so starving and wretched as to require State aid, the Baigas, notwithstanding the failure of their Bhewar crops, were in as good condition and as contented as ever. They will not therefore emigrate to any spot, however distant from their jungles, where the soil may happen to be good, but prefer inferior land nearer at hand. Hence it came about that in the beginning of 1872, in consultation with Runjur Pujari of Khandapar, I selected Karwahi and Barwahi, these barren wastes, for their settlement. Karwahi, notwithstanding that a road has since been turned through it, is admitted by all to be by far the most promising of all the Baiga locations,† and now with its "tola" called Budhatola boasts of no less than 329 inhabitants, including those who at the census were temporarily absent at Kanhatola, but exclusive of the 10 households recently arrived. ‡ Barwahi has by some mistake been given on a ten years' lease to a neighbouring malguzar § instead of being reserved. Jaldidhar was selected by Mutira Pujari himself, and although not a very suitable place, has, as I expected when I agreed to it, answered its purpose in inducing several Baiga families to settle. Several who first settled in Jaldidhar have moved to Bhainswahi just outside the hills, and the Pujari himself is ready to follow so soon as land is found for him.

(1) Karwahi
(2) Goara.
(3) Jaldidhar

† To use an Americanism.

Men.	Women.	Children.		Total.
		Boys.	Girls.	
87	85	82	75	329

‡ These have agreed to settle in Sareka.
§ Of Pinkapar near Rupizar.

Goara was selected by Ganu Baiga himself, and is quite suitable, notwithstanding that the main road to Behir has since been turned through it. Baiganagar, under the Dukri hill, appears suitable; and Malihar, away on the Western Ghats, will do for the Binjwars.

21. Having said so much about the sites already selected, I will mention a few places I would recommend to be reserved for the Baigas.

The villages of Sareka and Jutta, situated within a mile of Karwahi, were leased for 10 years to the Patel of Bhandori, but as he has failed to come up to the terms of his agreement, the leases will not be renewed. In both these, there are large areas of good soil, well suited for the Baigas. Barwahi, which joins Karwahi to Jutta and Sareka, and is close to the jungles, should also if possible be reserved. I have arranged to locate a few families of Baigas at Kumdul, a small piece of good land lying to the south-west of the Tipagarh hill, and some of the Jaldidhar people have already come down to Bhainswahi on the opposite side. If these places shall prove insufficient for the Nahrotias, then the two Government villages of Gogatola and Parsatola, also close to Karwahi, can be made available for the purpose.

22. The Binjar Baigas can be provided for in any of the Government villages of the Man and Paraswara Taluks, or possibly they may be induced to follow the example of some of their caste fellows, and settle with other castes in permanently settled villages.

23. I observe that it has been urged that Baigas should be induced to locate themselves with ordinary cultivators in permanently-settled, villages, but I think I may safely say that great experience shows that for the present at any rate, this is not practicable except with the Binjwars, nor do I think it desirable. Alone the Baigas will learn to use the plough, and mixed with others they will learn no more except that which would be better left unlearnt.

24. The Bharotias will be found the most difficult to deal with. The stopping of their Bhewar has no doubt pressed them sorely, but I hope that now they see the only road left to them is to follow the example of the Nahrotias, they will gradually come down. They can easily be provided for in any of the waste villages of Bhimlat or Raigarh.

25 The late Tahsildar of Behir, Ramcharan Lal, rightly reported that there is great difficulty in collecting Baigas together in large communities. The Baigas when they disagree settle matters by separating. There is no particular advantage in making large collections of Baiga houses, and there will be no difficulty in settling them in small tolas scattered about the village lands. This has been done at Karwahi where there are 3 or 4 tolas, and is a common practice all over the district.

26. I will conclude by giving a brief sketch of an alternative, or it may be styled an auxiliary, scheme for settling the Baigas. I have long had it in contemplation, but have not been able to set it on foot.

27. The measures I have above proposed to be adopted by Government will doubtless go far towards establishing the Baigas as regular cultivators, but there are two points regarding which doubts arise in my mind, namely :—

(a) Will the Government agree to incur this expenditure, which for the present at any rate is in amount beyond accurate estimate?

(b) Will the permanent improvement of the Baigas be thereby ensured?

My auxiliary scheme will, I venture to think, go a great way towards stopping any possible gaps that may be left by the Government measure.

28 My proposal is to endeavour to induce the many charitable people and institutions in the British Isles, to send out a Mission to the Baigas; for I believe that if a really good man such as many of the Missionaries are, could be permanently located amongst them, their permanent improvement would be ensured, and not only this, but that much good would result to the country for many miles round.

29. When last on furlough, I wrote a paper on the Baigas, and sent it round to several Missionary Societies. Most seemed to have their hands very full, working up to the extent of their incomes, and pleaded want of funds, but the Free Church Mission of Scotland said they would undertake the work, if I could guarantee them about £150 a year.

30. Now, I believe that the difficulty about funds can be easily overcome, for apart from any contributions that might be made from Imperial, Provincial and District funds, the money that could be raised from private individuals at home and in this country would suffice to meet all demands. Possibly also the Aborigines Protection Society would give some help. But before the public can be expected to take any interest in the matter, it will be necessary to lay the case before them in a popular manner. This I propose to effect by writing a short paper about the Baigas and circulating it in great numbers amongst all who will probably answer to the call. The only difficulty I have is in the printing, but if the Chief Commissioner, after approving of the draft pamphlet, would sanction this being done at his office press, I would during the ensuing rains re-write in an abbreviated and amended form the paper I drafted in England.

31. I have now only to express my regret that the statistics accompanying this report are not nearly so full as I should have wished, but not finding the materials ready, I preferred not to delay the report for them. I have taken measures to have fuller information ready for the next annual report.

No. 164, dated Simla, 28th September 1881.

From E. C. Buck, Esq., Offg. Secy. to the Govt. of India, Revenue and Agricultural Department,—To the Chief Commissioner of the Central Provinces.

I am directed to acknowledge receipt of your Officiating Secretary's letter No. 8/50-176, dated 1st September 1881, submitting a report on the progress which has been made in inducing Baigal families of the Mandla and Balaghat Districts to settle down to regular cultivation by furnishing them with the means of husbandry.

2. In reply, I am directed to express the satisfaction of the Government of India with the results so far attained and with the active efforts which Major Bloomfield, Deputy Commissioner of Balaghat, has successfully made to reclaim these hill people.

3. I am further to inform you that, subject to an annual report of progress, the Governor-General in Council sanctions the yearly allotment of Rs. 2 500 from Provincial Revenues for the next four years, as requested in the 14th paragraph of your letter under acknowledgement.

E. C. BUCK,
Offg. Secy. to the Govt. of India.

LAND TENURES OF TRAVANCORE.

MEMORANDUM.

THE land tenures of Travancore may be chiefly divided into five classes, *viz* :—

1 Jenmom
2 Enam
3 Service
4 Pandara Ootty
5 Pandara Pattam

2. There are no records to show how the Jenmom right originated, but traditional accounts state that Parasurama reclaimed from the sea the country called Malayalam (hill and depth), colonized it with Brahmins from the Paundy country, built pagodas in various parts of the Principality, and granted at the same time in gift extensive tracts of land for their maintenance.

3. Jenmom lands are completely free from assessment, but this exemption ceases whenever the lands pass out of the hands of the original proprietor on any pecuniary tenure. In such circumstances they are liable to be assessed with Arilonoo or Ettilonoo, *i.e.*, one-sixth or one-eighth of the full tax on garden land and mooperah, *i.e.*, three-tenths of the average full tax on paddy land.

4. Classes of Enam lands are numerous, such as Adima, Anoobogom, Thiroovolom, Thiroovadayalom, etc.

5. The quit rent on this class of lands is generally about one rupee per acre, which is increased in proportion as the lands permanently change hands. The tenure under such circumstances is converted into Pandara Ootty.

6. Vrithy or service lands, a considerable portion of which has been enfranchised by the State, are still retained under the original tenure in consideration of the services exacted by the Government from their holders.

7. Pandara Ootty lands are those which are held under mortgage by the ryots from the Sircar, and *vice versa*.

8. The sale of Ootty lands is also accompanied by an augmentation of the original quit rent.

9. Pandara Pattam lands mean Sircar or Government lands. They form the largest portion of landed property, and include Jenmy lands which had been escheated to the State, private lands which, having fallen waste, have been relinquished by their proprietors, service and other lands which have been confiscated by the Sircar, lands which have been reclaimed from the Sircar wastes, and lands which have been purchased by the Sircar.

10. The ryots are secure in possession of such lands under the Royal Proclamation of 21st Edavom, 1040, so long as they pay the stipulated tax thereon. They are not, however, allowed to relinquish them unless they show satisfactory grounds for relinquishment. No remission of tax on account of drought or other adversities of the season is granted generally on such lands, unless the calamity is proved to be *universal* and *unusual*. In view to compensate the holders of such lands for contingent losses arising from deficiency or failure of crops in ordinary seasons a reduction of 20 and 30 per cent. in the Ayacut rates had been made, 20 on Pattom and 30 on Vrithy Pattom land. This reduction does not, however, extend to Pattom lands paying tax below one parah of paddy for every parah of seed land. For improvements made in Sircar Pattam and Ootty garden lands the Government allow in favour of improvers a deduction of one-fourth of the full assessment thereon.

11. By a proclamation passed by His Highness the Maharajah under date 2nd June 1865 / 21st Vycasy, 1040, all Pattom land holders have been made proprietors. The Sircar has given up all arbitrary power over these lands, reserving to itself only the right of regulating the assessment on them.

12. Whenever Nair families become extinct, all the property, movable and immovable, of the last surviving member, becomes escheated to the Sircar. Distant or collateral heirs may succeed to the property on payment of certain fees, equal to a share varying from one-fourth to one half of it. Adoption is also sanctioned by Government on payment of the usual Adyara fees.

13. The property thus escheated is generally sold by the Sircar by public auction, and the assessment on the landed property is then revised under existing rules.

14. Government waste lands are granted under the following rules :— Whenever any application is received for any piece of waste land, order is sent to the local Tahsildar to make inquiries whether there are any objections to the grant of the same, and if none exist, to ascertain and report the exact extent of the waste land applied for, and the rate of assessment to which it is liable according to standing orders ; *i.e.*, the highest rate of tax borne by the adjoining wet lands, and if no such lands exist, the tax determined by Vigours or assessors. If the report shows no objection, the matter is reported by the Dewan Peishkar to the Dewan, who, except in the case of Europeans, passes final orders thereon. If the applicant be a European, the case is then referred to the Palace and settled according to His Highness the Maharajah's commands.

15. If the waste applied for be found to be situate within the limits of Edapully or Vaucheapulay Edavaga, or if found to be a part of any cherikal belonging to any private Jenmy, the applicant is referred to the Edavaga chief or Jenmies.

16. Tax on garden land is 4 chuckroms for first class cocoanut tree, 3 chuckroms for second class, 2½ chuckroms for third class, and two chuckroms for fourth class; 4 chuckroms for jacktree, and one-eighth chuckrom for areca nut tree. Tax on waste lands not planted with taxable trees in generally 4 annas per acre.

17. The rule is different as regards the grant of registered waste lands which had been once cultivated. They are disposed of generally by public auction, and the highest bidder secures them on Ayacut rates. They are sometimes granted for a certain period on lower terms if competition does not exist. Hill paddy cultivation is taxed at one-tenth of the gross produce for Government lands and one-twentieth for private Jenmy's lands.

18. The land revenue system is Ryotwary. The revenue is collected by the Sircar servants directly from the landholders.

19. There are some farms the rents of which the farmers pay directly to the Sircar according to the terms of their contracts, the collection of the rents from the ryots being made by the farmers themselves. But this system of farming is much discouraged now-a-days.

20. Each ryot is responsible for the revenue so far as it bears on his individual holding. If he fails, his property real or personal, is sold for the satisfaction of the Government demand, and at times his person is also placed under restraint. So long as he has the means to pay, he must pay, whether or not he cultivates his quota of land.

21. In cases in which the ryot is unable to pay the tax, or in cases in which his lands on which the tax is due are washed away by rivers or otherwise permanently placed beyond the possibility of cultivation, the tax is then written off his name.

22. The assessment on the lands abandoned in consequence of the holders's inability to pay tax readjusts itself according to the productive capacity of the land, under the operation of the Durkast system.

23. There are large extents of Kundookrishy lands (crown lands) in the Districts of Ambalapulay, Chungancherry, Cottayam, and Yettoomanoor. The revenue of these lands is collected wholly in kind by a number of Vicharipears under the superintendence of a separate Tahsildar, and is appropriated for public purposes. These lands are treated differently and are governed by different principles.

24. Ordinarily no remission of tax is allowed for Government lands left waste. Whether the ryots cultivate the whole or a part of their respective holdings, or whether they cultivate them with paddy or sugarcane or any other production, they are required to pay the fixed tax, and the Sircar does not generally interfere in the way of ascertaining every year the extent and nature of the crop raised by each ryot on his individual holding.

25. The rate of assessment varies both on wet and dry lands. The assessment on Pattom lands ranges from one-eighth to ten parahs of paddy on a parah of seed land. The average assessment comes to something less than half a rupee per parah of land, or about four rupees per acre. Besides these, there are various extra cesses called Chathacooly, Mathapayara, Kottoocooly, Attocvaree, etc., amounting on an average to nearly four annas an acre.

26. Enam lands, such as Adima, Anoobhogom, Thiroovolom, Thiroovadayalom, etc., are subject to a moderate quit rent called Mooperah Vitharu, Michavarom, Vithudal or Cadama. The average assessment on this description of lands amounts to generally not more than two annas per parah, *i.e.*, a little more than a rupee per acre exclusive of an extra cess called Choomattoopauom, generally about two annas upon each holding.

27. The land tax is settled in kind, but payed partly in kind and partly in money, according to the Pattayom granted in the Malabar year 939 ; garden tax is paid mostly in money, and in a few cases in cocoanuts, cadjans, oil, etc.

28. Upon what principle the settlement of the land revenue was originally founded is not quite clear at this distance of time. But it is obvious that the assessment does not appear to bear a just and equable proportion either to the gross or nett produce of the land. The principle seems to be different in different places, and this variation is perhaps due to the difference of systems which had formerly obtained in the several petty states which were absorbed into the present kingdom of Travancore.

29. In Shencottah Talook, Veedippoo, *i.e.*, the average collection of a series of years, has been made the basis of assessment, and in the Augusteswarom Talook the Ayakut account of the year 949 guides the collection of tax.

30. The commutation rate is low, it being only about half of the current market rate. This advantage is not, however, shared equally by

all ryots. In the greater part of the country the proportion of the grain to the money payments is not fixed at one uniform rate. It is genera'ly made dependent upon the extent of consumption of paddy in Devasoms and Ootooparahs in each Proverty. In some places the proportion is eighty per cent., while in others it is as low as ten.

31. The revenue is paid by several instalments. The garden tax by ten, commencing in (*Awany*) August, and terminating in, (*Tycausy*) June; and the land tax by eight, from (*Arpasy*) October, to (*Tycasy*) June, and in some places where there is Madapoo crop to (*Auny*) July.

32. Each talook is divided into from five to ten Proverties, and the division is made in reference to the extent and revenue of each talook. The Proverticar is held responsible for the collection of the land revenue of his Proverthy. This functionary has under him 3 or 4 accountants and 2 or 3 revenue peons. Besides this establishment he has at his disposal a large number of Mullacars and Vrithicars placed in charge of respective villages under him. The Mullacaren is considered as the head of the village over which he presides, and has generally 8 or 12 Viruthicars in his Mullay. These Mullacars and Virthicars help the Proverthicars in the collection of the Government dues, in the supply of provisions to Devasoms and Ootapurahs, and in sundry other matters. They are remunerated by the produce of lands granted to them at low rent, and their office is hereditary, the eldest member of the family generally succeeding thereto on the payment of the usual Adyara.

33. The land revenue is paid by the ryots into the hands of the Proverthicars. A Kykanakoo (puttah) attested with the Sircar seal is given at the commencement of every official year to such of the ryots as require it, showing the number of lands and gardens registered in his name, and the rates of assessment payable thereon and other necessary particulars, and all his payments to the Sircar are either endorsed on the back of this document or acknowledged in separate receipts.

34. The Proverthicar sends all the money collected to the talook treasury generally once a month, retaining in his granary all the paddy collections to meet the current requirements of his Proverthy. He assists the Tahsildar in the conduct of various revenue matters and also in the detection and suppression of crimes He is also a Marahmut Vicharipooca, in his Proverty, and is responsible for the conservancy of village roads, canals, etc.

SELECTIONS.

BEE-CULTURE IN INDIA.

BEES' wax and honey form no very insignificant items in our trade returns. People in India care very little for bee-culture; they are content to know that particular districts of Southern India afford both these items of luxury and medicament; some few may try to be critical about Cuddapah honey, but about the honey-bee of India most of us are as ignorant as those simple rustic folk in England, who, though "bee-masters" themselves, yet are in blissful ignorance of the full value of their interesting charge, their instincts and habits. Among the insects of commerce which India possesses, there is a *haitus* left in respect of the bees which amounts almost to neglect of the gifts of Providence. Not many months ago a project was talked of for utilising the countless tons of bats' manure which the hill-caves of Cuddapah were said to contain; whether it is to come to any head, or is to remain in the category of things *in posse*, remains to be seen. In the meantime it is interesting to know that Indian bees are beginning to be recognised as very promising creators of wealth, and that a venture is about to be made for ultilising the Indian bee to the purpose, if not to the same extent, that it is in France and elsewhere. Possibly, with the peculiar views held by certain classes of Mussulmans of the sacredness of the bee, some little opposition to its being domesticated may ensue, but it is not likely to be long-lived. It is a very remarkable fact that customs and prejudices exist long after the age which give birth to them. The hill-men of Cuddapah go out after the honey and wax, which they exchange with the low country-folk with instruments of barbaric sound. We wonder if they have heard at any time of Virgil and the directions he gives,—when you see the swarm issue from the hive, watch them attentively and raise tinkling sounds and clash the cymbals of Cybele. Somehow, the prejudice is both an old and deeply-rooted one which ascribes to bees a love for discordant sounds. To return to our muttons: an adventurous gentleman, whom a recent number of the *Tropical Agriculturist* named, is, we learn, about to start bee-culture in India. People have ventured on silk worms, and recorded successful issues, and we see no reason for believing the bees of the country to be more intractable. Bee-culture may have some little difficulties at first to contend with; so has silk-worm rearing, and what patience and unremitting care has compassed in one instance, they may succeed also in compassing in another. Cuddapah honey bears a high commercial value; when pure, it has a bright light yellow hue: it is only after it gets into the hands of the bazaar man that it acquires the mawkish taste and dull color that it does when it is brought into the market. We venture to predict a promising future for bee-culture in districts whose conditions are favourable to the industry, and trust Narbonne may find a formidable rival in Cuddapah and other honey-yielding tracts. It is not likely that the little honey used in hospital practice is always from Europe; and we see in the determination of Government, to utilise as far as practicable local supplies, an earnest and a guarantee that local efforts will meet with all the support that their real merits entitle them to. To the present day the caves of Salsette and Elephanta are as much frequented by bees as were formerly the clefts of rocks in Palestine, and as now are the fissures and crannies of the Cuddapah hills; no one either in this presidency or at Bombay, or for that matter any part of Asia, has tried to domesticate the bee, and the credit will be all the greater when some one shall be found to dissipate the illusion that the honey-bee of India is an unmanageable creature.—*Madras Times.*

COFFEE AND TEA.

A RETURN has been submitted to the Madras Government, showing the number of coffee and tea estates in the different growing tracts in this presidency, the number of existing plantations, the yield of coffee and tea and the cost of cultivation. The progress which these industries have lately made and the large amount of capital invested in them have induced the Government, for the purposes of preparing the necessary statistics, to obtain these returns which however are quite what are wanted. The column showing the number of plantations is misleading. Is it to be inferred that there are so many coffee estates in the different districts or that the estates are divided into so many plantations? We find it stated that, in the Madura district, there are 2,779 coffee plantations containing a total acreage of 4,581, so that each plantation is not quite two acres in extent. It would have been better to give the number of estates and their extent. But to the returns. We find that coffee is now grown in eight of the twenty-one districts of the presidency. In Vizagapatam there are only six acres of land planted with coffee; in Madura 4,581 acres, of which 3,059 acres are filled with mature plants, in the Tinnevelly district 2,844 acres of land have been taken up for coffee, and 2,005 acres are fully planted out. The coffee industry in the district having turned out well of recent years, has induced many persons, to open up estates chiefly in the Tenkasi and Nanguneri taluqs. In the Coimbatore district very little progress has been made in opening up estates, for while about four thousand acres of land have been taken up for the purpose, about 316 acres contain mature plants. In the Nilgiri taluq 22,648 acres are fully planted out, 321 acres contain immature plants and 21,255 acres taken up for planting have not yet been planted out. The approximate yield of the coffee estates is returned at 10,128,799lbs. at the average of 447lbs. per acre, the cost of cultivation being Rs. 100 to 130 per acre. It is to be feared that the next returns will show a large decrease under this head owing to the fact that many plots of land have, since the past ten months or more, been made over for good mining purposes. In the Salem district the number of plantations is given at 323, the acreage planted with mature plants 3,932; with immature 1,662, and the acreage taken up but not planted 5,078; total land taken up for coffee 10,667 acres; approximate yield of coffee 983,000lbs. The cultivation of coffee on the Shevaroy Hills is being pushed on steadily by the owners of estates, but there is just now not that desire to launch out capital in the enterprise as was the case fifteen or twenty years ago. In many cases, the estates have brought their owners large returns and, as in all other matters, a great deal depends on personal supervision, and where this is properly exercised, success is secured. The present year has not been a very favourable one for coffee on the Shevaroys; the rains have been late, but notwithstanding some of the estate have given pretty fair returns, The Malabar district which includes the Wynaad, has a total of 31,061 acres under mature coffee, the land taken up for cultivation being returned at 62,123 acres and the yield given at 6,114,826lbs. In Cochin about 7,795 acres have been taken up for coffee, of which only 1,436 have been planted. In Travancore, the extent of land planted with mature and immature plants is 16,775 acres against 37,067 taken up. For the entire presidency, the figures are as follows: mature plants 73,822 acres; immature plants 13,463 acres; not planted out 38,925 acres; total land taken up for coffee 176,210 acres approximate yield of coffee 21,492,682lbs. The Travancore estates give an average of 175lbs. of coffee per acre of mature plants against 323lbs. in Cochin and 197lbs. in the Wynaad.—*Madras Standard.*

AN AGRICULTURAL DEPARTMENT FOR BOMBAY.

WE pointed out the other day, in connection with the contemplated local extension of the Department of Agriculture, how meagre and often inaccurate are some of the statistics supplied in the annual Administration Reports of this Presidency. In 1872 the Government of India, to ensure uniformity in statistical returns, enjoined on all local and provincial Administrations the adoption of new statistical tables as perform prescribed by them. These tables have accordingly been appended to the annual reports since 1872-73. Few readers of Administration Reports have the patience to go through these statistical returns; but any one who has the curiosity to examine them with a view to extract any valuable information therefrom, returns back from them disappointed. One of the most vital questions of the day, for instance—one in which the statesman in India, no less than the ordinary tradesman, is interested—relates to the food supply of the country. What is the total food supply of India? This question resolves itself into the question of the produce of food in each Presidency, and that, furthermore, into the question of the supplies of each district. Similar information is needed in respect of the Native States. Taking, however, for the present, British districts of our own Presidency, we doubt if any of our district collectors are able to tell us, within approximate limits, what is the quantity and value of the food produce of the districts under their charge, what is the consumption of the people, and what is the surplus stock left at the end of the year to meet a threatened scarcity, drought, or famine. It may not be the collectors' fault; but there is, nevertheless, the broad fact that on a vital question, on the right determination of which depends the welfare or woe of millions of people, tolerably correct or reliable data cannot be had. Even the compiler of the *Bombay Gazetteer* has not been able to give the statistics of food supply in all except two or three districts. The fact is such statistics are not to be had. No wonder, then, that even the Famine Commission should be left to guess, or form a vague general idea of the stocks and surplus food produce of each of the large divisions of India. The Commission tells us that, from rough estimates made from data of which the best it can say is that "we hope to see them more accurately established," the increased production of the country has kept pace with the requirements of a growing population. Now, we need no Famine Commission to tell us this. We all know that in ordinary years, with a fairly favourable season, India is not only able to produce food sufficient for its own population, but to leave over and above what is actually consumed, surplus stocks to meet any immediately threatened contingency. We know, moreover, that large tracts of land may yet be brought under profitable culture, and that with improved methods and extended irrigation, there is reason to believe that increased production may yet be secured. What we miss the Government to tell us, however, is whether and how [illegible] well-informed and influential [illegible] in many parts of the country [illegible] have been [illegible]

arable lands, to an extent which scarcely leaves good culturable land available for the supply of the future needs of an increasing population. Such fears admit of being easily allayed by a careful compilation of statistics. And no time we think is more suitable for this than the present. The period after the famine may be made the starting point of more complete and accurate statistical inquiries, as was done in Great Britain some four-and-thirty years ago. Mr. Caird tells us that statistics in the United Kingdom began to be collected from the time of the potato famine of 1847 in Ireland. "Not for twenty years" says he, "were there any complete returns from Great Britain. After long perseverance, I succeeded in obtaining a Resolution of the House of Commons in favour of the collection of agricultural statistics, which were in consequence carried out for the first time in 1867, the collection of the returns being made by the officers of the Inland Revenue, and their arrangement for publication by the Statistical Department of the Board of Trade;" and fourteen years' repetition of the inquiries has supplied the officers of the Inland Revenue with such a fund of information as to admit of no question as to the substantial accuracy of their returns. It is not, therefore, too much to presume that an era of correct agricultural, vital, and economic statistics may dawn upon this country by the starting into life of the Agricultural Department.

We may here briefly indicate the directions in which steps may be taken to ensure more correct and complete returns, since it is hardly necessary to repeat that upon their completeness and accuracy will depend the public view of the prospects of every coming year in India—prospects in which the Government, no less than the mercantile and general public, are interested. As a first step, the present returns of rainfall in every district require to be more accurately framed. Old and ricketty rain-gauges now in use in some districts must be replaced by new and improved gauges, and arrangements must be made for a regular registration of the gauge indications by responsible persons, and not through the agency of office sepoys or pattiwallas as is often the case now. Government, indeed, supplies us with weekly season reports purporting to convey information to the public about rainfall, state of crops, prices of food grains, &c. We have no wish to condemn these reports, but the best thing we can say of them is that a great deal of paper and printing is wasted upon them. At all events the reports might be made to subserve the ends of statistical inquiry much better than they do at present. Any one who examines these weekly season reports a little closely will find, first, that the record of rainfall given in them has reference to the fall only at the head-quarters of the district, and secondly, that it gives the total fall of the week. But the rainfall at the head-quarters affords, we submit, a most inadequate measure of the rainfall of the entire district, which contains some eight or ten talukas or sub-divisions each covering an extensive tract of country. Again, it is not an unfrequent phenomenon of rainfall in this country that a sudder station may be blessed with a full average rainfall, while talukas of the district may be without a drop of rain, so that plants may wither, and crops may be destroyed there, though the sudder station may be all the same for such deficient fall in the talukas. Then, again, what is of much importance to the steady growth of crops and a bountiful harvest, is a *seasonable* rainfall, more than a sudden and excessive downpour. Half an inch of rain every day for a week, for instance, assists a healthy growth much better than a sudden downpour of four inches of rain in a single day. These phenomena the season reports do not, it may be seen, well record. The same remarks apply to cultivation returns, and to crops and prices. Nobody in the district, so far as we are aware, is responsible for correct returns as to cropped areas devoted to wheat, bajri, peas, orchard produce, drugs and narcotics, condiments, starches, oil-seeds, dyes, cotton, fibres, &c. We make bold to say that the figures given under these heads in the tables for agricultural statistics, according to the forms prescribed by the Government of India, are mere guesswork, put down according to the fancy of the village kulkarni. They cannot stand the test of a minute examination, the fact being that there is no organized agency to look after the work, and nobody to check the figures. As to prices of food grains published every week, one is at a loss to make out whether they are retail or wholesale prices, and whether they are the prices ruling at the sudder station of the district against which they are marked, or the average of the taluka's prices. All these circumstances, trifling as they may at first sight appear, cause variations in prices. Unless the varying causes are recorded, prices of grains in a district afford no better indication of its economic condition than the figures of rainfall. Another element in determining the question of the quantity and value of the food grains in a district is the average yield per acre of its staple products. This is usually done by means of crop experiments conducted in a haphazard manner, which afford no scientific basis to work upon. In short, until the Statistical Department is organized as a special and distinct agency well trained to its work, there is little hope of problems such as those of food supply and home produce, of surplus stocks, prices, and economic conditions meeting with their proper solutions. If the proposals of the Famine Commission lead to the organization of a trained special agency such as we advocate, and which will supply the requirements of modern statistical science, the Commission will, we consider, be looked upon as having done no small service to India since no better way can be suggested of setting at rest many economic questions of the highest importance which at the present moment are matters of controversy in the absence of correct statistical data.—*Bombay Gazette.*

INDIGO IN THE PUNJAB.

THOSE of us who have sufficient of the old Adam left to retain the primeval instinct of gardening, must often have undergone the humiliating experience of finding some self sown plant blossoming gaily in the border long before its carefully nurtured, theoretically-grown pot companions thought of a bud. Indeed, one of the most striking characteristics of India is its passive resistance to whip or spur. The very soil resents being hurried and worried; it cannot run with new fangled experiments, deep ploughing, and artificial manures; but if left to take its own course gives—proportionately to the labour spent—a very fair result. So, while the Department of Agriculture and Commerce make costly experiments of superphosphate of lime on *kunkur* soils—a curious experiment, by the way, seeing that the infertility of such land arises from a natural excess of lime—while they report on the growth of guinea-grass and compare cotton staples, while European companies are started to give an impetus to the [illegible] and Government talks [illegible] its revenue rep about prickly chomfier and *eucalyptus* trees; little and self-sown indus tries, such as the manufacture of Indigo in the Multan and Mozaffargarh districts, spring up here and there, strong and vigorous. Indigo has, we believe, been grown there in small quantities since time immemorial, but the increase of cultivation since the extension of canals, especially in the last named districts, is simply marvellous. Nor do we wonder at it, for the climate is thoroughly suitable, and there is no reason whatever why indigo, fully equal to the Bengal dye, should not be manufactured. As regards to the growth of the plant itself, the conditions are far more favorable than they are down country. As every one knows, the greatest enemy the indigo crop has is rain: either when it prevents the seed from germinating, or when, by persistent falls it absolutely washes the dye from the mature plant, and so diminishes the yield. In Bengal, Indigo often has to be sown three or four times; and it is this susceptibility to excessive moisture, that gives it a bad name amongst the *zemindars*, who look on it as a *suberdust* crop. In the rainless tracts of, and below, Multan this danger does not exist, while the supply of canal water is ample for irrigation purposes. It would only need one glance at the magnificent indigo crops, now standing in these districts, to convince our readers that, as far as nature is concerned, there is no difficulty. The art, however, is not so satisfactory. Muddy water is used for steeping the plant; the resulting infusion is evaporated in the sun—proceedings which involve a considerable admixture of grit, and a very great loss of colour. Consequently, we find that, while Bengal indigo sometimes brings in Rs. 400 a maund, that grown in the Punjab used to sell for Rs. 40! During the last few years, however, an enormous improvement in manufacture has been effected, with a corresponding rise in prices, and this year some consignments have actually reached a price of Rs. 140 a maund. With proper vats and skilled supervision, there is no doubt of what the result would be; and always providing that the lately raised scare about the discovery of artificial indigo is not true, we are certain that a factory on the Bengal plan would yield rich returns to any one who started it. As it is the *zemindars* are daily becoming more and more alive to the value of the industry; and well they may since we believe it to be a fact in one village of the Mozaffargarh district where the total Government *jamma* is Rs 300 that the cultivators have netted between Rs. 7,500 and Rs. 10,000 on their indigo crops alone. In fact, what a few years ago was one of the poorest districts in the Punjab, bids fair to be one of the richest. This is of course most satisfactory both to the cultivator and to Government who, as the district has just been re-settled, will of course have taken these facts into consideration, and gain a corresponding increase of revenue.—*Civil and Military Gazette*

ASPARAGUS ON CLAY SOIL.

WHERE there's a will there's a way, and this is the best time to plant Asparagus. This sea and sand loving plant does not like a cold clay soil, and it may be (but should not be) a hard task to make a fine plant, wherefrom to cut fat sticks, on a soil that may be compared to wet putty in winter and Babylonian brick in summer. Before I became a Hermit the heavy undrained clay at Hermitage had never borne a crop of Asparagus, but as I brought with me experience of a quarter of a century of horticultural work on the worst soil that could be found in Stock Newington, I ordered a beginning to be made for Asparagus at the upper end of a piece of very wet grassland that slopes very slightly from the site selected towards the natural flow of the water. And the first step taken was to sow a bed in a sheltered garden a furlong distant, where we could not afford room for our bearing beds, the only object being to obtain plants to begin with. The rule determined on was to form two beds every year until a certain space was covered, each bed to be 4 feet wide and 60 feet long, on a foundation of unmitigated clay, a considerable piece of which was to be converted into a kitchen and reserve garden.

When your people understand you the wheels do not need greasing. If there is a bit of hurry you do not run against each other, and if an accident happens no one is in haste to utter a word that sounds naughty. The faithful Tom sauntered up to the high road, and caught sight of a string of carts conveying the rubbish from some buildings that were in process of demolition, and with due caution of a Jew he asked, "How much," There was a bargain made instanter, and we had carted in, for "a mere song" (which I am now singing) a grand lot of the rubbish. It was knocked over, and the large stuff wheeled away as metal for roads, the woody stuff went towards the chimneys, and the mixture of plaster mortar, sand, and small broken brick remained as the raw material for the manufacture of Asparagus.

This stuff being laid in convenient ridges, the top spit of grass turf was taken off on a space 60 feet long by 14 feet wide, leaving an ample margin for two 4 feet beds and a 2 feet alley between. But the margin was none too much, as you will see. Then we brought to the spot all the old leaf-soil and cleanings of melon pits, and scrapings of turf from odd corners—a sort of indefinite infinity of all kinds of rubbish, but every bit containing something suitable to feed a plant. All these things—the top turf, the calcareous rubbish, the leaves, and the sweepings—were thrown together methodically and the mixture made a great raised bed, looking very grey and stony, except where chips of live turf stood out to make a few dots of greenness.

This being accomplished in the month of March, the new bed was at once planted with Ashleaf Potatoes; while on the other side, in the sheltered garden, the Asparagus to follow the Potatoes was making a beginning of its noble career. The Potatoes were a grand crop, good in every way save that they were found in the skin; and the only exhibit n they were fit for was that which took place daily with the aid of a joint or a bird or it might be the o [illegible] family dinner.

When September arrived and the "Taters" were gone, the new big bed was well stirred over, and some fat dung was laid in the trenches as the work went on. All being made tidy, the ground was pegged out to form two beds of 4 feet each with a 2 feet alley between; and then we made shallow furrows for the plants. These were taken carefully so as to leave the seed-bed well occupied to furnish plants for the next year without need for another sowing. In planting we put single plants in their places and slightly covered them with the finest of the stuff near at

hand, and when this was done the earth from the alleys and outsides and ends was strewn over and amongst them, all lumps and stones being thrown out, and the bed was then raked over and the rows carefully trodden to fix the plants in their places.

As regards distances, we began with a line down the centre of each bed, and plants at 18 inches distance. From this each way was a line 15 inches distant and plants 18 inches apart. Thus, the two outside rows were 9 inches distant from the alleys, and the plants throughout were 18 inches by 15 inches apart, every one carefully singled in the process.

They were green when planted, and so continued for a month, when they were done brown and were cut down, and the work of the season came to an end in the laying on of a thick top-coat of fat dung that had been saved for the purpose under cover.

Early in the subsequent spring the ground was very carefully pricked over between the rows and very thin sowings of Radishes and Lettuces were made between rows. These were removed from time to time either as weeds or as crop. Where a Lettuce stood near an Asparagus crown he had to take flight along with a groundsel or a Chickweed, but enough remained to pay the rent, and came to perfection and did no harm. We did not cut a stick the second year, but we cut fairly the third year, and greatly the fourth; and, except for the circumstances that bring mundane things within finite measures might have gone on cutting our sticks for ever.

For three years we continued to lift plants from the original seed-bed to furnish the new bearing beds that were made each spring, and having borne a crop of Potatoes were planted with Asparagus in September. The management never varied, except that, as we found the growth very strong we gave the plant a distance of 2 feet in the rows still keeping to the 15 inches measure between them. A dressing of fat dung was put on the top after cutting down in autumn, and we soon learned to give another dressing in spring, which was peculiarly beneficial, and must have a paragraph to itself.

It is not the rule to protect Asparagus. Now, our lower garden at Hermitage was blest in spring with a strong supply of pure air from the hyperborean regions. When a frosty wind swept over the marshy meadows and slid through the rising grass like a flash of lightning with a razor edge, I used to notice that many a fine stick just rising would be cut off, and many that followed were flinty in their hardness, owing to the check to growth from the sudden onslaught of the east wind. And so I had a great sweep up made of all kinds of light rubbish. Rough grass was cut from neglected corners of the shrubbery, leaves and sweepings of the hay-loft were gathered together, and this light stuff was put over the crowns in little heaps. The rising sticks often lifted up the light protection in a lump, like the head of a Mushroom, and the sticks so protected were as green as needful, and very much more fat and tender than such as had to fight through without any such help. It became therefore the practice to save leaves and light litter for the spring dressing of the Asparagus beds, and the stuff was never put on until it was really wanted, because it might have been blown away, or might have quickened growth, which in so exposed a situation was not to be desired.

It is the custom, I observe, to put a crop of Cauliflower, or some such thing in the alleys between Asparagus beds. This, in my opinion is bad practice, allowable only in the first season, after which it becomes a profitless game of burning the candle at both ends: Those alleys should be kept clean and the outside rows of Asparagus will root into them and enjoy the range; therefore, to dig the alleys is to do mischief. Far better keep them open, for the roots to run below and for the cultivator to run above. In the course of his running he may find it expedient, as I have done, to stake his Asparagus beds with light brushwood to afford support, for when the top grass is snapped short off by the wind the growth of the next year's crop is prejudiced. Where frost and wind are unknown it will of course be waste of time either to protect or support Asparagus.—*Shirley Hibberd.*

AGRICULTURE AND COMMERCE IN JAPAN.

THE *Nichi Nichi Shinbun*, of 14th April, contains the text of an interesting memorial, purporting to be addressed to His Excellency the Daijo Daijin, by their Excellencies Okuma Shigenobu and Ito Hirobume, and detailing the grounds for the formation of a separate State Department to be termed the Bureau of Commerce and Agriculture. The following is a careful translation :—

"To effect a more complete reform in the conduct of departmental affairs, it is urgently necessary that all those sub-departments having control over husbandry and trade should be amalgamated into one independent department. Under the present system, all matters relating to agriculture and merchant shipping are controlled by the agricultural bureau and general post-office branches of the home department; those relating to commerce by the board of trade, a branch of the finance department; while no office in connection with industry has existed since the industrial board, a branch of the public works department, was abolished. On examination into what has been done by those bureaux, we find that the duties for which they were established, namely, to lay down systematic rules for the encouragement and protection of husbandry and trade, and to stimulate those industries without favour or partiality, have been made mere minor objects.

"This condition of public business must be altered; moreover, the present system of division under two chief departments is attended with inconvenience, an occasional duplication of business, and an increased expenditure as the following figures will show :—

			Yen.
Agricultural Bureau Expenditure	...	...	31[illegible]
Post Office	...	...	,103,364
Do. Marine Office	...	...	58,703
(Mitsu Bishi subsidy excluded.)			
Board of Trade	...	...	66,[illegible]17
Great Seal Office	...	...	81,941
Forest Office	...	...	200,000
Total	...	...	1,832,100

To which must be added expenditure on the Mita training establishment, agricultural college, and Shimosa farm, under the agricultural bureau, amounting to 142,793 yen, making a grand total of 1,976,901 yen.

"In Austria, husbandry, trade and public works, form one department; in Germany, France, and Italy, there is a special department for husbandry and trade; and in countries where there is no special department, the business is performed by other departments. From this it is clear that trade and husbandry are not less important than public works and other business. The postal service has become extensive, embracing international treaties, consequently in some countries it is an independent department; while in others it forms a semi-independent department.

"These are reasons why we recommend the formation of a new department, etc., etc."

(Signed) OKUMA SHIGENOBU, Sangi.
" ITO HIROBUMI, "

LOCUSTS IN AMERICA.

I HAVE had occasion more than once to refer to the destruction caused by locusts or grasshoppers to the agricultural produce of the States bordering the Rocky Mountains on the east. There cannot be the least doubt that these have some years done a fearful amount of damage, and are yet looked upon as one of the greatest bugbears to farming on the plains. In many districts there are various kinds of grasshoppers or locusts, which each do a trifling amount of damage; but the real migrating locust or grasshopper is the *Caloptenus spretus*, and is native to the high and dry regions of the Rocky Mountains. The best professional authorities place his habitat in the region between 43 and 53 degs. north latitude and 103 and 114 degs. longitude west Greenwich. Portions of this territory are said to be deserted for other places, but always somewhere in this immense domain they are sure to exist in considerable numbers. The conditions for their increase are dryness and warmth. With these conditions those that are spread over this vast region increase with amazing rapidity, and if two favourable seasons succeed each other they are sure to migrate. Professor Aughey, an authority on the subject, says that after they hatch out in the spring it takes about seven weeks before they reach their full growth. During this time they moult five different times, and each time change slightly in colour. Only at the last moult are full wings acquired, the thorax flattened, and the insect ceases to grow. Where now they cover the ground in their native haunts the scanty vegetation is soon exhausted, and they then manifest their peculiar instincts. They take short flights for several weeks, apparently to test the strength of their newly-acquired wings. The warm, pleasant days, with gentle winds, are their favourable periods for flight. When all is in readiness they rise from eight to ten o'clock forenoon, and move off with a rapidity dependent almost entirely on the wind, varying from three to about fifteen miles an hour. They do not move in broad sheets but in columns like fleecy clouds, from one to five thousand feet thick. They sometimes continue their flight through clear, warm, moonlight nights, but more generally come down between three and five o'clock to feed. On the following day they continue their flight if the weather is favourable. A change of wind or a fall of temperature brings them to the ground at any time. From their native habitat they move mainly in an easterly, south-easterly, and southern direction. Moving in this direction, those that migrate from Montana by the middle of July reach Nebraska and Kansas some time in August and September. They do not always deposit their eggs where they first light down; frequently they remain from one day to three weeks, and then move further on before egg-laying is commenced. The numbers that light down are often enormous. In Cedar County, Nebraska, in 1866, during July, they appeared in such numbers that the sun was darkened and limbs of trees broke down and bent by their weight. It was very difficult for one to move through the living mass. On the Union Pacific line of road the engine wheels and rails sometimes got so greasy running through a cloud of them as nearly to stop the train. Such cases are extreme and exceptional, but have occurred at long intervals over limited areas. It has been no uncommon thing, however, for them to be so abundant as to entirely cover the ground. The female lays her eggs from middle of August to beginning of October. They are mostly deposited in high, dry, and somewhat compact ground. The number layed is simply enormous when the "hoppers" are thick. One authority says as many as 14,000 to 20,000 eggs to the square foot have been picked up. When severe frost comes on the old die off rapidly; at the appearance of permanent cold weather they have all disappeared. In some of the warmer portions of Kansas and Nebraska some of the early laid eggs hatch out, and are killed with the first winter cold. Again, warm weather in January or February may hatch out many more, which are also killed by subsequent cold weather. The usual hatching time is March and April, and, as already stated, as soon as the last moult they seem disposed to migrate. No exception to this rule is known on the plains. In Iowa, Nebraska, Missouri, Dakota, and Kansas they are disposed to return to their native domain in the Rocky Mountains. They, therefore, move mainly northward and westward. Their instincts seem to force them to the higher and drier regions where they originated. Such was, I understand, the case when countless millions left these States in 1876. In 1877 the spring was cold and wet, and a great many of them perished, and those which did survive seemed sickly and demoralised. These survivors first moved northward, then southward, and finally were seen to move in all directions, one column above another, moving in opposite directions. The greater part of this season's locusts evidently ran out by staying too long in a climate unsuitable for them. When the migrating locusts reach Kansas and Nebraska, the greater part of the wheat, barley, and oats are safe; corn and the gardens are the victims. If they come before the former is sufficiently ripened to resist their attacks, which is not always the case, a swarm of locusts can ruin a field of corn in a few days or even hours. Often the fields are only partially destroyed. Sometimes the silk and foliage are partially eaten off and the [illegible], so that the crop [illegible]

mature. If they leave at this stage all is well, and if not they deposit their eggs and so endanger the wheat crop next spring. The countless numbers that are hatched out in the spring become exceedingly voracious. As they soon commence to move by jumping in one direction, they are apt to devour everything in their path. This continues until they are old enough to fly, when they remove to other regions. Generally some corn can be saved in spring, and late planting may entirely escape. Sometimes the third planted corn during locust years yielded a fair crop. The cereal grains are, however, usually largely destroyed between the period of hatching out and flight of the locusts. No means have yet been devised for destroying the locusts on their appearance in swarms from the north-west. The injury they then do is, as already stated to the corn and gardens, and also to the fruit and forest trees A great many methods are, however, devised for destroying their eggs, all of which are more or less successful, some so much so that some farmers have been known to save their crops, whilst others have had them entirely eaten up. The plans adopted are too numerous to mention here, but unfortunately the farmer only too often stands and looks on, and does nothing until his crop is destroyed. It requires energy and decision to fight them, but when it is properly commenced and persevered in it is successful. Owing to the sudden and extreme changes of temperature experienced on the plains locusts can never become localised on the agricultural portions of the prairie States. The spring of 1877 is a notable illustration of this fact. In March and April countless millions hatched out, then followed cold rains with extremes of temperature. In consequence, in spots which seemed alive with them previously not one could be found a few days afterwards. As a matter of fact they cannot do with a low altitude and moist climate. The amount of damage done by invasions of locusts have been usually over-estimated. There can be no doubt but that they did considerable damage in 1874,'76, and '77, but by no means as much as was currently reported. The drought, human indolence and carelessness, doing much more. There were men those years who never touched their corn after it was planted, and grew nothing but weeds, and blamed the locusts when these were miles distant. Sometimes there are many years between locust invasions, and it rarely occurs that a whole State suffers at once, while the small visitations are frequent. The destructive ones occur at long intervals and over comparatively small areas. One reason for the destructiveness of locusts hitherto has been the small area in the thickest settlements under cultivation. When the area of cultivation is trebled the damage will be much less. Another more important factor against their increase and destructiveness is the increasing rain-fall of the prairie States advancing with cultivation. It has been noticed how the wet spring of 1877 destroyed the greater part of those that appeared that spring. With extended cultivation the moisture of the climate is likely to increase, and the instinct of the locust will tend to keep it away from a climate hostile to its existence. While, therefore, the locust in the trans-Missouri region is extremely undesirable, it is by no means the pest that it is usually represented to be. Human energy and skill can to a great extent counteract its injurious effects. I have been mainly indebted to careful data collected and published by Professor Aughey for the facts in this article, but these have been largely corroborated by a great many old settlers I have met during my peregrinations over the Western States and, as I have had to refer to them oftener than once, and this point of locust is often made a very powerful argument against the prairie States I have thought it best to lay a plain and unvarnished statement of the facts so far as I can gather them, to show what this locust pest really means. As a matter of fact it can be neutralised to a great extent by protective measures, and is not by a long way the greatest drawback arable farming has got on the plains of the prairie States as any settler who has been here over the locust year will at once inform you. I had been led to look upon this locust plague as something awful, and delayed writing until I could get authentic information, which in a form, I have attempted to place before the reader.—*Glasgow Herald*.

COTTON PRODUCTION IN THE UNITED STATES.

THE Census report upon the cotton growth in the United States presents many facts of considerable interest, both of a commercial and geographical nature. The whole annual production of 5,737,257 bales is grown on 14,441,993 acres, limited to 14 States. Of these, the highest in rank is Mississippi, which produces over eight-tenths of a bale per head. It is generally considered that the special fertility of this State is owing to the large area of the 'Yazoo' bottom of the Mississippi river; in reality, however, only one-fourth (27 per cent.) of the cotton production of the State comes from this source, one-half of the whole being produced in what may be termed the first-class uplands or the little land-belt bordering the Mississippi bluff and the two prairie belts. The remaining one-fourth is grown in a scattered way over the sandy uplands, bearing more or less of the long and short-leaved pine, that forms about half the area of the State. Another reason of the exceptional yield of this State is the fact that cotton culture is the one pursuit to which the population devotes itself. The yield of the State is 955,808 bales, the average per acre being over three quarters of a bale, even with the imperfect tillage and incomplete picking of the crop that at present exist. Estimating the lands reclaimable by simple exclusion of the Mississippi overflows at only 3,000,000 acres, the annual production could be readily raised to 1,250,000 bales, without any change in the method of culture, in the Yazoo bottom alone. With improved cultivation the production could easily be brought up to 5,000,000 bales; and thus with a similar improvement in the culture, of the upland, the State of Mississippi could grow the entire crop now grown in the United States. Georgia comes second in the list, though her physical capabilities are very different from those of Mississippi, the first and second-class soils being very limited. With half a million more inhabitants than Mississippi, the cotton product of Georgia is only about half a bale per head and the average per acre two-thirds of that State. But Georgia owes her yield [illegible] bales, to better cultivation, the use of fertilizers, and the [illegible] of an industrious population. Alabama (699,654) would stand hard in relative proportion of yield, but she is overstepped by Texas, which has an enormous area and is therefore enabled to assume the third rank in actual figures. Alabama is a newer State than Georgia, and, as her agricultural features are almost identical with the latter, it would be expected that there would not be so much difference in the yield; and the inference, therefore, is that while Mississippi is still within the period of the first flush of fertility, and Georgia has reached the stage when the use of fertilizers is renovating her fields, the soils of Alabama have passed their first stage, though her population has not yet realized the necessity of sustaining the powers of the soil artificially. Florida shows a low product of less than a quarter of a bale per acre, the land being mostly pine and cultivated without manure. Nevertheless the area of production has steadily increased and the population very largely so, though this is due more to the fact that the culture of tropical fruits has lately engaged the attention of capitalists. Tennessee (330,644) presents some curious features —viz., that her total production is less than half that of Alabama, but her average product per acre is one-half greater, and equal even to that of Mississippi. The explanation of this is that the cotton production of Tennessee is concentrated upon a comparatively small area of highly productive land, the rest being devoted in preference to grain, tobacco, grasses, and other industries to which the climate and soil are adapted, while in the other cotton-growing states, cotton is very generally cultivated as a matter of course regardless of all other industries. Arkansas produces 608,000 bales on about a million of acres, and presents nothing peculiar in her statistic. Louisiana (508,539) like Tennessee is engaged in other cultivations, and notably that of the sugar cane; but the rate of production of cotton is singularly high. The small parish of East Carroll in the north-east corner of the State, has the highest average product of any country in the cotton growing States (1·95 of a bale) and this little spot is apparently the centre of maximum cotton production on natural soil in the United States, and probably in the whole world. Texas, although returning a yield of 803,642 bales, stands only 11th in rank in production per acre, partly to be accounted for by the accidents of the season during to the census year. The coast countries produce but little cotton while inland, between Red River and San Antonio, about 25 per cent. of the total is grown on black prairy land, the average product per acre on such land being 0·34 bale per acre. The Carolinas, which stand sixth and eight respectively, were the first of the original Union of Thirteen to place cotton culture upon a permanent foundation by adopting a system of regular returns to the soil, and the high product per acre as compared with Georgia and Alabama on the one hand and with Mississippi on the other, exhibits strikingly the tide-wave advancing westward, the ebb of the first fertility in Alabama and Florida, the rising tide of restored productiveness in the Carolinas, with Georgia on the westward slope of the wave on which it is rising and showing distinctly a higher product per acre in its eastern than its western portion, where the use of fertilizers is much less extended.

TEA AND SILK FARMING IN NEW ZEALAND.

SOME six years ago we directed attention to the island of Ceylon as likely to become an important tea-producing country in the future, and to Australia as a vast field for sericulture. Since then the strides taken by the former country in tea growing and manipulation have been simply extraordinary. This will be admitted when we mention that at the late Melbourne Exhibition the tea planters of Ceylon carried off 11 first awards out of a total of 49 bestowed, and altogether, they secured 36 honors for the 78 samples they exhibited, out of a total number of 270 awards earned by 506 samples shown by the various tea-producing countries. It is with a feeling of pleasure, therefore, that we congratulate our protégé of 1875 on having taken so distinguished a position in the great Colonial gathering of 1880 and 1881. It is not our purpose at present to re-direct observation to the progress of the sister occupation in Australia, although we understand that silk culture there has been fairly successful; but rather to allude to an important proposal, having for its objects the farming of tea and silk as a twin industry in New Zealand, which is at present being discussed in this country.

Practical persons have for some years been studying the scheme in all its bearings, and are assured that the North Island possesses many of the necessary advantages, and that the province of Auckland offers nearly all of them. There the temperature rises to between 90° and 100° Fahr. nearly every summer, with occasional leaps to 110°; the mean of the coldest month is 51°, and that of the warmest 68°. Snow is seldom seen except upon the mountain summits, and even slight frosts are a curiosity on account of their rare appearance or their evanescence. Moderate showers, spread over 186 days of the year, fall annually to the extent of 47 inches; the hot blighting winds and dust storms of Asia, so devastating to vegetation and so baleful to the silkworm, are unknown; and the mulberry, ailanthus, castor-oil plant, and numerous semi-tropical shrubs and trees flourish profusely in the open air. For China and Japan tea these advantages promise the perfection of climate, and the rarity of frost favours the belief that the indigenous Assam shrub might also be successfully cultivated. We have noted the guarded expression that Auckland offers nearly all the advantages desiderated for tea and silk farming, the exceptional circumstance being the want of cheap labour. Were it proposed to cultivate and prepare either product by itself, we should feel pretty well assured that in no sparsely populated country, however suitable otherwise, could either tea farming or sericulture conducted separately pay. But pursued together on the same estate under the same general management by much the same staff of employes, the scheme assumes rather an inviting complexion. Indeed, if the economy likely to be effected by the efforts of a highly trained staff, using every scientific and mechanical aid to produce two or more important and valuable commercial articles instead of only one, be appreciated; if we bear in mind the moderate price of land generally in New Zealand, and Auckland's homogeneous and equable climate, so favourable to abundant and varied crops; if we recollect how trifling must be the expense of inland carriage to a shipping port in a country no part of which much exceeds 100 miles from the sea, as compared with the serious outlay incurred for transport by the tea and silk of China and India to the coast; if we give due weight to these advantages, and then reflect upon the enormous local demand for at least one of the products, the belief seems most reasonable

that the higher outlay for wages will probably be far more than counterbalanced by reduced expenditure in other directions

Several objects actuate the promoters of this enterprise, and their proposals may be thus epitomised :—"It is proposed to establish a syndicate with adequate capital, under the title, probably, of 'the New Zealand Tea and Silk Company (Limited),' for the judicious employment of capital and labour at the Antipodes by the acquisition of an area of say 30,000 acres in Auckland, or elsewhere in New Zealand, to be used partly for the land settlement of special classes of immigrants, and partly for the inauguration and prosecution of sundry important industries particularly those of tea growing preparation and sericulture, and, with the subsidiary design of offering agreeable and remunerative work to a great many females of education, who have been deprived through misfortune or fraud of their incomes, and of trying to improve the habits of the aboriginal population by engaging them in congenial employment whenever practicable." In explanation, we may say it is expected that one of the first results of the successful introduction of tea and silk farming as a combined industry into New Zealand would probably be a copious influx of immigrants more or less connected with the industries in question or with allied trades. For the accommodation of such, and in order that handsome immediate advantage might accrue to the syndicate, the acquisition of a much larger surrounding or adjoining acreage than would otherwise be necessary is proposed. It is suggested that portions of this reserve land should be sold, let, or used in the most profitable manner as the state of trade at the time might dictate, and on other parts selected farmers of ability and some means, with labourers and others of good character, should be settled. Food would thus be provided for the infant colony, and at the same time there would be a battalion of reliable assistants upon which to draw during any sudden crisis. In short it is suggested that, in addition to the functions of tea and silk farmers, the syndicate should assume those of a land settlement company.

The purely industrial feature of the scheme consists in the gradual plantation of an area of 3,000 acres with tea and mulberry shrubs at the rate of 100 acres or more of each per annum. Simultaneously with this work, other products, such as olives, grapes, oranges, lemons, small fruit, honey, sugar, &c., are intended to be reared, all of which, being usually considered more remunerative than even the most lucrative crops of the ordinary farmer, would soon furnish a material item in the income of the syndicate. During the time occupied by the tea and mulberry bushes in arriving at a yielding age—in the one case four years, if from seed, and in the other two years, if transplanted at five years old—the necessary buildings would be erected, the water service surveyed and arranged, water-wheels and other machinery constructed and the general cultivation and improvement of the estate attended to and gradually increased. In the course of the second year the first silk harvest would probably be gathered, and the net returns, if all went well might amount to £30 per acre for the yielding area of mulberries; a requital which as far as the leaf crop alone is concerned, would probably be doubled after the bushes had been five years in situ. Until the fourth year there will be no appreciable income from the acreage under tea, and as this shrub has not yet been grown on a commercial scale in New Zealand, the promoters very properly think it better in the meantime not to hazard any opinion as to the probable return. But for the reasons already given united to the circumstance that the present large local consumption of 1,500,000lb. a year would render any export of the product for some years unnecessary, thereby effecting a saving in freight, commissions, and dock charges, they look for a very gratifying result from this source also.

To the philanthropic the intention of employing educated female labour in the more delicate manipulations is an appeal which has only to be known to meet with a hearty response. The successful employment of Maori workers, where practicable, would also be a philanthropic object well worthy a trial. But apart from this interesting, although a subsidiary, feature of the proposed undertaking, we think it may be said to contain the elements of success, and it deserves the careful consideration of those who are anxious for the development of our Colonies. Further information may be had of Mr. William Cochran, of Overdale House, Dunblane Perthshire, N. B., who is at present performing the duties of interim secretary.—*British Trade Journal.*

HAY-DRYING APPARATUS.

MR. A. PEEBLES, agent to the Duke of Northumberland, has drawn up the following report with reference to Gibbs' hay-drying machine on trial on his Grace's estate :—

I am requested by his Grace the Duke of Northumberland to communicate the results of our recent successes with the hay-dryer at Albury Model Farm. We have succeeded during the most unfavourable weather in securing our second crop of water-meadow hay in excellent condition. This is all the more satisfactory as the grass was young and succulent, and required a large amount of drying. Mr. Whellens worked the grass into cocks as quickly as possible, and when it was fair overhead these cocks were loaded into the wagons and passed through the machine. During the late heavy rains the grass was so saturated with moisture that much of it had to be passed twice through the dryer before it was fit for the rick. This occupied upwards of two hours and a-half for two tons of hay ; but if the water is well out of the grass, it will dry from a ton to a ton and-a-half per hour. Since we finished our rick Mr. S. R. Tristram, Q.C., has been using his Grace's machine to dry some very wet water-meadow hay, and is much gratified with the result. He had a quantity of old hay which was so much damaged by wet as to be perfectly unfit for food. I reported to you some time ago that part of this hay was put through the machine, which purified it from mould and dust, making it perfectly innocuous, and cattle and horses ate it at once. It was, however, dry and brittle, and was wanting in that aroma which is so desirable in good hay. I advised Dr. Tristram to mix it with grass newly cut, and put the two through the machine together. The experiment was tried yesterday at the model farm in the presence of a large number of ladies and gentlemen interested in agriculture. The hot-air blast purified the old musty hay, the green grass imparted a pleasant aroma, and the result was a fair sample of wholesome hay, which will be exceedingly useful during this season of short crops. The visitors expressed approval, and pronounced the experiment a success. From a detailed statement of expenses prepared by our farm bailiff, I find it costs 18s. per ton to make hay in wet weather, and about the same amount to purify damaged hay and mix it with new grass. The advantage of this process of converting mouldy hay into wholesome food cannot be over-estimated. The reprehensible practice of making such stuff palatable by treacle, spicing, or steaming is a source of danger which subjects farmers to unforeseen losses. There can be but one opinion as to the value of making such stuff wholesome and palatable at the small cost of 18s. per ton, which includes hire of engine, fuel, and labour.

The rick of water-meadow hay we had previously finished under such adverse circumstances was examined, and the quality considered all that could be desired. These results are highly satisfactory, and demonstrate that in wet seasons these machines will be of immense advantage. One of his Grace's tenants, whose hay was spoiling in the field, is at present using the drier to save his crop before it is unfit for food. Our unfortunate experience of adverse seasons invests this subject with special interest to agriculturists, and speaks in forcible language in support of any means which can be adopted to secure the crops in our changeable climate.

CULTIVATION OF THE PINE APPLE.

THE cultivation of this valuable fruit, for which there is a gradually increasing demand in the markets of the United States and elsewhere, is a rapidly-progressing industry, and one which cannot fail to return considerable profit to the producers if proper care be taken in the selection of suitable tracts of land and a careful routine of culture be adopted.

The soil adapted for this industry is one which is best described as a gravelly loam, neither too much clay nor too much gravel, the first of which would render the ground wet, the latter too dry ; an intermediate one between the two is therefore desirable, and its value will be greatly enchanced if it contains plenty of decaying fibrous material. The pasture land at present in "ruinate" on the Liguanea Plains offers a most suitable soil, and one which is also to be highly recommended on account of its proximity to the largest seaport of the Island.

Commencing the cultivation with a piece of ruinate, the first work is to cut all bush, &c., and, if possible, have it removed from the ground without burning, as by burning the grass and weeds which are on the surface of the land will be destroyed, and we shall see that this is required in our method of cultivation. Having laid off the land in straight lines by placing stakes four feet apart at the ends and straining lines between them, we commence and hoe off all grass and weeds, arranging them in the centre between the first two lines, thus forming a ridge. After two rows are thus formed we commence with pick and shovel and loosen the ground to the depth of six inches in the centre space between the rows of weeds, and throwing half the soil thus stirred on the top of each row of weeds we proceed thus till the whole is covered, forming well defined ridges about 18 inches wide and 9 inches high with an interspace of 30 inches. After allowing a few days for the weeds and grass to decay in some measure and the ridge to settle the suckers may be planted. These should be selected after the bearing season is over, or indeed any time between October and January, if the weather is not too wet for planting. The lower dry leaves of the suckers should be removed to afford the small roots in their axils ready access to the soil, and then placed in the centre of the ridges to a sufficient depth to render them able to remain upright, to assist which they should be firmly rammed with a wooden rammer, leaving a small basin-like cavity at their base to hold sufficient water to solidify the soil and fix the plant firmly in its place. After the first or second watering no more is necessary unless a period of exceptional dry weather is experienced. The plantation must be kept free of all weeds, and the hoeings may be left in the trenches between the rows ; different kinds of vegetable refuse may also be placed there, and will benefit the pines by its gradual decomposition, as well as by the moisture it affords. Pines are not, however, as a rule benefited by large quantities of manure ; a little may be applied at times, but gradually, as it is apt to induce them to rot at the base and thus spoil many a fine plant. The best and most profitable kinds are the Ripley, Black Antigua, Black Jamaica, Charlotte Rothschild and British Queen.

P. L. Simmonds, in "Tropical Agriculture," says that in 1873 the canned fruit shipped from the Bahamas was valued at over £14,000. Considering that these pines are, though much larger in size, considerably inferior to Jamaica Pines in flavour, it furnishes a fact worthy of emulation by Jamaica cultivators. The cultivation of this fruit in Jamaica is known to pay, and an instance is known to the writer in which the return, clear of expenses, for one acre has exceeded £60 per annum.

It is not intended by these specific instructions to convey the idea that the writer's method is the only one by which successful cultivation can be carried on, as no particular method of cultivation can, under all circumstances, be relied upon, and much must therefore depend upon the care and energy with which the industry is developed, and all failures, success, and other experiences turned to account. Planting on the flat, without any ridge, may be found in many cases to have got a few points to recommend it, but, the writer's method, as before described is one which may be depended upon as supplying to the uninformed the main points which lead to success in the production of large and well-flavoured fruit.—*John Hart, Superintendent of King's House Gardens, Jamaica.*

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday, the 22nd September, 1881.

S. H. ROBINSON, ESQ., V. P., *in the Chair.*

THE Proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Members:—

The Superintendent of the Chumba State, Messrs. H Farer, C. S., F. W. Tytler, C. A. N. Wallich, Captain T. A. Freeman and Dr. C.N. Kernot.

The names of the following gentlemen were submitted for Membership :—

The Rajah of Bood, Cuttack,—proposed by Baboo P. C. Mittra, seconded by Baboo Joykissen Mookerjee.

Major W. Dalrymple, Cantonment Magistrate, Neemuch,—proposed by the Secretary, seconded by Mr. J. E. MacLachlan.

C. Y. Downing, Esq., Zemindar,—proposed by Mr. R. S. Pyne, seconded by the Secretary.

CONTRIBUTIONS.

1. Annual Statement of Sea-borne Trade and Navigation of the Bengal Presidency for 1880-81. Report of the Police of the Lower Provinces for 1880. Records of the Geological Survey of India, Vol. 14, Part 3, 1881, and Annual Report of the Royal Botanic Garden, Calcutta, for 1880-81. From the Government of Bengal.

2. Memoirs of the Geological Survey of India, Vol. 18, Part 3. From the Director.

3. Journal of the North China Branch of the Royal Asiatic Society, new series, Nos. 11 and 13. From the Society.

4. Plants of *Brownea ariza* and seed of *Pithecolobium saman*. From the Superintendent, Royal Botanic Garden.

5. A small collection of Orchids from Singapore. From E. Kock, Esq.

GARDEN.

A report from the Superintendent was read, of which the following are extracts :—

The garden has been considerably thinned of large and small trees as there are several other specimens, and the effect is, better light and ventilation ; several other large and useless trees will be shortly cut down.

Trial germination of vegetable seeds per Sutton (English) and Buist (American) has been successful, all having germinated freely, the young plants look vigorous and healthy ; a detail statement will be submitted in next month's report along with that of flower seeds when tested.

Both tanks are well supplied with water.

Angling.—Both tanks are well stocked with fish.

The garden can now issue *Musa uranoscopos* under English cost prices, and the following is description of the plant. This new Queensland Banana will form a noble ornament for a warm conservatory, it has a thick handsome stem form ed, as in its allies, by the sheathing leaf stalks, which support large broad leaves not unlike those of *Musa ensete.* The flowers and fruits are borne in erect racemes, unlike those of the ordinary Banana, in which they are nodding—will flourish in the open in India.

Ficus diversifolia.—See the *Gardener's Chronicle* of 20th ultimo, page 247, figure 52. The garden has a small number of these plants ready for issue.

Members are advised that the garden is having accessions of plants daily, and as the same are in constant issue, it would be impossible with any degree of accuracy to keep altering the Catalogue, but by watching the proceedings, members can make out their requisitions accordingly. Orchids are not enumerated in the Catalogue as their value is averaged with cost of collecting, exchange, &c., and therefore fluctuate ; but I can confidently say from what I have learnt from Members and others, whom I have supplied with these interesting plants, that the cost is astonishingly low. The garden stock of Orchids from Nepal, Shillong, Kossia Hills, Singapore, Burmah, Borneo, the Andamans and other places is extensive. Orchids from America and Australia are very expensive, and do not seem to thrive in India, so the cultivation of these plants is not continued in this Institution, as they only entail disappointment.

This report would be too lengthy if I were to enter into a very full detail of our plants, but at the present moment, I may say, it is rich in such plants as will thrive in the country with ordinary care."

A recommendation was submitted from the Council that Members be allowed to have fruit grafts to the value of Rs. 20 annually according to Catalogue rates, should they prefer them to ornamental plants. This rule to be tried for one year. Agreed to.

POTATOES.

Read a letter from Messrs. Wheeler Brothers and Lee of Ramgurh Estate, *viâ* Nynee-Tal, acknowledging receipt of a small quantity of Japan potatoes which were placed at the disposal of the Society by Mr. H. A. Firth with the view of trying them at Nynee-Tal. Messrs. Wheeler Brothers remark that " the season has now passed for planting them, but we incline to think that they will do very well here, as we raise some splendid potatos on this Estate, though we have not hitherto given a trial to the variety which you have sent. We will store those which you have sent us with our own seed potatoes this winter, and will carefully sow them in the spring, in a plot by themselves, and send you a report as to the result."

As bearing on the same subject a letter was read from Messrs. Lloyd and Co, respecting the consignment (32 maunds) of Melbourne potatoes received in February last, and alluded to in the proceedings of that month. " We can now "—observe Messrs. Lloyd and Co.—" give you the information you asked for regarding the Australian " potatos. The persons to whom we sent them up to in Darjeeling, reports on them, as follows :—' The Australian turned out badly. Nearly all were rotten as Mr Leitch saw. All the pieces I thought good I planted at Helensburgh, except about 30 I planted above the Hotel : these latter all rotted. At Helensburgh 1 in 40 came up and of these the slugs ate several away at the root. Several rotted and had insects eating in them. I tried three boiling when they were new. They were not very tasty, *i.e.* not good flavour. The remainder consists of about 8 mds. of small potatoes which I think of setting in the Terai, unless you want them elsewhere.' "

TUBERS OF " CHUFFA," CYPERUS ESCULENTUS.

The Secretary placed on the table some tubers of the above grass, recently received in response to his application from the Director of the Botanic Garden, Adelaide, who thus writes respecting it in a recent report ;—*Chuffa or Earth Almond.* The American papers praise it, and say that for a few years after its introduction nothing was heard of it, except here and there as a curiosity ; but within the past year or two the interest in the plant has revived, and the Southern papers are advocating its culture. It is said that an acre of Chuffas will produce more pork than an acre of corn. The yield is said to be about 200 bushels to the acre. It is also still extensively grown in modern Egypt. The Chuffa dies down during winter. It is planted in rows two and-a-half feet apart, and two tubers should be planted two feet apart, and two inches deep. *It does not seem to do so well with us as* in America."

It is also alluded to by Dr. Royle in his *Himalayan Botany* as follows :—" The aromatic principle being absent in the tubers of some species, while fecula is secreted in larger proportion, they are employed as food, as those of *Cyperus esculentus*, a native of the South of Europe, and of the North of Africa, and supposed to be the Malinothalle of Theophastus. In addition to fecula these roots contain a fixed oil, which enables them to be formed into palatable emulsions, which, with the addition of sugar, have been employed as a substitute for coffee and cocoa."

The Secretary added he had also applied to Dr. Schomburgh and received from him some seed of the the Egyptian Pearl Millet," which is apparently our ' Bajra" (*Panicum spicatum*). A portion of the Chuffa tubers had been sown in the Society's garden ; the remainder (a very small quantity) is now available to Members.

JAPAN PEA.

Read a letter from Captain J. F. Pogson, forwarding an extract from an American paper (*Missisippi Patron*) respecting a prolific pea raised in Japan, and suggesting that steps be taken towards obtaining a quantity of this variety for trial in India, which was agreed to.

The following is the extract alluded to :—

Mr. T. E. Martin, and Mr. R T. Rutledge, both American progressive farmers, state that the " Japan Pea " is the most productive, as well as good food that they have ever grown for all kinds of stock ; horses, cattle, sheep, and hogs will eat the peas, stem and leaves if harvested before fully matured and cured like other hay, with as much relish as they do corn. Then there is no Pea for the table, soaked in water the night before cooking, that has a more exquisite flavour. They grow on a stout bushy stalk from two to three feet high, somewhat resembling the cotton plant. The main stalk, as well as the branches of the limbs, are literally loaded with small peapods, filled with little yellow peas similar in colour, size and flavour to the English garden pea."

As regards cultivation, they state :—" But the way to get the greatest yield is to plant in drills two and-a-half feet each way, allowing but one stalk to the hill, to remain after the first working. That will give you 6,960 stalks to the acre, and on ordinary land, cultivated the same as corn, will average at the lowest estimate a pint of shelled peas to the stalk, or a fraction over 108¾ bushels per acre. I doubt not that with high cultivation, and good soil, it would be an easy matter to double that yield, besides there is no other crops that will yield more hay to the acre. In fact I know of no crop so remunerative as the Japan Pea. It is a sure cropper, as clearly demonstrated by my experience with this season's crop. Neither wet nor dry weather materially interferes with the quantity or quality of the yield."

BAEL FRUIT.

Mr. R. A. Sterndale submitted an extraordinary cluster of Bael Fruit, nine in number, with the following particulars :—

" Baboo Hem Chunder Mookerjee of Jonai, a well-known zemindar of these parts, has just brought me the accompanying very curious cluster of Bael Fruit which I send over to the Society as a rarity.

The bunch consisted originally of ten Baels, but one got knocked off. On the same tree but almost out of reach is a similar bunch but larger. Baels, as a rule, grow singly or occasionally in pairs. I have never seen a cluster like this before, it resembles a bunch of gigantic green grapes."

Letters were read—

1. From Deputy Assistant Commissary-General, applying for a pound of tobacco seed for cultivation in the Andamans. Complied with and results of sowing promised in due course.

2. From Under-Secretary, Government of India, Revenue and Agricultural Department, requesting that in future a copy of the Journal be sent to the Department.

3. From Dr. Gustav Oppert, applying for publications of the society in exchange for the Madras Journal of Literature and Science.

4. From the Librarian, North China Branch of the Royal Asiatic Society, forwarding certain Numbers of their Journal and requesting an interchange of Publications. Agreed to.

MINERALOGY.

THE total quantity of gold raised in the Australian Colonies since 1851 amounted in 1879 to sixty-nine million ounces, valued at £271,000,000, by far the greater portion of which came from Victoria.

A COMPANY in Tasmania recently sent to Launceston a cake of gold of 1,202 ounces in weight, valued at £4,820, obtained from 776 tons of stone. Another crushing company sent 2,122 ounces from only 418 tons of quartz, or an average of over 5 ounces to the ton. When shall we hear of similar results from Southern India? With the prospect of having the rupee at one shilling and six pence, and with the knowledge that £3,400,000 has been locked up in the various companies, we may well ask anxiously.

THE Royal Commissioners on Mines are now engaged in carrying out practical experiments with the object of determining the best means of avoiding explosions. They have privately visited Wigan, and carried on a series of experiments with electric light. These, we understand, go to show that whilst the light might be useful at the foot of the shaft or in large clearings, it will not do for "getting" coal.

WE observe that the Government have taken the first step towards resuscitating the unfortunate Bengal Iron Works They have offered to take over the whole concern for a sum of three lakhs. The Company has spent over fifteen lakhs, so that if it be decided to accept the offer made by Government, a vast loss will have been sustained by the shareholders. It does not follow that the concern is worth fifteen and-a-half lakhs, although that sum has been expended, but experts agree in considering it worth much more than the amount offered by Government. If this be so, it is hardly worthy of a great Government thus to take advantage of the company's impecuniosity. The shareholders have asked the Government to reconsider their offer, and either to purchase the concern at a valuation, or assist the present company with money, or certain concessions, as the purchase of Government stores. It is a pity that a new industry of this important kind should be ruined for want of a little encouragement, or from want of capital, and Government might be a little more liberal in interpreting the phrase, "development of the resources of the country."

IT is strange that the Government does not seem to encourage the working of coal in the Mergui district. Many years ago, coal was discovered there by Dr. Helfer, and as far back as 1841, the state worked some mines on the banks of the Tenasserim river. The coal that was turned out was found equal to ordinary country coal used in sea-going steamers. It came out in good masses and burnt freely, but the iron pyrites in it were somewhat against it. At another place in the Mergui district, from 70 to 100 tons was extracted by a Burman, brought to Mergui, and delivered on board the Company's steamer *Pluto*. It proved to be a very effective and useful coal, keeping up steam well, and easily fired, of rather rapid combustion, and more adapted for tubular boilers than those of ordinary consumption. The Burman received Rs. 24 per ton at Mergui for this coal supplied to Government, I learn from the British Burma *Gazetteer*, and he was anxious to enter into a fresh contract for the supply of a further quantity at Rs. 16 per ton. As Government does not seem inclined to work the Mergui coal mines itself, and has not done so for so very many years, inducements might be held out to Chinese and Burmese on the spot to do so. I do not know what the British India Steam Navigation Company would be inclined to give per ton for coal at Mergui, but this might easily be ascertained, and as the steam trade between our southern districts, Junkseylon, and the Straits is assuming large dimensions, a local coal depôt at Mergui would be a very paying industry to start. The Chinese have long worked the tin mines in this district, which a European firm tried to do with improved machinery, and eventually discontinued as too expensive. The Chinese, however, continue their mining operations, and find them sufficiently remunerative. They would, no doubt, be able to make coal pay where a Government or an expensively conducted European corporation would fail, and it would certainly be as well to give people the chance of opening out a new industry like this, which we have had so long on our hands without doing anything to make it of public utility to the people and trade of the province.

AMERICA'S COAL SUPPLY.

AT a late meeting of the American Association, an interesting paper on the American coal supply was presented by P. W. Sheafer, of Pottsville. "The coal resources of Great Britain," Mr. Sheafer says, "are all developed now, and in process of depletion; while in this country, when our 470 miles of anthracite are exhausted, we have more than 400 times that area or 200,000 square miles of bituminous, from which to supply ourselves and the rest of mankind with fuel. The coal product of the world is about 300,000,000 tons annually. The North American continent could supply it all for 200 years. With an annual production of 50,000,000 tons it would require twelve centuries to exhaust the supply. But with a uniform product of 100,000,000 tons per annum, the end of the bituminous supply would be reached in 800 years. What the annual consumption will be when this continent supports a teeming population of 400,000,000 souls, as will be the case some day, must be left to conjecture. But with half that population as energetic, restless and inventive as our people in this stimulating climate have always been, it is a very moderate estimate, guided by the actual output already reached in Great Britain, to suppose that there will be ample use for 100,000,000 tons a year of bituminous coal for home consumption alone. We have about 340 collieries, and produce 20,000,000 tons per annum, or about 60,000 tons each. Great Britain has nearly 4,000 collieries, and mines 132,000,000 tons, or 33,000 tons per colliery. Most of the anthracite mining in the United States is now done at a less depth than 500 feet vertical."

FORESTRY.

GOVERNMENT recently issued a Resolution to the effect that very little appears to have been done, in many places nothing, to put the hedges in order, in the Districts of Tanna, Kolaba, and Guzerat, and have ordered better attention to be paid to the condition of road-side trees.

A CORRESPONDENT of the *Pioneer* writes:—"In a recent article upon 'provincial expenditure,' you contrast the expenditure of the Madras and Bombay presidencies, showing that in the former the administration is much more economical than in the latter. The proof is complete as regards most items, but as regards the Forest Department I beg to take exception to your conclusions. In Madras, the forest management is lamentably inefficient, while in Bombay it is, I believe, tolerably efficient. The main object of the Forest Department is, as you say, to conserve the present forests, and to raise wood for the future. In Madras hardly any steps are taken for this purpose. There are, it is true, large teak plantations at Nilambur, and a few of the other forests are nominally reserved, but the bulk of the forests are left to themselves, and even many of the so-called reserves have not been demarcated. There is as yet no forest law for Madras. The Government of India forest law was not extended to Madras, because local legislation was proposed, but this has not been carried out. This is partly due to the misguided opinions of certain high officials who have now left the country, such as Sir William Robinson and the Duke of Buckingham. The former doubts whether forests have any effect upon rainfall, and the latter was willing to allow the forests of the Western Ghats on which the Cauvery partly depends for its supply of water, to be cut down because it would make the forest tracts more healthy. The fact is, that the Bombay expenditure pays for the conservancy of the forests and for the realization of revenue, while that of Madras is devoted almost entirely to the expenditure of bringing forest produce into the market. In fact, the forests in Madras have been so long neglected, that if the scientific system of management is introduced the departmental expenditure will have to be doubled, while revenue will be stationary for a year or two. In a few years, it may be expected to rise, and to recoup the additional expenditure as it has done in other provinces. Even if it failed, financially, the measure is imperatively needed on climatic considerations, as the important rivers that supply the irrigation works are deteriorating perceptibly every year, and a diminution in the rainfall in forest tracts is also perceptible. The Government of India have frequently remarked upon this subject. Let me refer you to some Proceedings of theirs quoted in the *Indian Agriculturist* of 1st August. I believe that the local Government are alive to the need of reform, and that it will not be long delayed, but I am anxious to prevent a misconception that may possibly be caused by your article above referred to."

AT a meeting of the Committee of the Agri-Horticultural Society of Madras, on the 13th ultimo, the following letter from Dr. Kirk, dated British Agency and Consulate General, Zanzibar, 4th June, was read:—"The Copal tree, of which I sent the seed, is, botanically, *Trachylobium hornemannianum*. The tree yields now an inferior or rather a second class varnish resin, but the same tree did yield the Animi resin, the highest priced varnish material in the world; the only difference being that the one is modern and the other has been buried for thousands of years under the soil, and there been changed. Still, I have clearly proved that the tree is the same in each case, and age is the agent that has so improved the value of the article. In many cases a change in the level of the land seems to have taken place since the old trees yielding the Sanifarini Animi died, for Copal is often found in the ground where the tree is now lost or rare. It is a fine tree of considerable size. I hear from Ceylon that plants of the Landolphia I sent you have reached the gardens from Kew; they were there grown from seed I furnished. Yours are the first in India, as Calcutta lost the seed I sent. I am now forwarding a second supply. I find the seed germinates easily, and it grew well at Kew; I do not understand its failure elsewhere, but it has failed certainly in most places, and I have applications for plants. I hope to get furlough soon, and shall not now ask you to send me a case of plants, as our dry season is coming on, and I hope to be off on leave before the next hot season. I shall always be glad to

do anything for you." The Committee recorded that from "the liberal supply of Oopal seed sent to the Society by Dr. Kirk, we have as yet raised only 62 plants, the greater part of the seed having perished before it reached Madras. The seed of Landolphia sp., to which Dr. Kirk refers, had also all perished before it reached the gardens. The plants we have were received from Dr. Kirk in a Wardian case in May, 1879, and nineteen of them are flourishing in pots and in the ground. Twenty-five plants were received, one was given to Dr. Bidie for the museum grounds, one to Mr. Cameron for the Lal Bagh, Bangalore, one to Dr. King for the Royal Gardens, Calcutta, and the other three died."

THE Vienna *Politische Correspondenz* says: "The one famous cedar forest of Lebanon, formerly so extensive, has dwindled down to the dimensions of a mere thicket, numbering about 400 trees. To save it from complete destruction and preserve it at least in its present extent, Rustom Pasha, the Governor-General of the Lebanon, has issued a special ordinance, containing a series of stringent regulations calculated to check, if not quite to put a stop to, the Vandalism and carelessness of most travellers. It is expressly forbidden to put up tents or other kinds of shelter within the district of the trees, or to light fires or cook any provisions in their vicinity. No one is allowed to break off a bough or even a twig from the trees. It is forbidden to bring any beasts of burden, be they horses, mules, asses or any other kind of animal, within the district. Should oxen, sheep, goats, or other pasturage cattle be found within the prescribed limits, they will be irredeemably confiscated."

THE following is a startling account of the vagaries of an Australian acacia:—

A rich planter of the Nevada district—so the story runs—some time ago imported a number of saplings from Australia with a view to their acclimatisation. Among them was one, apparently belonging to the acacia family, which, however, grew far more rapidly than its fellows, and exhibited peculiarities of a somewhat startling description. For instance, every evening at sunset its leaves and the slender extremities of its branches rolled themselves up tight, and the whole tree, when any part of it was touched, however lightly, began to quiver violently, keeping up that abnormal exercise for as much as a minute at a stretch. Later on in its American career, it performed still more amazing feats. Its rapid growth necessitated its removal from the greenhouse, in which it had been accustomed to curl and shiver, to an open-air plantation. As it was being set in the fresh earth prepared for its reception, to the extreme consternation of all present, its trunk commenced swaying and its branches waving in a distracted manner, as though it were convulsed by pain and apprehension. Presently it emitted an odour of such power and pungency that the witnesses of this strange phenomena were quite unable to endure the stench, and promptly took to their heels. Since that achievement, it has been regarded with profound awe by the coloured folk of Virginia who are of opinion that it must be a supernatural being, or at least a nigger bewitched, the victim of some dread Obi enchantment. There is probably no soil in existence, save that of Western America, which is capable of producing anything like the effect above described upon the habits and disposition of a respectable Australian acacia.

A TANNER established at Dolores, in South America, draws attention in the columns of a French contemporary to the fact that Quebracho wood, when it is ground, rapidly loses the tannin it contains by exposure to the air, while the wood in logs preserves its tannin almost indefinitely without becoming impaired. He believes that the barks recently introduced into commerce, under the name of Quebracho bark, is nothing but the bark of the "Acacia curupy," which is a good tanning medium, but imparts a too decided colour to the leather. The bark of the Quebracho, which grows in the province of Corrientes, he adds, only contains insignificant traces of tannin, and is unsuitable for tanning purposes.

CALIFORNIA has hitherto been celebrated as possessing the biggest trees in the world, but the last Australian mail brings us a report from Mr. Clement Hodgkinson, which proves, if true, that the big trees of Victoria overtop those of California by about 100 feet. The startling announcement is made that the eucalyptus, or giant gum-tree, achieves in Victoria the immense height, in favoured situations, of 500 feet. The tree sheds its bark at certain seasons of the year, and appears in a coat of silvery glistening white, at which times the eucalyptus like stand rows of marble columns.

A GENTLEMAN recently had his curiosity aroused, while the trees were covered thickly with ice, as to the relative weight of the ice and the wood it surrounded. So he cut off a limb, and found it weighed two and three quarter pounds; after the ice was melted, it weighed two ounces. Two hours later another trial was made; at first the limb weighed four and-a-half pounds, after the ice was removed it weighed three ounces. Another trial showed a weight of thirty-two pounds, while the limb alone weighed two pounds.

OSIER CULTURE.—The subject of the periodical overflow of the Thames, and other rivers, upon which a good deal of public notice has lately been bestowed, should be the means of directing more attention to the possible improvement of wet ground in marshy situations by the planting of osiers, which, under the technical name of "rods" and "willows," are a merchantable commodity, regularly in request by the basket-makers, which will yield a more certain return, perhaps, than many agricultural crops that are subject to casualties arising from adverse seasons, the profit being very considerable, and the management comparatively easy and simple.

Nature, indeed, spontaneously suggests this application; for the goat-willow, or sallow (*Salix caprea*), may often be found indigenous in moist ground, more particularly in those waste and marshy situations that are, under usual practice, so difficult to deal with. A two-year-old seedling plant of the goat-willow will often produce several shoots three or four feet high, and if allowed to grow longer still, and cut down every three or four years, no tree will produce so great a bulk of faggot-wood, for a well-established stock will sometimes give out in one year shoots eight to twelve feet long, straight and well proportioned, some of them an inch in diameter, at a yard from the ground. Ultimately the goat-willow becomes a fine tree, often attaining a height of forty or fifty feet with a trunk varying from one and-a-half to two feet in diameter, and for hoop-poles, rods, crates, sheep-fences, and other purposes, the earlier produce of the goat-willow is extremely valuable.

But it is in the form of osiers regularly cropped, that can be grown upon land subject to tidal overflow, that a definite produce and consequent regular income can be relied on, and as there is a good deal of confusion existing as to the various species of *Saluxia*, we will briefly indicate them.

The green-leaved osier, or Ornard (*Salix rubra*) is strong and tough, and in request for carboy baskets.

The Spaniard, or Spaniard rod (*Salix triandra*) has several varieties, some very good, and others very inferior. The black-budded Spaniard is used for the bottoms, rims, and handles of large baskets. The Grey Spaniard comes in useful for course brown baskets. The Horse Spaniard is a very poor kind.

The old common osier, being soft, of course, and brittle, is not worth cultivating, in many instances; but there are some varieties of the *Salix viminalis* that are extremely useful, and the good and the inferior ones bear such a close resemblance to each other, that the difference often cannot be detected except in the working. The best variety is known under several names, as those of the Snake osier, Brindled osier, Blotched osier, and Speckled osier. The Yellow barked osier is also a good one, while the Long-skin is of smaller growth, but has the good qualities of being heavy, firm, and tough. The Brown-rod, Brownard, or Silver osier (*Salix Hoffmanniana*), has a whitish hue on the under side of the leaf, eel baskets being usually made of this variety. The Gelsior partakes somewhat of the nature of the Spaniard, but is of more tapering habit, with a thick butt. The new kind (*Salix Forbyana*) is also akin to the Spaniard being equally strong, but more pliable in working. The Hollander resembles the new kind in its qualities, but is different in appearance, and these may be seen growing in large quantities on the Dutch coast. The Stone osier is a good kind, used for fine work.

The Blunt-leaved Ornard (*Salix Lambertiana*), the Bastard French (*Salix lanceolata*), and the Rose Ornard (*Salix Helix*) are very inferior, used only for fish baskets and hampers, their ends snapping in the working inwards and outward, which consequently makes inferior work; but the Bitter Ornard (*Salix purpurea*) grows tough and slender, and, like all the other ornards, will grow in water.

The French, French-rod, or Real French has been imported from France, where it is much used in the manufacture of small ornamental baskets. On the Continent it is much in request by wine-coopers, who bind on their wooden hoops to the wine-casks with it.

The rods, or willows, as they are termed in the trade, comprise several varieties, as the Skit-willow, the Goldstone, or Hornrod, of which there are two sub-divisions—the Wire-hornrod, which is thin and tough, and the Waterhornrod, which is very inferior. The rods (osiers, &c.) grow best on strong and loamy soils.

And here we should remark that soil exercises as material an influence upon the growth of osiers as upon other crops, requiring a compact sub-soil that retains moisture, and thus they will not answer in strong clayey soils, which in summer become hard and dry; for these crack, and the moisture of the land evaporates. The Spaniard, New kind, and French, sometimes answer very well upon light land, where the sub-soil is kept moist by land-springs; but where the supply of moisture is imperfect, an osier plantation lasts a comparatively much shorter time, and requires renewing in a space of time varying from fifteen to twenty years; but in land the best adapted for their growth, by the margins of rivers subject to tidal overflow, they will last for fully seventy years with occasional moulding; but on light land the osiers are smaller and shorter, and the crop less bulky than when grown upon strong loam.

Upon the first formation of an osier plantation the ground should be well trenched to the depth of a foot and a half, and in light soil the sets should be planted in rows eighteen inches apart, and fifteen inches from each other in the row; for where the supply of moisture is not continuous, the shoots are fewer and shorter, and it is in such situations that the smaller varieties suited for the manufacture of small baskets are grown, and there is an advantage in thus planting them close, for if more space were allowed, instead of drawing each other up long and slender, they would branch out and grow crooked and "clubby" near the stools.

Upon the soils better adapted for their growth, which is rich and continuously moist, they are planted at wider intervals for upon such they will reach a length of eight, ten or dozen feet, so that the rows should be placed two feet asunder, and the sets and a foot and-a-half apart in the rows. If these were planted as close as the former the result would be that, there not being room enough for the number of shoots that the stronger plants will throw out, a few of the leading ones would get very tall, and their growth would prevent the action of light acting upon the others which in consequence would become of inferior quality and not ripen their wood in the course of the season, which in this state would be soft and pithy, and consequently unfit for manufacturing purposes.

The action of light upon osiers is somewhat remarkable. In ordinary seasons they are of a yellowish brown, but they sometimes assume a dull

green colour. The willows in cloudy seasons are of a dull brown mahogany colour, but in clear seasons the shoots grow of a bright red colour.

The sets are cut from the lower part of the shoots, and are generally used about the thickness of one's little finger for the larger varieties. The small part of the rods would strike just as quickly, but they produce smaller shoots. The sets should be about sixteen inches long, and be inserted into the ground at about half their length.

In severe seasons, some of the plants will die, the most injurious weather to an osier plantation being when mild winters are succeeded by hard frost in early spring. The plantations will then require mending, which is done in the following manner. The longest and smoothest rods are chosen, which are cut from their butt ends in a slanting direction, and are thrust into the ground by the side of the dead stool to a depth of eight or nine inches. These are inserted as they have grown, without being shortened, for if this were done, they would be smothered by the shoots of the older stools, and by being inserted of their full length, they have the benefit of air and light for a considerable time, which enables them to establish themselves before the others grow high enough to overtake them, when the summer will be considerably advanced.

Osiers may also be grown upon springy land. That is sometimes met with near the bottoms of elevations, the slopes of which are kept moist by the drainage of higher lands; and although such springs might often be cut off and drained by means of a few deep drains, aided by auger holes driven down into the porous watery strata which form their reservoirs, by the method known as the Elkington system after the name of the farmer who first practised it, such drainage is very often left undone; and there are many waste spots upon which osier could be profitably cultivated, which would prove a source of profit to owners or occupiers of land, that are frequently entirely neglected and overlooked.

Osiers can be cut any time between the fall of the leaf and the rising of the sap in the spring. And although they are often cut before and after this time, it is not good practice to do so—especially when cut late in the spring, as it weakens the succeeding crop.

According to the accounts which have been published, the osier grounds upon the estate of Holkham that are planted with *Salix viminalis* commence their profitable return the second year after their formation, the first crop averaging £34 17s. per acre, after which they are cut down yearly and realise about £37 10s. per acre; these figures furnishing a strong argument in favour of the plan now recommended for more general adoption.—*The Farmer.*

EFFECTS OF LIGHTNING ON TREES NEAR A TELEGRAPH WIRE.

SOME instructive facts in this connexion have been brought to light by M. Montigny, in a recent examination of poplars bordering part of a road in Belgium between Rochefort and Dinant. The part in question is some 4,000 metres in length, and runs westward; it is level for some distance, then rises gradually to a height of 61 metres, through a wood, traverses a wooded plateau 200 metres in extent, then descends, still through wood, to a plain. A telegraph wire runs near the row of Virginia poplars on the north side, and it appears that, out of nearly 500 poplars forming this row, 81, or a sixth, have been struck by lightning. Hardly any have been struck in the other row. The trunks have been mostly struck on their south side and nearly opposite the wire. Comparing different portions of the road, it is found that in the horizontal part none of the (129) trees show injury from lightning, or at most only one (a doubtful case), but as the road rises through the wood the cases quickly multiply, and on the wooded plateau as many as nine out of 14 trees, or 64 per cent. have been struck. On the slopes the proportion is 25 per cent. M. Montigny distinguishes three kinds of injuries—(1) the bark torn and detached on a limited part of the trunk; (2) a furrow, straight or (rarely) spiral, made on the tree from near the wire, down to the ground; and (3) a peculiar oval wound, with longer axis vertical, and lips coloured light brown. Now, the furrows, which are probably due to the most violent discharges, are relatively most frequent on the plateau and on the western slope, which the storms usually reach first. M. Montigny is of opinion that the lightning, while provoked by the wire, does not strike this first, then the tree, but strikes the tree directly. His conception of the process is to the following effect:—Suppose a thunder-cloud charged with positive electricity. A long telegraph wire under it, though insulated, may acquire as great negative tension in the nearest part as if in direct communication with the ground, and the tension is greater the nearer to the cloud. While the inductive influence affects the wire most, near objects, such as trees, share in the influence according to their conducting power. The lightning attracted in the direction of the wire, yet does not strike this, the insulating cups presenting an obstacle to its prompt and rapid escape. It finds a better conductor to earth in a neighbouring poplar, wet with rain. From the facts indicated it results, that of two similar houses, one built on a plain, the other in a wood, and having a telegraph wire fixed to them, the latter is the more liable to injury by lightning, and the danger is greater if the wood enclosing the house be upon an eminence.—*Times.*

TIMBER IN BRAZIL.

WITHIN an area of half a square mile, Agassiz counted 117 different kinds of wood, many of them admirably fitted by their hardness, tints and beautiful grain, for the finest cabinet work. The [illegible], tortoise-shell wood, undoubtedly the most precious wood in the world, is found in large quantity on the tributaries of the upper Amazon, where the water can be most easily applied as motive power. The pao de sangre, the rosewood, the pao de ferro (iron wood), or *Apuleia* [illegible], the various species of jacaranda known to natural history [illegible] under the name of *Dalbergia nigra*, *Machaerium* [illegible] and *Platypodium elegans*, the white and black [illegible], the pao santo or holy wood (*[illegible]*), and the sebastana—both of which are rivals of the most beautiful walnut—are wasted yearly on the Amazon in amounts ample enough to veneer all the palaces of Europe. Maurice Maurie, the explorer, believes that with the facilities which the Brazilian Government is ready to impart to enterprising industry, the export of these commodities would develop immense profits in the shortest time, while the capital invested need not be enormous.

It is only necessary that these woods be introduced into the market to obtain a decided preference over those now most sought after in the two hemispheres. Still richer is the country in timber for the purpose of construction. The acapu (*Vouacapoua Americana*) is most plentifully found there, and often in the most imposing proportions. Mr. Maurie has seen dining tables six feet in width made wholly out of one piece. The wood, like all its kindred, macarandnba and itauba, or stone wood, furnishes ship timber as durable as teak. The longer these remain in water the stronger and harder they become. The former will compare the more favourably with the teak, inasmuch as it is more compact. A pistol bullet which will pass through an inch board of teak wood will not penetrate half an inch into a board of acapu. The itaubatree, too, offers many advantages over teak; it branches off naturally into keels and ribs of any size, and is lighter and more resistant.—*Journal of Applied Sciences.*

GARDEN.

THE number of fruit trees in Bohemia of all sorts, but chiefly, apples, appears, from some recently published statistics, to amount to 14,000,000. Of these, 10,000,000 are in gardens, 1,600,000 in waste lands, and about 2,000,000 on the sides of the public roads. The number of young trees annually planted is about 1,500,000. Between 6,000 and 7,000 miles of road are planted with fruit trees, mostly of the best sorts, and the revenue therefrom is very large. The fruit is largely exported to the north of Germany and Russia.

THE Vienna *Vaterland* reports that the gardener attached to the Palazzo Ferentino, at Naples, has, after the labour of years, succeeded in raising camellias having a distinct and fragrant perfume. The perfume is described as resembling somewhat a mixture of jonquil and pythosphorm, and as being very delicate. The flowers themselves are of a tender pale rose tint, and it is only in flowers of this colour that the agreeable fragrance has been hitherto obtained, although the gardener has endeavoured to impregnate white camellias with it.

FLORIDA ORANGES.

THE orange culture in Florida amounted to little or nothing before the war. Northern industry and methods have found their way into the State since, and given this cultivation a remarkable impetus. Ten years ago even the product amounted to but little. Now it brings millions to the State, and its increase for the next ten years can hardly be estimated. General Cameron was taken lately by ex-Senator Yulee, a friend and former associate, who represented Florida in the Senate thirty-five years ago, to see the largest orange grove in the world. This was the first time they had met since Mr. Yulee left the Senate for the South in 1861, and the renewal of the friendship between the two has been one of the pleasing incidents of the stay in Florida. A little later the train dropped us in the midst of 75,000 orange trees, covering over 400 acres of ground. A perfect wilderness of orange trees, apparently not cultivated with care, certainly not planted *regularly*, but just as nature had sown the wild seed. The wild luxuriance of nature had however been curbed by man, who in pursuit of wealth had turned vine arbor into money, and, by grafting on the sour trees the finer sweet varieties, had snatched from the wilderness an income of over 40,000 dols. a year. General Cameron rambled with us over the place, all of us plucking the golden fruit *ad lib.*, and imagining ourselves in the veritable Garden of Eden—earth, air, and sky, soft, balmy and ethereal, combining to fix the allusion, and we were only brought back to a realisation that we were fifty miles from our hotel by an exclamation from one of the party "By Jove, we're lost!" This fact soon became apparent to us all, and just think of it—you who are bound by bands of thick-ribbed ice—lost in an orange grove in Florida! General Cameron enjoyed the joke, and busied himself eating the fruit plucked with his own hands. Many of the trees were laden with fruit of immense size and beautiful colour, although much of the crop had been gathered. One of the tempting sights in the grove was the grape fruit (*Citrus Paradisi*), of great size and beautiful lemon colour, and said to be the forbidden fruit of the Garden of Eden. It is useless except to look at and for preserving, although it is eaten by some. It has a sour, insipid taste. Lemons of immense size, growing upon small trees, now and then dotted the orange orchard. After an hour spent in looking over the grove, we, one by one, found our way back to the packing houses, where the superintendent told us that 18,000 boxes of oranges had been shipped this season from one half of the grove over which we had been rambling; that means 1,800,000 oranges, for which the owner had been offered 35,000 dollars while the fruit was on the trees.

"How many years does it take for an orange grove to come into bearing?" I asked the superintendent. "Eight years from the seed, and about five years if grafted or budded on to the wild fruit. That is, I mean to say they will bear in eight years from the seed, and in five years from the graft. They constantly grow better and bear more oranges every year. [illegible] can tell how long the tree will be [illegible] certainly [illegible]."

People [illegible]

to 4,000 oranges, but there is a great deal of fancy in this statement and the truth is marvellous enough.

THE CULTURE OF HYACINTHS IN POTS.

THE time for potting or planting these popular roots is approaching, and a few remarks on the best way to treat them will now be seasonable. Should the grower choose his own bulbs, and be at the same time a tyro in the art of bulb culture, it will be beneficial to him to learn that extra size or largeness of the bulb is no safe criterion of the excellence of it. It may or it may not be better than a smaller bulb, but the balance of the chances are against it being so. The great difficulty in getting large bulbs thoroughly matured will always operate against their turning out superior to small bulbs The best test is not size, but solidity and weight. The former quality is easily ascertained by trying the firmness of the individual bulbs, small or large, by means of pressure with the fingers. Those which yield to pressure, especially at and around the crown or top of the bulb, should be rejected—they are not ripe, and those which weigh light—a point which can by practise be ascertained by balancing the respective roots in the hand, or better still by weighing them by means of scales—should be rejected. The heaviest roots, taking relative size into consideration, should be chosen; even if the smallest may by these tests be the heaviest and firmest; let there be no doubts about preferring them; they are certain to give the greatest amount of satisfaction.

The next most important consideration in the culture of hyacinths in pots is the soil or compost in which they should be grown. It ought above all things to be rich and light. It may be made up of the following :—One-third leaf mould, one-third rotten cow manure, and one-third fibrous loam, mixed and laid up where it may be protected from rain a couple of months before being required, though it may be, and often is, used immediately after being mixed.

A good proportion of sharp river sand may be added to this compost, when it is brought to the potting bench for use. The most useful size of pots for general purposes and for single bulbs is five-inch; yet if they may be wanted for room decoration in smaller pots, they can be grown very well in four-inch or even three-inch. In these small pots, however, they will want more careful attention than in larger ones after they have filled the soil with roots. It is important in potting to avoid burying the bulbs deeply. The top of each should be just level with the surface. Those that are to be forced early should be planted as soon as they can be obtained, while the principal batches should be potted in October. When potted, place them on a bed of coal ashes and cover them with the same or with cocoa-nut fibre or sand to the depth of four or five inches. In four or five weeks from the time of potting, they may be taken out of the plunging material, and placed in a cold frame. A selection of as many as may be wanted for a first batch may be made from the best rooted, and placed in heat at once; and from time to time, as wanted, they may be so drawn upon to keep up a good supply for all purposes. In severe frost the stock in the cold frame should be protected sufficiently to prevent the balls from being frozen through; but in all sunny, bright weather the frame should be freely ventilated in order to keep them slowly moving. When they are brought into the forcing house, place them as near the light as possible; give manure water liberally, and on all favourable occasions—that is, when the outer air is mild, let them have air freely.

To grow hyacinths in water, single varieties are preferable to double ones, because they are unusually better in spike and are also, as a rule, more free to grow. The very best roots also ought to be selected for this manner of growing hyacinths. Those who have not attempted their culture in water will find it very interesting. Having procured the roots and the glasses, let the latter be filled with pure water to such a height that the base of the roots will just barely touch the water. Before placing the roots put one or two small pieces of charcoal in each glass, to aid in keeping the water sweet and pure. The roots may then be put in, and the glasses removed to a cool dark cellar, or any other place in which they may be kept dark and cool in a dry atmosphere. Here let them remain for a month or five weeks, or till they have sent their roots down to the bottom of each glass, but examine them occasionally to see that all is doing well. Should the water evaporate quickly, so as to leave the roots bare make it up at once. It may also become foul and injure the roots, in which case they should be taken out, the glasses be emptied and well cleansed, and refilled with pure water as before and the roots replaced carefully. Fungus sometimes attacks the bulbs when grown in water, and will injure them if not brushed off in time. When this disorder is persistent and troublesome, dust the bulbs over with sulphur. When the roots have grown to the bottom of the glass, or nearly so, the glasses should be brought to the light gradually, and when they have become quite inured to the change, let them stand close to the glass, give plenty of air, but avoid cold draughts. As the flower stems expand they will need support, and the best way to secure this is to obtain the prepared hyacinth supports in brass or japanned iron which are usually sold along with the glasses.—*N.B. Agriculturist.*

THE HYACINTH, THE TULIP, AND THE GLADIOLUS.

THE ground should be well manured and trenched or deeply dug in the latter end of September. The best time to plant is October; any time during that month. Take advantage, therefore, of a dry day and a dry state of the ground to do the planting. The crowns of the bulbs should be not deeper than six inches, nor shallower than four inches. Nor should they be planted thinly, about six inches from bulb to bulb being the most that should be allowed between them, if a good solid display of colour is wanted. It is a point of some importance to have the bulbs all one depth in the soil, the flowering will then be more uniform, therefore let them be either four, five or six inches deep, but all one depth or the other. When the planting is finished, cover the surface of the bed or border with a few inches of [illegible], out of which the rankest of the litter has been shaken. [illegible] firmly and equally all over the surface, [illegible] In spring, as soon as the leaves have [illegible] remove the manure. If the weather [illegible] leave the plants uncovered; but in the [illegible] [illegible] lightly over them at night. [illegible] positions they will be the better of a breakwind of mats or any similar fabric fastened to stakes and placed on the windward sides of the beds or borders when they begin to throw up their flower stems. It is recommended by some to lift and preserve the bulbs, after they have finished the flowering with the view of using them for next season's planting. Our own experience is that the game is not worth the candle. The roots may certainly succeed to the extent of giving a fair supply of flowers for cutting from if that is wanted, but they are not fitted to make a brilliant display in bed or border. For the purpose of cut-flowers, they may be grown in a dry, warm position, planted, thickly—standing root to root will not be too thick—and cut when their flowers are sufficiently expanded. But for the purpose of keeping up a good display in the flower garden, there is no more satisfactory way than making an annual purchase to the extent required, which may be done at compratively small expense.

TULIPS.—These may be treated in precisely the same way as hyacinths in all respects except the depth of planting. They should not be planted deeper than three inches, and should be covered with stable manure to the same depth as the hyacinths. They may also be planted somewhat thicker, or about five inches apart each way. As they ripen their growth better than hyacinths in our climate, they may be lifted and replanted annually, with better results. When they have finished flowering and their foliage begins to decay, they may be lifted and laid in a sunny spot in sand, kept moist till they have lost all their leaves, when they may be stored away in dry sand in drawers or on shelves, till planting time. Only the best should be planted, so that the display should be as bright as possible, and the deficit in the numbers be made up by purchase.

THE CULTURE OF GLADIOLUS.—There are few more gorgeous yet graceful summer and autumn flowers than the various *sword lilies* or gladioli. The varieties known as gandavensis hybrids are those most to be relied on to succeed well in our Scotch climate. For early summer flowering they should be planted in October or November. Treat them in every respect like hyacinths. Prepare the ground liberally, and plant about four inches deep, and about some distance apart, bulb to bulb, but not less than nine inches between the lines. In cold, wet localities let planting be deferred till spring; but as this can only result in late flowering, the bulbs wanted for early flowering should be potted in December and placed in cold frames to be kept as cool as possible, only they must not be exposed to frost, which would kill them. These may be planted out in April, taking care to disturb the balls of roots as little as may be in transferring them to the open ground. Those intended for autumn flowering should be planted in February or March, according to the condition of the weather and the soil. On no account plant in wet weather or when the soil is wet. Prepare the latter by trenching deeply and manuring well. Plant as before described. Covering with manure is not essential, but will be found beneficial, although more as a protection from summer's drought than spring frosts, which will hardly penetrate to such a depth as to injure the roots or growth. It is important to give early attention to gladiolus in the matter of staking, otherwise the young growth in windy positions is apt to get broken before the flower stems expand.—*Gardener's Chronicle.*

TEA.

TEA cultivation in Ceylon is now attracting attention, and is making headway in the colony. We see no reason why it should not pay in Natal. It is already grown here, and succeeds on a small scale. We made a trial recently of the Natal product, and to our taste it is preferable to the Assam we are in the habit of using. It is strong, and like all Indian teas, does not do to be infused long. We to-day publish an article on the subject by a practical Indian planter, who is confident that under efficient management, tea growing in Natal is a branch of industry that will yield a very good return on the capital that may be invested in it. Several parties are already growing a few plants, and they all agree that they are well suited for Natal, and that they would persevere if only they could get leaf manufactured. Heat and moisture, with soil that retains water, are desirable. We commend our correspondent's remarks to the attention of our readers, and our columns are freely open for discussion on the subject. With sugar an established success, were tea proved equally so, there is no limit to coast industry, whilst abundance of suitable land is still procurable. The local Cape and South African markets would consume for some time to come all that is likely to be raised here at prices more remunerative than for export. Natal last year imported tea to the value of £6,264, and the year previous £9,793, whilst the returns from the Cape Colony aggregated in 1878 1,252,850lbs, and in 1879, 879,599.

JOHORE Tea has been characterised as "Good blackish leaf, strong Pekoe flavour." This, to begin with, is encouraging, and it may be that at no distant day we may see tea plantations on the Malay Peninsula. The experimental tea gardens belonging to H. H. the Maharajah are flourishing excellently. A tea planter from India, who recently visited them, stated that the "soil and climate was all that could be desired" for the successful cultivation of the tea plant. Samples sent to London have been reported on as above, and valued at from 1-7 to 2·1 per pound. Indian teas are increasing in favour, the deliveries in London reaching nearly 50,000,000lbs. annually. Apart from the export trade, Messrs. Thomson, the Tea Brokers, state that the deliveries of China Tea are about 116,000,000lbs. The quality has deteriorated. Java Tea is not esteemed in the home market, and the

same may be said of much that is exported from Japan. There are thousands of acres in Johore admirably suited for this industry, and judging from the quantity and quality of Gambier leaf and the general super-abundance of foliage everywhere on the territory, there seems to be nothing wanting to guarantee success to the planter except cheap Indian labour. The nearness of Johore to the Singapore market is in itself a great advantage to the planter.

WITH the exception of one million pounds to Canada and half a million to England, all the Japan tea exported was sent to the New York market during last year.

The Lekin Taotai (P'an) recently issued a proclamation in the city, suburbs and settlement, relating to the manufacture of of "lie" or spurious tea. This proclamation was issued on the 26th ultimo, but did not make its appearance in the settlement until a few days ago. Even now we are unable to get a fair copy thereof owing to the same having several of the Chinese characters obliterated. As far as we can make out, the substance of the proclamation is pretty much as follows: "It having been ascertained that spurious tea is being manufactured in this place, and whereas the larger portion of the revenue of this port is derived from the duty on tea, it is not fitting or proper that spurious tea should be made. It has come to the notice of this office (Lekin) that unscrupulous dealers, brokers, and others have manufactured largely thereof to the great injury of respectable merchants. Guards have been despatched to the various stations to seize all spurious tea and to strictly examine all tea brought down from the country. At the East gate of the city, the lekin guards seized a quantity of the article in question, and at another place (name not given) nine loads (piculs ?) were seized, which upon examination proved to be false tea. All of the spurious tea seized was ordered to be confiscated and burnt. Should no rigorous measures be adopted, it is hard to tell how far this illicit traffic might extend, causing thereby great injury to merchants and others. Orders have been given to redouble the guards, and to exercise the strictest vigilance to wards suppressing this evil, and it is necessary that proclamations be issued for the purpose of warning the soldiers, carriers, tea dealers, and others against dealing in spurious tea. This traffic is not to be allowed, and as a warning this proclamation is issued for the information of every one. Should, after this, any one be found to disobey this warning, not only will the spurious tea be confiscated and burnt, but the party so transgressing will be detained, and sent in to this office for punishment."

THE returns of tea cultivation in Madras are very small, but the success that has so far attended the efforts of enterprising people, has induced many to take to it. Tea is grown in three districts of the presidency, namely, in Madura, Malabar and the Nilgiris; in the two first named districts there are only five plantations, but on the Nilgiris there are 79. The total average of land under tea is returned at 2,573 acres against 9,123 acres of land taken up; the acreage of land with immature plants is returned at 1,705. The approximate yield of tea of all the estates is returned at 649,460lbs, the cost of cultivation varying from Rs. 50 to 200 per acre.

COFFEE.

COFFEE prospects in Ceylon are not bright this year, and from Brazil we also learn that the crop will not be a very good one. Ceylon has suffered much from this cause, and the uncertain nature of the weather is frequently advanced as the cause. We suspect, however, that the real cause is impecuniosity, and the consequent necessity which exists for working cheaply. If we desire good crops for a long succession of years, we must nourish the land, and the soil and climatic conditions of Ceylon are so favourable to cultivation, that this point has been neglected. It has been thought that because the land has hitherto been so generous, it would always prove so. If the present depressed state of the industry leads planters to see this, shareholders will not have suffered in vain. The tea industry is now recovering from a panic of a similar nature. The prices obtained in London in many cases did not cover the cost of production. This led to a thorough investigation into the cost of manufacturing, and planters gradually found out what we have all along insisted on, that eight annas per lb. ought to be the maximum cost of cultivating and manufacturing. Now that prices have somewhat recovered, they will be in all the better a position to benefit by the more favourable market.

THE *Lucknow Witness* tells us that "a horse-race was won the other day on the Saratoga track in America by the free use of coffee. That is, instead of giving the horse spirits of [illegible] as is common, a quart of coffee before the second heat and [illegible] before the third enabled him, though he was out of sorts and lost the first heat, to win the other two." If we must have a [illegible], argues our contemporary, let it be coffee or tea, rather than the fierce and dangerous alcohol.

THE Madras Government, at the request of the planters of Wynaad, have been pleased to extend the provisions of the Coffee Stealing Act to the low land tracts traversed by the coffee in transit to the coast, *i.e.*, along the main roads from Wynaad to the coast. The Government are desirous of giving as much protection as they possibly can, and have requested the Collector of Malabar to report, if the concession made is sufficient. It is thought that the whole district should be thus protected, and not the roads alone, and that a form of pass should be obligatory, the pass-bearing a stamp to cover the expenses of the additional protection afforded the coffee thus entailed upon Government. The suggestion if practicable is a good one, and moreover shows the authorities that the planters are prepared to pay for the protection given their industry.

MON. P. J. VAN MAANAN of Java offers an invention to the public for drying coffee by a mechanical process. Planters must have felt the extreme difficulty of getting the parchment dry enough either for transport or storage during wet weather, and the coffee moreover loses both in color and taste by being kept in a damp condition for days together waiting for the sun to appear. This invention, which is well spoken of by the Commercial Association at Samarang, offers to render the coffee planter independent of the weather, in preparing his produce for shipment, and if it really does this at a moderate cost, it ought to be invaluable in some localities. The cost of the machinery is stated to be £200, and it is warranted to dry from 50 to 100 piculs of coffee in 24 hours at an insignificant expenditure of fuel and labor. We shall publish any further information we get on the invention as soon as it comes to hand.

A WAIL comes from the coffee districts around Palghaut. Young estates in this neighbourhood enjoying all the conditions for successful cultivation, soil, good climate, everything that can be desired, elevation suitable, and rainfall perfect, are attacked in the most unaccountable way with leaf disease. The young wood which gives promise of excellent bearing capabilities for the next year, is suddenly denuded of foliage, and the wood itself dies back to the primaries, all in the short space of a fortnight. No apparent cause can be assigned for this rapid progress of the disease. Everything is being done to counteract the disastrous effects of the disease, especially vigorous manuring, and time alone will decide whether the estates will bear the attack or succumb.

LEAF disease, this year, in Coorg is generally pronounced to be worse than it has ever been before; it shews up badly in coffee that has not been thoroughly pruned and handled, and it is hard to say what is best to be done to neutralise its ravages which—just imagine!—are more serious now than those of the indefatigable borer. After pruning a tree badly affected with leaf disease, the hands become perfectly yellow with the rust, caused by the fungi, of the leaves. Coffee under charcoal shade, I notice, suffers severely from leaf disease; and this appears to me to be a good reason for the destruction of that shade tree. Coffee in good soil suffers very much less from leaf disease than that in bad; and, in this respect, estates with good soil, and which were originally heavy forest, have the advantage, and if every chance be given them in good cultivation, will doubtless keep leaf disease in check, yielding at the same time paying crops. Dusting the trees and ground every year after a thorough pruning with fresh slaked lime has shown most beneficial results, and, although it is not a cure for leaf disease, it has certainly checked it and allowed the trees to bear heavily, and will repay any one for the trouble and expense of application.

"WHAT is one man's food is another man's poison" is an adage, it is to be feared, which will scarcely solace coffee-planters for the information given us by the *Sydney Mail*, that 50 lb. weight of chicory seed has been distributed among cultivators in the south-eastern district of South Australia, with the view of extending the growth of that plant. It is impossible to take up a journal published in our coffee-producing colonies without reading testimony to the general belief that their industry is seriously affected by the extensive adulteration of coffee by chicory, and consequent demands that efforts should be made to induce the Home Government to check it. There may be other uses to which chicory is applicable, but there is no doubt that the soft flavour imparted by it to coffee makes the adulteration of the latter more favourably regarded than it otherwise would be, and therefore this effort in the direction of "new products" in South Australia will be certain to call forth complaint in Ceylon, and other coffee-growing Colonies, which even now have difficulty enough to sustain the competition to which they are exposed with countries where labour is almost compulsory, such as the Brazils and Java.

COFFEE LANDS IN MYSORE.

THE following proposed terms for the [illegible] Coffee lands in [illegible] as average [illegible] are [illegible] in the Madras [illegible]

1. [illegible] on all [illegible] lands [illegible]

2. Subject to the approval of the Government of India, permanent assessment at Rs. 1-8 per acre to those who may desire it, on the terms of the Madras Coffee Land Rules, but with a reservation of the Government claim to royalty on valuable mineral products, viz., metals and precious stones.

3. An assessment of eight annas per acre only for very poor lands, or for lands which have greatly deteriorated in their condition.

4. Grass lands in clearly defined compact blocks, to bear an assessment of four annas per acre if retained for pasture or growth of firewood.

5. Land newly granted to be held free for three years. To be charged with half assessment for the next two years, 4th and 5th, and to bear full assessment thereafter: Lands granted within the last five years to have the benefit of this rate, reckoning from the date of the grant.

6. Lands totally abandoned, or thrown out of cultivation owing to the ravages of the borer or other cause, may be taken up again on terms provided for new grants of land.

7. The assessment provided in Rule 1 to come into force at once in regard to old estates. But the settling officer may provide for the levy of half assessment only for any period not exceeding five years, when such consideration appears to be required in consequence either of the inferior productiveness of the estate as in the case of Native holding, or owing to portions of the estate remaining unplanted.

8. The area of grass land in an estate to be assessed under Rule 4 to be taken in the first instance on the estimate of the pattadar, subject to correction and levy of the proper assessment retrospectively upon survey.

9. Estates not exceeding 50 acres in extent must be relinquished wholly and not in part. In the case of estates exceeding fifty acres in extent, relinquishment will be permitted of a portion not less than one-half of the whole estate, or less than one hundred acres. Provided that the land relinquished shall form a compact block on the margin of an estate and divisible from it by a reasonably straight line of boundary, and provided further that the cost of re-surveying the land and of erecting the boundary marks required be borne by the applicant.

With regard to these terms the subjoined order has been issued by the Mysore Government :—

His Highness the Maharajah's Government has had under its consideration the terms proposed and sanctioned by the Government of India for the settlement of coffee lands in Mysore on an acreage assessment, and the correspondence connected therewith. His Highness the Maharajah entirely concurs in the views held by Sir James Gordon, that the interests of the State as well as of the planters are best consulted in according to them a permanent assessment, and he is pleased to accept and sanction the above terms inclusive of Rule 2 providing for a permanent assessment at Re. 1-8 per acre to such of the planters as may at once offer for it. As it is understood that the above terms generally meet the wants and wishes of the planters, His Highness the Maharajah directs that the Survey Superintendent, in communication with the Deputy Commissioners of the respective districts, will at once take steps to carry into effect a settlement of the coffee lands on the above terms in the current year. The Survey Superintendent should, in communication with the Planters' Association and the Deputy Commissioners of Hassan and Kadur, submit a draft form of the title-deed to be issued to the planters. It will be seen that the Government right to a royalty on metals and precious stones, to sandals, and to an excise duty on areca-nuts is reserved, and that the lands will continue to pay the established local cesses. The halat duty on coffee as well as on cardamoms will, on the introduction of this settlement, be abolished. In regard to cardamoms on Government forest lands which are not held on cultivation pattas, arrangements should be made for their being given out on rent annually, or for longer terms. When the lower rates of assessment provided for temporarily by Rules 3 and 7 are fixed, planters will be allowed a permanent assessment at Re. 1-8 per acre to take effect after the expiration of the temporary assessment, but their applications for the same should, as in other cases, be submitted at once. If Rule 9 requiring that estates not exceeding fifty acres in extent should be relinquished wholly and not in part is found to operate with hardships in the case of the smaller coffee estates held by native ryots, the Survey Superintendent should submit for consideration any modification of the Rule which may be required in the above cases.

COFFEE AT HOME.

THE figures presented by our London correspondent in his commercial report, which we recently published, claim careful consideration by reason of the great decline in the exports of coffee from London during the first eight months of the year, as compared with the corresponding period of 1880. It was shown that the export deliveries up to the 3rd of September amounted to no more that 25,227 tons; whilst in 8 months of the preceding year (which was itself by no means remarkable for a brisk continental trade) they were 36,040 tons, or a falling off of very nearly 11,000 tons. A closer examination of the items shows that the deficiency accrues chiefly in Ceylon and Brazil coffee, the proportion of the former being nearly 8,000 tons. At the same time, it must be borne in mind that on 3rd September the stock of coffee in London was less by 3,400 tons than the same date in 1880, whilst at the great continental entrepots there was a relative surplus of 34,000 tons.

It is quite clear, therefore, that continental dealers have this year resorted less to the London market than in last year, to the extent of about 30 per cent., either because they could do better elsewhere, or because there was not the same demand for the article. For a long time past the tendency has been towards the decentralisation of the coffee trade of London, and the promotion of more direct intercourse between producing countries and the European ports. This year especially the direct shipments from Rio and Santos to Havre, Antwerp, and Bordeaux have been on an exceptionally extensive scale. These remarks, however, do not apply to direct shipments of Ceylon coffee to continental ports, which during the current season have been about on a proportionate scale with the exports to the same places during last year. The argument, however, applies equally here so far as regards the tendency to direct communication between the country of production and that of consumption. No doubt our direct shipments of plantation coffee would [illegible] extensive than they are, were it not for the circumstances that [illegible] the finer growths of our mountain plantation crops must of [illegible] be shipped to London, and are therefore not procurable in the [illegible]

[illegible] had on the 1st ult. reached the [illegible] high [illegible] at Antwerp 7,800 tons more than last year, and [illegible] of 2,790 tons. The truth is, no doubt, that heavy [illegible] made from Brazil to these ports; because the holders could not sell on the spot, and were bound to turn their goods into money, the consignees have been ready to sell at prices relatively lower than those ruling in London, and hence the inactivity of business there.

It is possible, too, that the consumption has fallen off in one at least of the chief coffee drinking countries of Europe. The emigration returns to the United States are of themselves sufficient to account for something in this matter. Last year more than 200,000 persons crossed the Atlantic from various European States not including the United Kingdom, and this year it is reckoned that the number will not fall far short of 300,000. By far the larger proportion come from Germany, but there is a good sprinkling of Norwegians, Swedes, and Italians, and it may safely be said that they are all coffee drinkers. Moreover, the enormous increase of emigration from Europe lately is itself a sign of poverty and depression amongst the labouring classes who form the bulk of the emigrants, and as a matter of course those who remain also suffer, though they do not adopt the same remedy, and it is reasonable to suppose that amongst the household economies enforced upon them is the restricted consumption of coffee; so far as the emigrants are concerned, they only transfer their consuming power to another sphere, where they are doubtless soon in a better position to gratify them, and hence the hitherto steady increase of consumption of coffee in the United States.—*Ceylon Times*.

CINCHONA.

THE Cinchona Succirubra is now being extensively cultivated in Coorg, the fine prices it realizes, (3*s*. 4*d*. to 3*s*. 5*d*. per lb.) and its suitableness as a shade for coffee, have rapidly brought it into notice.

A SINGLE cinchona tree, about eight years old, in Ceylon, grown at an elevation of 5,000 feet, was rooted up the other day and yielded 96 pounds of wet, and 32 pounds of dry bark. If this tree were a Succirubra, it returned no less than £4 of crop, making an acre of plantation of this variety worth £4,800.

AN idea of the progress that has been made in shade cultivation in South Coorg may be ascertained by the fact, that several planters find that their planted shade has grown so thick that they are obliged to thin it out to enable the coffee trees to crop properly.

A SALE of Cinchona Ledger seed took place on the 21st inst., at the office of Mr. C. E. H. Symons. There were forty-five boxes of seed put up, each box containing two grammes or thirty-one grains English weight. The first sales were made at Rs 50 the box, after which the price of Rs. 60 was realised, and finally one small box, sold as containing a quarter of a gramme or not quite four grains, realised as much as Rs. 11. According to these figures the first boxes realised at the rate of Rs. 774 the ounce, the second at the rate of Rs. 929, and the third small lot at the rate of Rs. 1,361 the ounce, or equal to Rs. 21,791 per pound.

THE manufacture of cinchona febrifuge is steadily on the increase, the demand becoming larger year by year as the article becomes known. The quantities manufactured each year have been as follow :—

			lbs.	*oz.*
1874-75	...	...	48	10
1875-76	...	...	1,940	6
1876-77	...	...	3,750	12
1877-78	...	...	5,162	0
1878-79	...	...	7,007	0
1879-80	...	...	9,434	13
1880-81	...	...	9,296	0
	Total	...	36,639	9

The cost of making this valuable medicine was as follows :—

354,480 lbs. bark	...	Rs.	58,136	11	6
Cost of manufacturing, &c.		„	27,784	10	9
		Total Rs.	85,921	6	3

Cost per lb of febrifuge made—

Bark ...	...	...	Rs.	6	4	0·76
Manufacturing	...	...	„	2	15	9·865
			Total Rs.	9	3	10·625

This is all very well from a Government point of view, but it is not a fair estimate of the cost of producing a pound of febrifuge, and, to the extent of this error, it so far militates against private enterprise engaging in the business. Suppose a joint stock company were to commence the manufacture of this febrifuge, they would have to purchase their raw material in the open market, and so far from obtaining the bark at 2as. 6·4147 pies per lb, the amount debited in these accounts as the value of the bark, they would have to pay about Re. 1-4 per lb. It takes 38·13lb of bark to make a lb. of febrifuge; consequently the cost would be something like this :—

38·13 lb bark Re. 1-4	=	Rs.	47	10	7
Manufacturing charge, say	...	„	2	15	11
		Total Rs.	50	10	6

It would thus be manifestly impossible to place it in the market at 20 rupees per lb. The quantities sold during the last two years were :

1879-80	...	... 8,164 lbs.
1880-81	...	... 8,654
Increase	...	490 lbs.

equal to an increment of 6 per cent. Besides the febrifuge now in use, Mr. Gammie, the accomplished and successful Superintendent of the gardens and factory, has "succeeded in turning out a crystalline prepared of the febrifuge which, being free from the amorphous alkaloid, may prove a pleasanter medicine than the febrifuge in its present form. Mr. Gammie's crystalline febrifuge is a very pretty preparation, being nearly as white as quinine itself. It is now under trial in various Government hospitals, and if it is reported well of, arrangements can be made for its production on a large scale." "Mr. Gammie has continued to direct his attention to the economical manufacture of sulphate of quinine. Decided progress has been made in this matter since last year, but further experiments will be necessary before I," says Dr. King, "can advantageously submit a full report on the results." The plantation, near Darjeeling, whereon these experiments are being carried on, is itself a great success. The number of plants now growing is as follows :—

Cinchona Succirubra	...	4,034,535
Cinchona Calisaya	...	412,695
New unnamed variety	...	199,898
Other kinds	..	30,592
	Total	4,677,720

An effort is being made to extend the cultivation of the *Ledgeriana* variety of the *Calisaya*, as it has been found to give the best result. A small parcel of *Calisaya* bark, of too low a quality to be of service at the factory, was sent to London for sale in open market, and this invoice, which weighed 12,519lbs., sold at prices ranging from 2*s.* 9*d.* to 7*s.* 6*d.* per lb., the average price realised being 4*s.* 6½*d.* With this were sent 625lbs. of *Ledgeriana* bark (the first which has gone to London from India) to test the market, and this small sample realised 10*s.* 10*d.* per lb., which must be considered very satisfactory.

CINCHONA CULTIVATION IN BENGAL.

THE annual report for 1880-81, of the Superintendent of the Royal Botanic Garden, Calcutta, and the Government Cinchona Plantation in Bengal, is one that will interest the planter, the physician and the public. To the former, perhaps, the most interesting fact is the sale by public auction in a parcel of 625lbs. of Ledgeriana bark, at the rate of 1*s.* 1*d.* per lb. proving that the cultivation of this variety in India justified the high opinion that early analyses indicated ; and that the valuable property of yielding a high percentage of crystallizable sulphate of quinine may be relied on as a permanent peculiarity of the variety. That this opinion is held by the officer in charge of the plantations is proved by the planting out of over 100,000 plants of this variety of Calisaya in the Mungpoo and Sailong reserves, and the formation of large nurseries to keep up the supply for future years. On the other hand, the extension of area under the Succirubra variety, has not been proceeded with, a forest of four millions of these trees being considered ample to provide "druggist's" bark for preparations, decoctions, and tinctures, and also the Government febrifuge which may be styled the mainspring of the enterprise. The only attempt at introducing a new variety, that yielding the Carthagena, or Columbian bark, has also apparently been fairly started ; for although there were only four plants in 1880, there were in July sixty rooted, and ninety partially rooted, cuttings, combating with success the attack of the "turnip" pest which has attempted their destruction. Cinchona planters will note with interest that 75 acres of Succirubra reported at eleven years old, gave a yield of bark averaging 20lbs. per tree, which is considered poor ; that a southern aspect has been found most suitable for Ledgeriana and that the Java plan of shaving the bark of living trees to the height of eight to ten feet from the ground, has been a success, the bark renewing perfectly. But while we have successfully followed the lead of the Dutch planters, headed by Moens in Java in the method of gathering bark, another of their experiments has not been attended on these plantations with success. While the Ledgeriana is valuable from its peculiarity of yielding an alkaloid rich in quinine, it suffers from a delicacy of constitution and a timid habit of growth. On the other hand, the Succirubra is remarkable for its vigor, and adaptability to widely varying soils and climates. By grafting the richer variety on the poorer, it is hoped that the more valuable characteristics of both may be combined, and a bark containing alkaloids, yielding 10 per cent. or even 15 per cent. of quinine, be grown with the freedom that Succirubra yields in its present one to two per cent. condition. So far failure to achieve this in Bengal is reported, though we have seen the the plan successfully carried out by two methods in the Wynaad, so there is reason to hope that the further trials which are to be made may meet with success.

In the several essential points the Government in growing Cinchona for the manufacture of its alkaloids into medicinal products, has achieved a marked success. The total out-turn of the febrifuge Factory during the year was 9,296lbs., obtained at an average cost of Rs. 9-3-10 per pound. The sales to the public are steadily growing, and this year amounted to 3,150 lbs., showing an appreciation of its value that has extended beyond official circles ; while to medical depots no less than 6,5[illegible]lbs. was supplied.

"The actual profit exhibited on the year's working was Rs. 89,290, equal to 8 per cent. on the capital of the plantation, while the value of the stock in hand at cost price was Rs. 94,921. This, however, does not represent the whole of the gain of the year. The price of quinine was very high, and the cost of 5,550 lb., which would have been used by Government had the febrifuge not been available, would have been at the lowest estimate Rs. 5,50,000. The cost of the febrifuge used was only Rs 90,880. There was thus a clear saving of Rs. 4½ lakhs. The saving effected by similar substitutions of febrifuge for quinine in previous years amounted to 11¼ lakhs. The total saving therefore has already amounted to more than 16 lakhs of rupees." Considering that but for the labours of Mr. Clement Markham, acting on behalf of Government, the growth of cinchona in India might be still untried these may be regarded as magnificent results. At the same time it appears that as the object of the Government is not to make a profit, but to obtain an efficient antidote to fever at the lowest possible cost, the question of lowering the price of the febrifuge might be seriously considered. The introduction of quinine producing plants, and their successful propagation will always be a feather in the cap of the Government of India, but while taking all due care of those who are too poor to take care of themselves, they must be careful not to check private enterprise. A true middle course is not difficult of attainment, and we would suggest that as their aim is primarily cheap febrifuge, such could be attained by purchasing as well as growing barks and erecting suitable manufactories at convenient centres. The report speaks of Mr. Gammie the executive officer of the Mungpore factory, discovering processes by which the various preparations of Cinchona bark are cheapened, and it would be a help to many planters if they could sell indifferent barks in India. It is from such barks that the febrifuge is mainly manufactured so the Government would gain in obtaining quantities that might permit of a sensible reduction in price, and lead to an increased demand.—*Madras Mail.*

CINCHONA CULTIVATION IN JAMAICA.

THE following appeared in the Kingston (Jamaica) *Gleaner* and *Tri-weekly Gleaner* of the 27th August, 1881 :—

We publish to-day the terms upon which the Government of this Island, being desirous of encouraging the cultivation of Cinchona, offers to make grants of public lands to persons who will embark in the enterprise. The situation of the land is not mentioned, but we presume the extensive unopened tracts of forest on the higher Blue Mountain slopes are referred to. The Government has already encouraged, under favorable concessions, the cultivation of cinchona by private enterprise thereabouts, and is now, we are glad to believe, seeking to establish the industry systematically. The land we speak of lies at elevations of from 4,000 to 6,500 feet ; is without roads but of fine quality ; is distant from Kingston two-score miles, but possesses a climate delightful alike to those who dread the cold of a northern winter and those who dread the heat of tropical high noon.

To anyone who thinks seriously of investing his capital in cinchona cultivation in Jamaica, but fears to venture, we would point out that he will not be alone in the undertaking. We could name at this moment several gentlemen, including His Excellency the Governor, who have devoted land and capital to it. In his last Report, Mr. D. Morris stated that large numbers of plants had seen put out at Whitfield Hall, Radnor, and Clydesdale. To this list, the names of many well known high plantations between St Catherine's Peak on the west, and Blue Mountain on the east, might be added, while the cultivation of cinchona adapted to lower elevations is being prosecuted with vigour in Manchester. The demand for seeds and plants increases daily, and can hardly be met. This new industry brings into productiveness regions which in many cases were unsuited for coffee or provisions, and which were a burden on the owner. We regard this departure as creditable not only to the Government, but to the planters who have been so often, so foolishly, and so freely accused of indifference to their own best interests, and to opportunities of unfamiliar profit.

Estimating the gain which may accrue from new enterprises is always a delicate affair. In the present case we will give the statements of authorities on the subject in preference to opinions of our own, merely pointing out that many of our shrewd and experienced planters have satisfied themselves as to the profit derivable from cinchona, and have given evidence of the faith that is in them. In his valuable report, to which we have already referred, Mr. Morris describes how he found a little patch of *cinchona officinalis* which had long been deserted on Whitefield Hall Estate, and which was found hardy and thriving He says :

"As indicating the value of cinchona planting in the Blue Mountains—taking these 379 trees which occupied an area of less than 120 square yards—it was estimated that if they yielded on the average one pound of dry bark per tree (young trees at the Government Plantations yielded 1½ pounds per tree) each tree would be worth at least 5*s.* ; this would give £94 15*s.* as the value of 379 trees on an area of 120 square yards, one-fortieth of an acre. Under ordinary conditions it would not, however be advisable to plant the trees so closely as this, but the value of an acre of land planted with trees even at one-half the above rate would amount to more than £890. Large as this sum may seem, it appears that with the precious Ledgeriana Bark, grown by the Dutch in Java, (a few plants of which have just been introduced to Jamaica) the yield per acre, as quoted by Mr. J. E. Howard, F. R. S, is estimated, from actual sales, at £2,000 per acre."

We will take, in addition to the above, the statement made by Mr. Clements Markham in his interesting and important monograph on "Peruvian Bark." In his chapter on "Financial Results," he says:—

"The results of the sales of bark from the Government cinchona plantations on the Nilgiri Hills, in India, is that a sum of £173,046 has been realised. The total cost of the whole enterprise from the commencement, including interest, was £129,628 in 1876. By the year 1879, allowing for charges during intervening years, the sum to be debited against the enterprise was only £38,942. In 1880, the whole capital account had been paid off with interest, and the plantations begun to yield a clear annual profit. It is therefore true of the Cinchona enterprise that as a mere commercial speculation, it has paid off the whole outlay, including introduction of the plants, cultivation, and interest ; and has become a complete financial success."

Mr. Markham also gives figures to show how private enterprise in India and Ceylon is reaping the same reward. For his remarks on this point, we must refer our readers to his work. It is shown that while the Government of India will in future have as much demand as it can meet, in supplying cinchona febrifuge for the millions of India, the planters of Ceylon and India, as well as of Java, find a ready and profitable demand for their bark in Europe. At the same time a vast market for the bark is being found in China, where until now opium has been the cheapest drug as a cure and preventive of fever, and where from 30 to 40 per cent. of the population use it, to their own ruin and to England's disgrace.

The prices obtained for Jamaica bark should stimulate to activity in planting Cinchona. Mr. Markham, in his sketch of Cinchona cultivation in Jamaica, says that *C. officinalis* does not thrive so well in this Island, but he speaks favorably of *C. succirubra* and *C. calisaya*. But the latest results furnished by sales of Jamaica "grey" barks, are proof that *officinalis* grown here commands better prices than that of Ceylon; and last week we had an opportunity of seeing how, as Mr. Morris describes, the *officinalis* spreads in self-sown forest patches at the highest elevations, thus exhibiting great fitness for the soil and situation. The Island has now, therefore, at least three kinds of cinchona well established, *officinalis succirubra*, and a good variety, called *calisaya*, but supposed to be a hybrid between the other two. Moreover, the *ledgeriana*, a variety of *calisaya*, introduced by Mr. Morris, is now growing well, as a plant, and seed of it has already been imported. Of this *ledgeriana*, which Mr Morris says fetches 17s. per lb at Amsterdam, Mr. Markham writes: "These plants yield an extraordinarily large quantity of quinine, as much as 9.97 per cent. In this respect they are unequalled." With regard to the species known as *succirubra*, and yielding the "red" bark of commerce, a variety which Mr. Morris recommends as being peculiarly suited to so much of our land from 2,000 feet upwards, Mr. Markham writes that it yields a larger percentage of febrifuge alkaloid than any other. As time rolls by, other varieties again may be found to naturalise themselves easily, "the Blue Mountains of Jamaica * * * being about the same distance from the equator on the North side (18o N.) as the calisaya forests are to the south."

As the Government now offers land for cinchona, it is also ready to supply the seeds and plants. Seeds of the *officinalis*, for cultivation at elevations above 4,000 feet, are supplied at 5s. an ounce; of *succirubra*, at elevations between 2,500 and 4,000, at 3s. An ounce is sufficient to produce 20,000 seedlings, which will plant five acres. Boxes of seedlings may be had at a guinea per box, and plants are obtainable at from 40s. to 60s. per 1,000.

We hope to witness an early extension of cinchona cultivation by men who have capital and can await the first yield in the fourth or fifth year. The opportunity now offered is excellent. It is possible that a market for the Jamaica bark will be found some day in the U.S.A., which consumes vast quantities of quinine, but for the present, England takes all that can be shipped, and at remunerative prices. The time cannot be far off when the masses of Jamaica will be provided by government with a cheap, effective febrifuge, now so greatly needed. And leaving out of question the commercial and social advantages resulting from cinchona, it may be fairly claimed that this tree, which once inspired the prose of Madame de Genlis, and the verse of Le Fontaine, will, with its graceful stem, shining leaves and clustering flowers, be an additional adornment to the far famed but neglected mountains of Jamaica. [We are sorry we cannot find room for the rules referred to. They are like other waste-land rules we wot of, and will not, we think, entice investors.—ED., *I. A.*]

SERICULTURE.

SILK culture is exciting considerable interest in the south and west of the United States, cocoons and eggs being now raised in Louisiana, Georgia, California, Utah, Pennsylvania, North Carolina and Missouri. The cocoons are worth in the market $2 a pound, and the eggs from $3 to $4 an ounce. The climate and soil of California are especially adapted to silk culture, and there are in that State a number of Europeans expert in the business. The *San Francisco Alta*, in a recent article on the subject, says that some years ago cocooneries existed in various counties, but they were not profitable, and all went out of operation, the trouble being the expense at production. At the present time, another combined effort is being made to introduce the industry.

THE Agricultural Bureau at Washington has received information that a new variety of silk-worm has been discovered accidentally in Nevada. Naturalists pronounce the worms *Bombyx quercicus*. This is a silk-worm largely used in China. It makes several broods in a year, and its silk has peculiar qualities. The fibre is stronger. All other silk-worms, in emerging from the cocoon, cut a hole for exit, which, by breaking the continuity of the thread in unwinding, renders it of little value. The *Bombyx quercicus* pushes aside the threads instead of cutting them, and the cocoon is as valuable as others reserved in ordinary kinds for spinning by killing the contained worm. This new silk-worm is hardier than the old; it is raised in the open air, needing neither care nor shelter.

A DESPATCH from Italy, says an French paper received yesterday by a silk-firm in our town says that hatchings (of silk-worms' eggs) have on the whole, been satisfactory, and that, so far, all goes well in this respect. The silk markets of Lyons and London are quiet, and prices are low. One need not be astonished that, under such conditions, transactions should be limited in Yokohama, where stocks are small, especially in good staples.

AMONG the striking signs of progress now visible in Japan, not the least important is the attention they are giving to their silk trade. They now propose to start a silk association or guild in Yokohama, with a capital of 30 million yen (£6,000,000). The idea is to perform an operation analogous to bulking tea. The silk of all members will be received by the guild, and be carefully graded according to quality advances will be made to manufacturers, and all silk passed through the guild will go to Europe, not as the make of any individual concern, but as belonging to, and guaranteed by, the guild. To a large extent this will do away with opportunities for private speculation of silk makers, but in the long run it should lead to better prices being obtained for silk passing through the guild's hands. Such would acquire a certain value, as the incentive to cheating would largely be eliminated. Such a guild in Calcutta in connection with tea could not fail to succeed, if only the feeling of jealousy connected with valuing were got over. An entirely disinterested and trustworthy valuator might be appointed to receive and put a price on all lots received; advances could be made on each lot, or payment in full made at the rate of one anna under the valuation. The tea would then be bulked in lots of a thousand chests or so, carefully re-dried, and packed for London, not as the individual brand of any garden, but as the property of the guild. At the close of the year, all profits could be divided *pro rata* among the members. By this means the teas of the guild would speedily acquire a name for almost absolute uniformity of quality, and members could not fail to benefit by the proceeding.

SILK ADULTERATIONS.

IT has been proved by numerous experiments that all pure silk burned in a gas flame yields in ashes two-fifths of the original weight, and that all weighted silks, when burned in a gas flame, weigh less than two-fifths in proportion as they are weighted, and where there is much iron, "the chief adulterant," the colour of the ash is a red brown. From pure silk the ash is always black, and the silk while burning seems to melt and run together, while the weighted silk keeps its form, shrinking equally from all parts. It is not necessary to burn any pure silk "unless comparisons are desirable," if you take the fact as established that the resulting ash is two-fifths of the original weight, and all silk not coming up to that standard is proportionately weighted.

The theory is pure silk leaves a residue of two-fifths when burned to ash, and the weighted leaving very little ash from anything but the silk it contains, the adulterants being principally converted into vapour and gas, pass off, leaving no perceptible weight of residue. The best method of burning the silk for testing is to lay it on a piece of wire gauze and let the gas flame pass through.

Scale.

20 parts silk yielding		8	in ashes is pure		silk.
20	" "	7	"	7/8	"
20	" "	6	"	3/4	"
20	" "	5	"	5/8	"
20	" "	4	"	1/2	"
20	" "	3	"	3/8	"
20	" "	2	"	1/4	"
20	" "	1	"	1/8	"

A very good idea of the purity of silk is shown by comparison: taking a piece of ribbon—any pure colour white, blue, pink, gold, or any bright colour—"one inch or two is sufficient," weigh carefully; then weigh exactly the same weight of silk to be tested and as much as it falls short in measurement with the pure silk it is weighted. Endeavour when testing as above to get a piece of ribbon the same substance as that to be tested.

When it is considered that the weighting is a very expensive process, and that the additional weight does not in proportion add to the bulk, and that the strength, durability, softness, and lustre are greatly impaired, the surprise is that the fraud is persisted in; but it being so, and the consumers must necessarily pay the expense of the adulteration, it is for them to ascertain how to protect themselves.

There are many black silks that are valued by weight, manufacturers and dealers agreeing as to the dyed weight; such is what is termed French twist, often returned by the dyer three pounds for one. This silk twist is made from waste, and as it is cut up and carded there is a great amount of fine fibre on the surface, causing a dull and woolly appearance. In the process of dyeing the silk is rotted by the many baths of nitrate of iron and other chemicals; the fibre on the surface becoming very tender is beaten off leaving a smooth hard twisted thread; but the processes are so detrimental to the strength, its use is confined to cutting up into fringes, but it soon shows its components, in becoming dull and cottony.

This French twist costs in the gray about four dollars per pound, and the dyeing heavy weight two dollars and fifty cents, so when finished, there is returned three pounds for six dollars and fifty cents, or two dollars and sixteen and three-quarter cents per pound. If dyed in the regular way, sixteen ounces would return twenty and cost fifty cents for dyeing. So in that way the good silk would cost four dollars and fifty cents for twenty ounces, or three dollars and sixty cents for one pound, against two dollars and sixteen and three-quarter cents for the heavy weighted. Let it be understood that the same number of yards and the same amount of good silk is in twenty ounces, costing four dollars and fifty cents, as in the forty-eight ounces heavy weighted, costing six dollars and fifty cents, and that the four fifty silk is clean and strong while the six fifty is dirty and rotten. So the advantage is hard to be understood, and perhaps is only in the fact there are yet very many who can only understand a pound is a pound and a yard is a yard and silk is silk.—*American Paper.*

TOBACCO.

IT was lately stated that the tobacco and cigar trade was steadily on the increase, and that large supplies were being sent from Madras to Great Britain and other places. It would appear from the return recently published that 4,399lbs. of tobacco and cigars, of which 2,763lbs. were shipped to Rangoon and 450lbs. to Yokohama, formed the export trade of Madras, last month in tobacco.

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NOTICE.

SUBSCRIBERS to the STATESMAN, FRIEND OF INDIA, *and* INDIAN AGRICULTURIST *are informed that arrangements have now been made by which these journals will for the future be published under the general superintendence of the undersigned.*

All communications concerning the general business of the STATESMAN AND FRIEND OF INDIA *Office, Advertisements, and Subscriptions to the* daily STATESMAN AND FRIEND OF INDIA, weekly FRIEND OF INDIA AND STATESMAN, *and* INDIAN AGRICULTURIST, *should be addressed to the MANAGER.*

All communications regarding literary matter should be addressed to the Editor of the paper for which it is intended.

WILLIAM RIACH.

June 13th, 1881.

CONTENTS:

NOTICE TO CORRESPONDENTS.

Our Correspondents and Contributors will greatly oblige us if they will take the trouble, where the returns of cultivation are stated by them in Indian weights and measures, to give their English equivalents, either in the text, in parenthesis, or in a foot-note. The bigah *in particular varies so much in the different Provinces, that it is absolutely necessary to give the English value of it in all cases. It would be a great reform if the Government itself followed the same course in all the official reports published by it.*

All correspondence must bear the full name and address of the writer, not necessarily publication, but as a guarantee good faith. We shall take no notice of anonymous letters.

ACKNOWLEDGMENTS.

REPORT on the capabilities of the Seychelles Islands.

ACCOUNTS relating to the Trade and Navigation of British India for September 1881. Calcutta : Superintendent of Government Printing, 1881.

REPORT on the External Trade of Bengal with Nepal, Sikkim and Bhutan for 1880-81. Calcutta, Bengal Secretariat Press, 1881.

SELECTIONS from the Records of the Government of India, No. CLXXVIII.—Reports on Artesian Borings in India ; Calcutta : Superintendent of Government Printing, 1881.

CORRESPONDENCE.

THE DIVI-DIVI PLANT.

(To the Editor of the Madras Times.)

SIR,—I notice in your paper that the Divi-Divi plant cultivation appears to be the question of the day, and as your readers may be glad to get some particulars regarding it, I send you a few remarks resulting from my own experience of the same. To the inquirer of the Tamil or Telugu word for Divi-divi, I will reply that it is difficult to satisfy him, as the Divi-divi or Libi-dibi (botanically Coosalpinia Corearia) is an American tree introduced in India by Doctor Wallich in or about 1813; its foreign origin is, perhaps, the cause of no Tamil or Telugu designation appearing for the same in the botanical works as *Flora Indica*, into which I have searched. The native gardeners call it in Tamil *Cona Velen*, on account probably of the form of the pods, which are turned as the letter S. There does not appear to be any designation in Telugu.

The Divi-divi pods are employed for tanning purposes, as they contain 50 per cent. of pure tanin. I have been told that in Bangalore there is a large plantation of this tree, and that its pods are largely used for giving the skins that superior smoothness remarkable in the Madras and Bangalore skins.

I have also used Divi-divi in dyeing, and I have employed a solution of acetate of iron after the bath in Divi-divi tincture. The ink used in most of the Government offices in Fort St. George is made with this plant.

The cultivation of this elegant shrub is very easy. The seeds should be sown in March, and the young plants can be removed from the nursery during the following rainy season ; they require some watering till they have attained the height of three feet, after which no more care is necessary. This plant grows luxuriantly in a clayish, calcareous soil, but very slowly in red soil, as I have observed at the Red Hills near Madras I think the difference in the growth in the two soils results from the clayish soil retaining moisture for a very long time in the summer, while in the latter the young plant is exhausted by the strong dry winds blowing on them. But I think still possible to cultivate this shrub in red soil with some success, by adding dry mud from tanks to the soil before replanting the young trees from the nursery. Cow-dung ashes will prove useful round the plant The great difficulty to contend with, however, in such soil is the want of water The cultivation I have made for the last few years is quite a success, and I have made experiments in both soils, clayey as well as red. I shall feel obliged if any of your readers will give me some information regarding the market current price of this dye in London or elsewhere. I think that the high rate of freight from India to Europe will not allow a margin of profit in the shipment of Divi-divi husks.

SEARCHER.

A BUBBLE-MAKING PLANT.

(To the Editor of the Madras Mail.)

SIR,—Among the numerous wild plants indigenous to Southern India, allow me to introduce one to the notice of your numerous readers. It is to be found in almost every hedge-row about the outskirts

of Madras and Bangalore, and somewhat resembles the castor-oil shrub, the leaves being nearly of the same size and shape, but of a lighter green hue. The Tamil name of it is "katamoney," by which it is well known among the natives. The fruit which grows on it in clusters is above the size of a damson, and an inferior kind of lamp oil is sometimes extracted from the seeds. The most singular part of the plant is a limpid juice which exudes from the leaf stalks when plucked, and which appears to possess highly saponaceous properties. This the native children have not been slow to appreciate, having turned it to account in the manufacture of bubbles, which are vastly superior to those made from soap and water, inasmuch as they are more tenacious, and their specific gravity appears to be considerably less. The bubbles moreover do not suddenly burst and instantaneously vanish like the ephemeral soap bubbles, but remain floating in the air for some seconds, gradually lose their irridescent hues, and assuming a milky or opalescent tint, slowly collapse and descend to the ground like particles of down. For the manufacture of these bubbles no pipe is necessary ; a bit of horsehair, cocoanut fibre, or the midrib of a large leaf bent in the form of a small loop being the only appliance needed. The loop is merely dipped into a cup containing the fluid, and when blown a score or more bubbles are formed and fly off at every puff, so that in a few moments the air is filled with hundreds of radiant little globes the effect of which is most pleasing, especially to the little folk. The juice is also largely used by the natives as a remedy for sore mouths ; and I think it would also answer as a detergent or dentifrice, as a few drops sprinkled on a wet tooth-brush and applied in the usual manner produce a foam in the mouth very similar to that caused by "floriline." The natives assure me that it is quite innocuous. The plant is a very hardy one, and will grow on almost any soil in any part of India.

OLD MADRASSEE.

AGRICULTURAL EDUCATION.

(To the Editor of the Madras Mail.)

SIR,—You are aware that in February last, a memorial was presented to the Madras Government, by the former and present students of the Madras Agricultural College, praying for an honorary degree to raise their social status. The Government, appreciating the value of agricultural education in a country like India, whose riches lie buried in the soil, and deeming it unnecessary to confer honorary degrees, forwarded the memorial to the University of Madras, for consideration. Another petition was prepared by such of the students of the Agricultural College as have passed the Matriculation, and was forwarded, in June last, to the Senate, in which they prayed for University degrees on certain grounds. The Senate seems to differ from the Government on the value of agricultural education. It is rumoured that the Senate is not willing to grant any University degrees to the students, on the ground that they are not F.A's. Students join the Agricultural College at Saidapet, not only from different parts of India, but also from the Colonies, as this is the only one in the East. Would it not be better for the graduates of the Agricultural College to return to their distant homes, with a hood and a gown, than to return just as they started three years ago from their beloved homes, to receive agricultural education at Saidapet? If the Bombay Agricultural College had worked as efficiently as the one at Saidapet, I am sure that the benign University of that Presidency would have ere long conferred University degrees (*vide* Sir Richard Temple's Minutes on Agricultural Education at Bombay) on the graduates of that College. My humble opinion is, as the Madras University is not to confer any degree without examining the candidates, that Matriculates ought to be allowed to compete, and that F. A. examinations are superfluous for agricultural degrees. It remains to be seen what reply the memorialists will receive from the Government if the University decline to grant degrees to Matriculates

CHINNAPPEN.

THE BIJNOUR AGRICULTURAL SOCIETY.

AIMS OF THE SOCIETY.

[*Communicated.*]

SUMMARY.

1. THAT the attention of the cultivating community be drawn to the sundry kinds of manure that lie, so to speak, at their very doorsteps, but of the value of which they have little or no conception.

2. That ploughs similar to the kaisar plough of Cawnpore be manufactured at Bijnour, and sold at cost price as well as let out on hire to secure their general adoption, also that steps should be taken to extend the use of—(1) Beheea mills, a good lot of which should be purchased and given out on hire; (2) winnowing machines; and (3) water-lifts.

3. That the Society manage to supply the agricultural classes with good seed of all crops wherever it could be procurable.

4. That measures should be devised to improve the local breed of cattle generally, and that the establishment of a cattle-breeding farm in a carefully-selected situation near the jungle should form a part of such schemes. That to obtain a better supply of fodder, efforts should be directed to promote grass reserves, cultivate root-crops, retain oil cakes, improve indigenous kinds of fodder plants, and introduce new ones, such as sorgho, lucerne, reana, guinea grass, and the like; and further that medicines for the several cattle diseases be made accessible to the agricultural classes with a view to their prevention by means of a cattle-disease medicine depôt at Bijnour.

5. In connection with the subject of irrigation, Government be induced to extend the system of State wells, as it seems to be the best means of ameliorating the condition of the cultivating population.

The latter may be also persuaded to make artificial tanks and reservoirs.

6. And lastly, that an agricultural show should be held at Bijnour this year, being the most efficient means of creating interest in agricultural matters and enlisting the active sympathy of zemindars and cultivators.

The Indian Agriculturist.

CALCUTTA, DECEMBER 1, 1881.

OUR MARITIME TRADE.

MR. J. E. O'CONOR has issued another of his useful and carefully compiled reviews of the maritime trade of British India with other countries. It is for the year 1880-81. We have already noticed totals, and shall now deal with details. To commence with imports, the receipts of quinine have fallen from 7,409lbs. in 1879-80 to 3,964lbs. in 1880-81, a decrease of 3,445lbs., or 46 per cent. Mr. O'Conor thinks that the "great epidemic fever, which swept over Northern India in the autumn of the former year," must have increased the demand for quinine. Doubtless, but the large quantity of cinchona febrifuge now used instead of quinine, may have something to do with the decline in 1880-81. The trade in imported malt liquors does not expand, and is now practically the same as it was four years ago. This is not due to a decreased consumption per head, but to the large quantities now being made and consumed in India. In 1880, no less than 1,974,578 gallons were made in India, of which Government purchased 1,298,773 for the troops, leaving 675,805 for general consumption. Machinery and mill-work increased from Rs. 61,68,327 to Rs. 76,98,437, and this is one of the most promising signs noticed in the report. The consumption of kerosine oil has increased in an astonishing manner, and has now reached 9,692,269 gallons per annum. We learn that the refining of the Borongo Island oil, near Akyab, has now been successfully accomplished, and we may soon expect to find it competing with the American oil. Paper and pasteboard figure at Rs. 48,60,076, which, at an average of four annas per pound, represents 8,700 tons, a very large proportion of which ought to be made in the country. Raw silk, to the extent of 2,511,802lbs., was imported, and that into a country like India which might supply the would with silk. Mr. O'Conor looks hopefully on the soap industry which, he thinks, will prevent importations from materially increasing in the future. Sugar is still imported into Bombay from Mauritius and China; and surely this should be unnecessary, if the indigenous industry were enterprisingly pushed. The quantity so imported last year was 49,113 tons. Perhaps the most anomalous import we have is tea. It is hardly conceivable that, while Indian tea continues to advance in public estimation at home, we

should not only use China tea in India, but that in increasing quantities, as the following statement will show :—

	lbs.
1876 77 ...	1,755,300
1877-78 ...	2,323,033
1878-79 ...	1,822,345
1879-80 ...	2,534,518
1880-81 ...	3,322,407

Mr. O'Conor gives a reason for this, and it is one which we have already asked planters to remedy. It is that Indian tea is sold in too large packets to be easily obtainable by the general public. As a rule the smallest quantity one can buy is one pound, whereas an ounce of China tea can be purchased. If only India tea-planters, or vendors of the article would place Indian tea on an equal footing with China, a vast business would be done. If it were sold in ounce or two-ounce packets, the entire make of our lower grades would easily be disposed of locally, thus securing a much better and convenient market for all the lower class teas made, and to that extent relieving the London stock of the article, and enhancing the value of tea in the market, while sensibly increasing the average quality placed on it with the obvious result of improving the reputation which Indian tea is already fast acquiring. Under these conditions nothing under a good Souchong, need be exported to London.

The impetus recently given to cigar-making in India is beginning to have its natural effect; the importation of foreign cigars fell from 88,082lbs. in the preceding year, to 65,782lbs. in the year under notice, a decrease of 25 per cent.

Our export trade shows signs of elasticity, and this is of great importance, as it cannot fail to indicate an improving position. Our cotton industry is showing steady progress. The following are the exports in rupees of twist and cloth of Indian manufacture :—

	Twist.	*Cloth.*	*Total.*
1876 77 ...	36,73,028	44,50,794	81,23,822
1877-78 ...	68,20,585	46 06,738	1,14,27,323
1878-79 ...	88,64,812	51,14,980	1 39 79,792
1879-80 ...	1,10,92,336	51,25,132	1,62,17,468
1880-81 ...	1,28 25 761	62,65,579	1,90,91,34 3

There can be no doubt that this reveals a prosperous state of the industry. Besides this, who can estimate the quantity of Indian manufactured cotton consumed in India ?

The fluctuating nature of the Indian wheat trade is clearly shown in the following statement :—

1876-77 ...	5,583,336	cwts.
1877-78 ...	6,340,150	"
1878-79 ...	1,044,709	"
1879-80 ...	2,195,550	"
1880-81 ...	7,444,375	"

and during the first four months of the present year (1881-82), the exports have been at the rate of one and-a-quarter million cwt. per month. As we have frequently said before, we think the railway companies are not sufficiently awake to their own interest in connection with this vast trade. As soon as a steady increase in forwarding traffic shows itself, rates are immediately raised. In this respect the Great Indian Peninsular Railway has been the worst offender, and is experiencing the just reward of such folly in a decreased carrying traffic. Of the 7½ million cwts. exported, 4,802,233 or 64½ per cent. went to England. In oils, we export largely, although not nearly so extensively as we might. The value of the exports, which principally consisted of castor and cocoanut oils, was 37¾, 37, 53¾, 57 and 58 lakhs of rupees for the five years, 1876-77 to 1880-81, respectively. At the same time, we must not overlook the fact that, while the value of oils exported last year was only Rs. 53,11,394, oil-seeds to the value of Rs. 6,34,52,089 were exported. Now, as this seed was purchased for the purpose of having the oil extracted, there is no reason, except want of business enterprise, why we should not make a great deal more oil than we do. The exports of Indian silk are sensibly declining, and this is much to be deplored, as the silk industry is one peculiarly adapted to the habits and aptitudes of the people of this country. We suspect the poverty of the people has a good deal to do with this. The exports of Indian sugar have fallen from Rs. 92,51,961 in 1876-77 to Rs. 31,17,508 in 1880-81, a decrease of 66 per cent. in four years. Attention is drawn to the advisability of encouraging other markets than London for the tea trade, and Mr. O'Conor, who speaks with authority, deprecates the returning tendency to flood the London market, and neglect that of Australia, simply because prices have temporarily risen in the former place. This, he rightly considers, suicidal, and he points out "that every pound of tea diverted from the London market, must tend to raise prices there, and keep them at a profitable level." "It may be hoped," he adds, that the temporary elevation of prices in England will not divert the attention of planters from Australia and the United States, and that now that these markets have been opened to them, they will be sagacious enough to keep them open by an uninterrupted and copious supply of tea." This is very much to the point, and we trust that the tea exporters of India will not permit the exports to London to increase, in like ratio with the increased production of our gardens, but will perseveringly find markets elsewhere for the surplus. By following this policy for a few years, the prices in London will be certain to keep up, and Indian tea will assume the position, relatively to China, to which its superior qualities entitle it. Tobacco, too, is a hopeful export. There are few countries in the world better adapted for the prosecution of this industry than India. So far as its growth is concerned, India need fear no rival. The value of the export for the past five years have been as follows :—

	Rupees.
1876-77 ...	8,91,398
1877-78 ...	9,30,371
1878-79 ...	12,03,222
1879 80 ...	12,98,097
1880-81 ...	14,08,310

Not only has the import of cigars been checked, but India is now exporting to a considerable extent, the total exports of all kinds of tobacco during 1880-81 having been as follows :—

		lbs
Unmanufactured ...		13,267,325
Manufactured—		
Cigars ...	207,005	
Other sorts ...	198,811	
		405,816
	Total ...	13,673,141

Of the unmanufactured tobacco, about one-third went to the United Kingdom, one-third to Aden for transhipment to Arabia and Africa, and the remainder elsewhere. There is room for a further increase in the exportation of this article, but India will never be able to carry on this trade to advantage till she produces at least half a ton per acre. In America, the outturn is occasionally over a ton per acre, while in India it is very much less, the average produce per acre being in the Punjab 780lbs., and in the Central Provinces 199lbs. The exports of tobacco must, therefore, be checked, from the inability of the farmer to make a sufficient profit in its cultivation.

A MODEL REPORT.

WE commend to the various report-writers of this report-producing land, the brief and succinct report of the Professor or Minister of Agriculture for South Australia, regarding the organization of an Agricultural College. From the space which it occupies in our columns, it may be seen that the whole report would not cover more than three pages of foolscap; and to those conversant with agriculture and its importance, it will be apparent that in this brief space, Professor Custance has stated the chief reasons and advantages that may be derived from an Agricultural College organized, and worked on a common-sense basis. It is quite refreshing to us here in India to come across a report-writer who can say his say and state his case within such short limits. It is probably hopeless, at this time of day, to expect that Indian officials will in

the matter of cumbrous, long-winded reiterated reports, change their ways; but it might be good for some of India's report-manufacturers, and would certainly be an unspeakable blessing to those of the present and succeeding generations who may have to wade through the compilations yearly poured forth from the various Secretariats, if, reading some such simple, short, straightforward statement as that noticed, they should "take a thought and mend." The multitudinous reports which are periodically called for, written, printed, re-written, "hashed up" and re-printed, are "quite too awfully" imposing; and men who would serve India better if they moved over their districts, came in contact with their subordinates, and saw things with their own eyes, and censured, and approved on the spot, are compelled to waste some of the best months of the year in writing long-winded reports, which some who write and many who read may wish heartily at Jericho. The best work in India is not done either by reports or report-writers, though both have their place—in our opinion, an unduly prominent place, as reports go in the present day. The official who does the best work is he who makes his individuality felt through the long line of his subordinates and upwards, by his straightforward, manly utterances, through gentlemen's gentlemen, secretaries, assistants and potentates, to the ear of the great body of public opinion, which in the end makes itself felt through triple bands of red-tape and circumlocution.

On the present occasion we have no intention of doing what has frequently been done in our columns, namely, advocating the claims of agricultural teaching for India. The short report of the South Australian Professor, with certain exceptions, is as applicable to this country as the colonies, and in the Madras presidency steps in the right direction have already been taken. Bengal may probably follow in the same path, when it gets a Lieutenant-Governor who believes that agriculture is quite as important to the welfare of India, as railways and roads.

The following is Professor Custance's first report to the Hon. the Commissioner of Crown Lands regarding the organization of the proposed Agricultural College for South Australia:—

"To the Hon. the Commissioner of Crown Lands.

"Sir,—In accordance with your instructions, I have the honour, to submit for your consideration the following brief notes regarding the organisation of an Agricultural College for South Australia.

"It may be as well to mention that England possesses two Agricultural Colleges, the Royal Agricultural College at Cirencester and the College of Agriculture at Downton, near Salisbury—both self-supporing and working satisfactorily. There is also a Chair of Agriculture at Edinburgh University.

"The Imperial Model Farm of 1,200 acres and School of Agriculture at Grignon in France, the numerous experimental stations in Germany, the Cornell University in the State of New York, the Glasnevin School of Agriculture in Ireland, and the Imperial College of Agriculture and Experimental Farm at Kornaba, near Tokio, Japan, are some of the best examples of Agricultural Schools.

"South Australia does not at present possess a school for agricultural instruction, investigation, and research, yet agriculture is of all occupations the one which stands in need of the safeguard of a sound scientific judgment and of scientific knowledge. No one will deny that at the heart of all large questions, political or social, affecting the prosperity and welfare of a country there lies, hidden it may be, but always real, the question, 'How can the greatest produce be secured at the least expense from an acre of ground?' The problems of agriculture are scientific problems of the highest difficulty and complexity; the adequate preparation of the ground for the growth of a given crop, the prevention or cure of the diseases of crops, &c., are subjects which, seriously examined, expand into a whole series of problems, taxing to the utmost the fullest and most advanced knowledge; hence the necessity for an institution where students can be trained for the work of practical and scientific farming, and where investigation and research can be properly conducted.

"Some of the advantages to be derived from an Agricultural College and Experimental Farm in connection therewith may be briefly referred to. A number of students, after receiving a practical and scientific training, would be fitted for conducting the business of farming more profitably, and by their example probably induce a better system of farming in the country. Regarding the future prospects of farming in South Australia, the advantages of an Agricultural Institution and Farm will be acknowledged by every one.

"The College could to a certain extent perform the work of an agricultural department in the collection and publication of agricultural information, &c. Enquiries from different districts could be received and answered, and information supplied when desired by a course of lectures or otherwise. Investigation and research should be carefully and systematically conducted. Lectures could from time to time be delivered in different districts by the Professor of Agriculture.

"The Farm in connection with the College should be an example of what can be accomplished in South Australia by good farming, the proper cultivation of the land, and the use of suitable manures

"Experimental plots on a portion of the farm would be of great interest and value. New crops, &c., might be tried; if successful, a portion of the farm could be devoted to the growth of seed for distribution. A series of experiments (under different conditions of soil and climate) might be conducted in various districts. The breeding and rearing of stock might also receive attention. The situation of the College should be healthy, in a farming district, and easy communication with Adelaide would be an advantage.

"The cost of the institution and working expenses need only be moderate. If a sufficient number of students attend the College it might become self-supporting or nearly so. The size of the farm might be from 1,000 to 5,000 acres, though a less area would be sufficient at first. The Professor of Agriculture would require one properly qualified assistant.

"In conclusion, allow me to say that an Agricultural Institution and Farm, where both the practice and science of agriculture may receive the attention they deserve in an agricultural community, should be, I think, commenced without delay.—I have, &c.,

"JOHN D. CUSTANCE.

"July 29, 1881."

POUDRETTE.

THE conversion into manure, and the incorporation with the soil of all the night-soil and excreta of towns and villages in this country is a question of vital interest to the Indian cultivator, and as far as municipal and cantonment committees are concerned, the Poudrette question is the most important in a sanitary, and it may be said economic, point of view with which they have to deal, unfortunately it is one which has not received any very general solution.

In England and Europe the ultimate disposition of all refuse matter of towns, human excreta included, is effected by means of elaborate systems of sewers pushed and cleaned by the agency of water. In certain cases the collected sewage is applied direct to the soil as a fertilizer; but where the natural conditions are not favorable, the refuse matter is, under certain restrictions, turned off to the nearest natural water-course, the sea or river as the case may be. In India in the smaller towns where, owing to want of funds, European systems of sewage and water-supply are (at present) impossible, we are content to allow the liquid refuse to run off by open drains, and dispose of the human egesta by what is termed the "dry earth system"; a system, by the way, which it was once believed would obviate all necessity of sewers and drains, and that every town wherein it was applied would be a model of cleanliness at a relatively small outlay.

We are not concerned at present to discuss the merits of the controversy Liernieur.—Dry earth *versus* Sewers; but suffice it to say that the chemists and faculty of engineering who were the chief supporters of the underground sewage system, have demonstrated the accuracy of their reasoning by the success which has invariably attended the construction on correct *principles* of underground sewers; the sewers carry off everything solid or liquid, and form a complete system: whereas the dry-earth system provides for the removal of $\frac{1}{20}$th only of the whole refuse matter of a town, leaving the other $\frac{19}{20}$th positively untouched. Towns are bound to get rid of their night-soil in such a manner that the health of the population shall not suffer, and at the same time dispose of it in such a way that it may minister to the wants of the suburban agriculturists. Experience gained in this country as well as in Europe has shown that to Poudrette, a certain commercial value can be assigned, though a difficulty has been met with in inducing cultivators to use it. Yet when presented to them in a perfectly inodorous form, inoffensive to touch or smell, their

prejudices have soon vanished before the most powerful of all motives—self-interest.

The Indian market-gardener has not a very extensive knowledge of *Agricultural Chemistry*, but he knows perfectly well that the substances composing his body are derived from the food of which he partakes: and that the food is the product of certain crops which he cultivates on his fields, and again that on the poverty or richness of his soil depends the healthy germination and subsequent development of his crops: moreover that unless certain substances, such as stable dung, compost, etc., are returned to the soil, he cannot maintain its fertility intact. He is thus, in his own imperfect way, able to trace out a complete circle or chain of natural causation, and he is also well aware that human and animal ordure have almost the same effects as stimulants to the soil, animal ordure being, however, a degree less valuable than human fœces, which, unfortunately, he is seldom able to procure in a properly dessicated and inoffensive form, hence his disinclination to use Poudrette. In some parts this disinclination amounts to a positive aversion, so much so that the "Arain" or Saini will not take it even if given gratis.

It is here that cantonment and municipal committees should step in, instruct both by precept and example, doing what is possible to remove the prejudices of the people.

In China and Japan the peasantry collect the excreta of their own households, and those who have fields or gardens bordering the main roads, sink close to the pathway large open mouthed vessels brim deep in the ground, and request travellers to ease themselves therein.

In Japan a regular trade is carried on between towns and villages in night-soil. The Japanese cultivator, however de-azotizes the excrement, allowing it to ferment in the open air. The mass is brought up into a liquid state by copious additions of water, stirred up with a huge ladle and after fermentation has ceased, and all volatile matter given off, the liquid when about two months old is applied as a top-dressing to the crop.

In China solid forces only are collected and pressed into sun-dried bricks forming an article of commerce, notwithstanding all this, travellers in Japan and China bear testimony to the total absence of the awful nuisance experienced in every Indian village, which is caused by the inhabitants resorting to the fields and water-courses, men and women promiscuously, like heads of wild beasts, in a manner subversive of all morality, cleanliness, and decency."

In England it was once imagined that all the waste and refuse matter of every town could be returned to the soil, that guano and other imported manures could be dispensed with. Baron Gustus von Liebig once said, "It is neither fantastic nor ridiculous to believe that without purchasing foreign manure, by a judicious utilization of the sewage of towns and villages England would be able to dispense with the importation of food from abroad."

The more moderate views of the English school demonstrated that, however desirable it might be found to return all refuse matter to the soil as manure, yet these sundry obstacles, such as financial considerations, coupled with unfavourable natural conditions of soil and climate which were insuperable difficulties to the universal realisation of the great German theory.

Like stable dung, Poudrette varies in manurial value according to the age and food of the individual producing the fœces as well as to the subsequent treatment it undergoes in trenching or in the manure pit.

The human body takes in—

Food solid and liquid, 75 per cent. of which is water	74·40
Oxygen through the lungs	25·60
	100·00

The loss is—

Water through the lungs...	31·80
Carbon Dioxide	30·20
Evacuations	34·60
Other losses	·50
	100·00

Solid fœces contain in every 100 parts the following substances:—

Water	75·00
Organic matter	22·13
Oxide of Iron...	·13
Insoluble Silica	·87
Lime	·43
Magnesia	·38
Phosphoric Acid	1·07
Sulphuric Acid	·06
Potash	·30
Soda	·08
Chloride of Soda (Na. cl.)	·05
	100·00

Human Urine contains in 100 parts—

Water	93·20
Urea, Nitrogen and organic matter	4·90
Phosphates of Lime, Soda, Magnesia and Ammonia	·60
Sulphates of Soda and Ammonia	·70
Chloride of Soda (Na, cl.)	·60
	100·00

Each human being on an average voids daily—

	lbs.	oz.
Solid Fœces	0	4
Urine	3	0
	3	4

And the dry matter in the excreta of a mixed population does not exceed 50 lbs. per annum, which is supplied as follows:—

Solid Fœces	4 oz. per diem containing	1 oz. dry matter	23lbs.
Urine	3 lbs. ,,	,, 1½ oz. ,,	,, 34lbs.
		Total ...	57lbs.

giving nearly 9·75lbs. of Ammonia, five-sixths of which is derived from the urine.

If the liquid excreta were properly collected in India and the volatile matter fixed, the Poudrette would have a very high value in an agricultural point of view, as it would then form a most powerful fertilizer and being cheap would be within the reach of the poorest cultivator. The only way in which it is possible to see the general utilization of Poudrette by rural communities is for municipal and cantonment committees to manufacture it on correct principles. At present this is *never* done, at least in Upper India, and this defeat forms a serious blot on the administration.

The process is so simple, easy and relatively cheap, that it is really a matter of surprise why greater attention has not been paid to this subject.

Mr. Robertson, of the Madras Agricultural Department, says "Manufactories for the preparation of Poudrette have been established near many European towns, and the objectionable characteristics of such manufactories would not be greater in this country. Indeed, I think that we have in our dry atmosphere and high temperature, excepting during a small portion of the year, conditions highly favorable for the manufacture of Poudrette, provided always that proper measures are taken to keep back the putrefactive process which in this country operates so quickly. In order to manufacture Poudrette properly, and make it available as a cheap universal manure, the following conditions are essential:—

I.—The exclusion of all moisture during the process of preparation.

II.—The use of cheap and powerful deodorizers.

III.—The storage of the material *under cover* preparatory to its being used by the cultivator.

Unfortunately these conditions are seldom, if ever, maintained, and what is worse latrines are seldom, if ever, properly built, being in most cases mere structures of *ka pa masonry*, consisting of four walls enclosing a certain area of ground open to the heavens, round these walls are ranged seats or "kadamchis" on which the people squat. Evacuations solid and liquid are allowed to fall on the ground. The renal excreta being removed whilst the urine is allowed to soak into the ground. Fresh *sand* is thrown in between the kadamchis from time to time, which, however, does not prevent the existence in perpetuity of the awful nuisance;

foul smells, the result of gaseous decomposition being given off, poisoning the air far and wide.

In the mean time, the solid fœces are carted off to the trenches, thrown in with a certain proportion of soil, which never by any chance happens to be dry clay, and the trenches are thus by degrees filled up.

Such is the system now in force, and one which is wasteful, unsanitary, unscientific, and consequently utterly irrational. The general failing complaint about Poudrette in this country is, that when used it demands such a copious and extravagant supply of water to the crop inorder to prevent it being *burnt up*. Now this is a serious defect, arising from the excess of volatile matter in the improperly dessicated manure, and the evil becomes more glaring when we recollect that liberal supplies of manure rich in *organic matter* actually increases in a high degree the hygroscopic power of the soil, or in other words, increases its drought-resisting properties.

The best deodorizers or disinfectants of human excreta are clay ashes, caustic lime, animal charcoal and sulphate of iron ($Fe. So_4$.) Clay and ashes are procurable everywhere, the same may be said of caustic lime, only the substance should be applied when the excreta are in a fresh state. Animal charcoal, the refuse of sugar refineries, may by omitted as being procurable in only a few places in India.

Clay is a most efficient deodorizer, and is cheap, at the same time it possesses in a marked degree the property of decolourising liquid filth, depriving it of all offensive odour.

Sewage if passed over and through soil entirely looses its color and odour, and in some places where it finds its way into the river after having fertilized the land, sewage water is found to be purer and freer from offensive and foreign matter than the river water itself.

Solutions of ammonia, potash, soda, and other salts if passed through soil, come out positively filtered, and we fail to recover the constituents so abstracted, by what is termed the capillary absorptive power of the soil. This is a property exhibited by all, but in the highest degree by clay soils. Clay is capable of being divided into an almost impalpable powder, and as all soils are a mere aggregation of molecules with a varying density and power of cohesion amongst themselves, it follows that that soil the molecules of which are capable of the finest and minutest subdivision presents, of course, the greatest area to the atmosphere, and the greater the surface attraction, the greater the capillary power exerted by the soil.

Where a column of sand by capillary attraction will not raise water more than 24 inches, a column of clay finely sub-divided will attract and draw up water through its pores 36 inches from its base: consequently we see how *dry* and *pounded* clay when applied to night-soil in its fresh state absorbs water and seizes on the other organic compounds, preventing further decomposition, fixing the ammonia, carbon, dioxide, &c., contained in the fœces, rendering as it were inert until by the action of tillage these substances are again, though in a different form, brought into a state available as plant-food and assimilable by the crop.

In preparing Poudrette it is essential to bear in mind—

I.—The vessels which receive the evacuations should be either—

(*a*)—Iron ashphalted within and without.

(*b*)—Glazed earthenware.

(*c*)—Ordinary native-made chatties, semi-porous, flat, open-mouthed vessels: these should be dipped into heated coal tar, taken out and allowed to cool.

II.—The vessel or pan should, before being placed between the kadamchi or under the seat, have a small quantity of dried clay mixed with chopped straw or leaves sprinkled inside.

III.—As soon as the evacuations have been voided, the pans should be withdrawn, and taken off to the Poudrette shed, sprinkled with ashes, to which should be added about 3lbs. of *dry pulverised clay*, the whole substance well mixed up and then emptied into the Poudrette vat.

IV.—The amount of clay required to completely deodorize the excreta of each human being will not fall short of 4lbs., add to this half a pound of ashes and half a pound of dry straw vegetable refuse or a total of 5lbs. per diem, allowing clay to weigh 120lbs. per cubic foot, we have in round numbers, taking 1,000 souls as a convenient factor and neglecting the difference in bulk and weight of the 5lbs. of mixed ashes and straw $\frac{5 \times 1000}{120} = 41 \cdot 66$ and $41 \cdot 66 + 30 =$ 1250 cubic feet of clay per mensem per mile of population.

V.—In preparing the Poudrette the contents of each pan or receptacle should be separately deodorized, and not thrown in indiscriminately with insufficient quantities of clay.

VI. The deodorizing power of clay is practically unlimited, and provided the one essential of dryness be preserved, *the same clay earth may be used or passed through the latrine four and five times over with perfect safety.*

VII.—In order that no detail of the process be omitted, one or two or more cinerators should be constructed in order to maintain a constant supply of ashes.

VII.—Dry sweepings, grass, leaves, vegetable refuse, and the thousand-and-one abominations which are comprised under the head of "koora" would form excellent fuel for these cinerators. At present no inconsiderable portion of this "koora" is sold to the kumars or brick-burners, being lost to the soil for ever, whereas if reduced to ashes and utilized in the preparation of Poudrette a very important reform would have been effected, and the monoply enjoyed by certain members of the sweeper community in virtue of what is termed their prescriptive rights would be abolished.

IX.—The central Poudrette sheds or depots should be so built as to be completely water-tight and dry, and sufficiently large to be capable of sub-division into two compartments; one for seasoned, and the other for unseasoned Poudrette.

X.—Poudrette should be allowed to season under cover for at least four months preparatory to use.

In light sandy soils 15·20 tons may safely be put down yearly to each acre. For maize, wheat, barley, sorghum, cucurbitaceous and leguminous crops, Poudrette will be found a most valuable and powerful fertilizer. It is on record that on the Experimental Farm at Broach (Bombay), a field of sugar-cane heavily manured with Poudrette gave an outturn of 49 tons of cane per acre or 110,760lbs. The average outturn in Louisiana, the best sugar-producing State in the Union, does not exceed 60,000lbs. per acre.

In places where the disinclination to use Poudrette is only too well founded, it will take some time to remove the prejudices of the ordinary "fat," and this can only be done by precept followed by practical example; for instance, its extensive utilization in Government gardens or Experimental Farms, or native gentlemen might be induced to use it by being guaranteed compensation in case of loss. Under any circumstances the manure would have to be given *gratis* at first, but when presented to the people in the perfectly inoffensive form their prejudices would soon vanish.

In the Punjab and Upper India, where the soil is sandy and porous, the addition of large quantities of Poudrette would be attended with the most favorable results. This light sandy soil is almost incapable in the hot season of supporting vegetable life, unless it be deluged with water. A great physical property indispensable to vegetable life is here wanting, yet if the soil be supplied with Poudrette, or any manure rich in organic matter, we find that the addition of the clay and organic substances increase the hygroscopicity of the soil to a high degree, enabling it to retain and absorb watery vapour from the atmosphere.

Pure sand, after being ignited in a crucible and subsequently exposed to the atmosphere, was found capable of absorbing only 0·12 per cent. of moisture, whereas the same sand, again exposed and mixed with organic matter, took in ·70 per cent. of its own weight of watery vapour.

A clay soil well tilled will absorb and retain 30 per cent. of moisture, and an addition of organic matter will still further increase its hygroscopicity.

The great want of the soil of India is organic manure in order to enable it to—(I) more effectually resist drought, (II) render more solvent the earthy phosphates, salts of soda, potash, &c., contained in the soil, thereby rendering them assimilable as plant-food.

Ordinary atmospheric air contains about 4 volumes of carbonic acid per mille, whereas in well manured soils after rain, Boussingault found as much as 9 per cent. of this compound in the soil.

Professor Voelcker in analysing dry night-soil from a pail in England found that, before being used, 10 tons of dry earth contained nitrogen 62lbs., phosphoric acid 36lbs.; and that—

			Nitrogen.	Phosphoric acid.
10	Tons of dry earth once used contained	...	74	52
10	" " twice " "	...	84	88
10	" " thrice " "	...	102	102

Now a wheat crop yielding 28 bushels of grain, 23 cwt. of straw, will abstract 193·93lbs. of fertilizing matter from the acre of ground composed as follows:—

	Grain.	Straw.	Total.
Potash	10·11	20·70	30·81
Soda	1·20	2·84	4·04
Lime	1·01	8·53	9·57
Magnesia	4·80	2·23	7·03
Sulphuric Acid	0·32	3·55	3·87
Phosphoric Acid	16·22	3·16	19·38
Silica...	0·43	73·47	73·90
	34·12	114·48	148·60
Nitrogen	29·20	16·13	45·33
	63·32	130·61	193·93

From Dr. Voelcker's analysis we see that an application of 10 tons of Poudrette would return to the soil more fertilizing matter than could probably be abstracted in three or four croppings.

It is stated in the record of the Poona experiments on night-soil, published in the *Gazette of India*, that the cultivators were enabled to use the Poudrette when eight days old, and that ashes were found to be the cheapest and most effective disinfectant.

The Poona results were certainly most gratifying, but it is extremely doubtful whether ashes will always be found as cheap as clay; and it is equally doubtful whether in places where irrigation is not available, the Poudrette could be safely utilized within a shorter space of time than three or four months. At places where canal irrigation is available, cultivators could of course deluge their fields with canal water, thereby mitigating the evil effects which invariably attend the application of raw and imperfectly dessicated fæces to the soil. And it here behoves us to consider the true economy of such a process, and whether the remedy is not almost worse than the disease.

As before remarked, to properly dessicate the fæces of each adult, at least 4lbs. of dry matter per diem is required: for each 100 souls 4000lbs. of ash would be required. Now, each 100lbs. of dry vegetable refuse could only yield 8lbs. of ash after complete incineration, consequently about 50,000lbs. of dry substances would be required; and where could such an enormous amount of dry sweeping be procured for a large town where the population could possibly number 1,000 × 30?

Clay can easily be delivered at any latrine for a sum not exceeding Rs. 2 per hundred cubic feet. Assuming that the population is 20,000 souls, all of whom frequent the latrines, we have $\frac{20,000 \times 4}{120} \times 365 = 2,43,090$ cubic feet and $\frac{2,43,090}{3} = 81,030$ or say 82,000 cubic feet at Rs. 2 per hundred cubic feet = Rs. 1,640. When fresh earth is used every time we should find that $\frac{20,000 \times 4}{120} \times 365 = 2,43,090$ cubic feet at Rs. 2 per cent. would bring our working expenditure in dry earth alone up to Rs. 4,800 per annum. Our Expenditure or rather comparison between the expenses of the two systems does not end here.

In one we have 100,000 cubic feet of earth supplied at the latrines, this, plus the deodorized excrement only, has to be removed.

Under the system now in vogue we have to provide at the latrines 2,43,090 cubic feet, this plus the deodorized excrement has to be disposed of so that in the matters of supply of earth and carriage the present system cost more than it should in the ratio of 3·1.

Under the system proposed, *viz.*, that of passing the earth three times through the closets, not only is the resulting manure vrey much enriched in fertilizing properties, but the committee's working conservancy expenses are considerably reduced.

Poudrette prepared according to the method adopted at Poona becomes in reality a special manure, inasmuch as its utilization is only possible where irrigation is available, and this is a serious evil. Poudrette not only contains all the inorganic constituents essential to a healthy development of vegetable life, but is singularly rich in nitrogen and other organic substances which are so sadly deficient as a rule in most Indian soils, owing to unscientific cropping.

The great want of Indian soils is organic manures, and scientific agriculturists have repeatedly demonstrated that a more liberal supply of these substances enable soils to dispense to a great extent with the irrigation water now *wasted* on our fields. A healthy crop of cereals has been found to exhale during its growth, water in the proportion of 250—300 parts by weight for every part of dry matter elaborated, and a crop of wheat weighing 2½ tons per acre will transpire 750 tons of water through its leaves alone, or an amount of water equal to a rainfall of more than seven inches.

M. Schiffmayer (Madras Agricultural Department) says: "Plants often exhale from their leaves up to seven times as much water as they receive by rain, so that 80 *per cent. of the water must have been absorbed from the atmosphere*, it must be admitted that the absorption of water vapour by the soil is a power of nature deserving the greatest consideration." In a previous remark in the same paper it is said. "A soil having much organic matter may when properly tilled in many instances receive *all* the water required for the production of crops by air irrigation, that is to say, the atmospheric air circulating in the soil can supply all the water needed by the plants."

Poudrette properly prepared and utilized accordingly, would go a long way towards counteracting the evil results attending the baneful and never-to-be-sufficiently deplored practice of burning cow-dung as fuel.

This is a question which will soon engage the attention of the new Department of Agriculture, and one in which we have every reason to believe and count on the hearty and zealous co-operation on the part of Presidents of Municipal and Cantonment committees.

Of all manures Poudrette is the cheapest, and for all practical purposes the most efficient, and we can only expect to see Rural communities use it when they see the excellent results attained in the vicinities of large towns and cantonments.

NOTES FROM A COTTAGE GARDENER.

IV.

Surface-Dressing and Mulching Fruit Trees.

(Communicated.)

SOME forty years since it was a regular custom to *dig*, annually, all fruit-tree borders, for it was considered that when the surface looked smart and fresh, there was, of course, good gardening beneath! As for minding the destruction of a net-work of those minute root-organs, termed fibres, why, it was not worthy of consideration, so long as the big black roots, which start downwards, were safe. In these times, sensible people not only forbear to dig over the roots, but actually set a decoy over them, to tempt these fibres upwards, and to secure them when obtained. I need scarcely say that the two practices are the very antipodes of each who would practice rational gardening to the very opposite nature of the two operations: surely no thinking person can pass them by as trifles.

And, perhaps, I may be permitted to show the necessary consequences of each operation respectively. There can exist no doubt of the following facts:—first: deep roots are in a cooler medium, during the growing period, than surface roots; secondly, they have a tendency to produce wood of a less fruitful character than surface fibres. It is pretty well-known that the air we breathe, and the soil we tread on, are perpetually interchanging heat with each other; and that, on each returning spring, the earth has to be warmed anew, principally by borrowing from the atmosphere, to be repaid most scrupulously. If this be admitted, it is evident that the surfaces of the soil must first be heated, and this being the case, it becomes necessary to inquire whether the ordinary heat of the soil, without solar influences, would be congenial to fruit trees. It is, surely, needless to answer this. If, then, roots enjoy a considerable degree of warmth, why not shape our operations and practice accordingly? I have years since paid close attention to the results arising from deep *digging* over the roots of fruit trees; and have even known what might appear anomalous results accruing therefrom. The *following* are the usual phenomena presented by a pertinacious course of practice of the kind. The trees become barren, their side branches,

fall gradually away, causing them to assume a lean and gawky appearance; they are apt to produce much watery or immature spray from portions of the tree which had lost the true or original branches; and that spray generally springs forth about midsummer and too late to be of any service to the tree, or the terminal growths are apt to become long jointed, and, in many cases, the joints of the shoot die, or become diseased. Moss is apt to prevail on the stems, if the trees be of some age; and, in general, trees thus circumstanced, are a prey to numerous insects, caterpillars, &c. These are a few of the evils; but, in addition, it will be found that what may be termed the principal young wood, is produced late, and by consequence continues growing late, and other enemies seem particularly attached to the first made wood of such trees. I have seen orchards thus attacked annually, until they become utterly worthless, the owners still hoping on.

But now let us for a moment cast our eyes on the trees undug and well rooted in a proper soil, with abundance of fibres nestling just under the surface. It is almost needless to look for moss on the stems of trees thus situated, their bark generally shines with a polish of a very different character. Their early made shoots progress with rapidity at the very period when the ill used trees receive their first snubbing with blight. But their young shoots are compact and short pointed, presenting altogether a very different appearance from the attenuated character of the young wood of the other class. Much less inferior or watery spray will be produced; indeed, with trees well managed on the platform system, scarcely any. The trees having freely and heartily made their first growth, generally begin to solidify about the period when the ill-used trees are beginning to ramble? And if any second growth is made, it is short, firm, and soon ended. As for dying points, there will not be much trouble concerning them, if the surface soil is genial and undug; unless top roots have been permitted, when the trees will be in part liable to the grievances complained of in the other class.

It is almost needless to add here a description of the results. in the one case, dwarf, compact, comfortable-looking and fruitful trees; in the other, gawky and barren skeletons, a discredit to the gardens, and how could it be otherwise? It must be obvious to any one, on the slightest consideration, that when the surface roots of any tree are annually mutilated, for eight or nine inches in depth that what roots the tree has remaining, must be several weeks later in receiving the necessary amount of ground heat produced by the return of summer, than trees whose fibres are just beneath the surface. The effect is, as before stated, the well-cared-for tree makes its early growth with the adjunct of a lively root action, thus bidding defiance to the extreme ravages of insect foes. The tree, dug over, is impelled to growth in the shoots, by the heated atmosphere weeks before the deep roots are put in active motion; here is, surely, some difference in condition! The early growths of the latter are almost sure to suffer in some way; they are in little better position than a cut-down stump, thrown across a stream; such as we all have seen many a time, attempting to shoot as springs return. The first growths being foiled, we arrive probably at or near midsummer, when the sun has warmed the soil to a greater depth, and the ill-fated tree, clinging with tenacity to life, makes another bid for an annual growth. But, as before observed, our autumns are not long enough to mature this growth, and, at last, a morbid condition is the consequence, and the cultivatior cuts the tree down in despair. I have stated this much, as paving the way to a few remarks on the immense benefits arising from a system of coaxing surface or shallow root. This is called by various names as surfacing, mulching, top-dressing, &c. But here let us distinguish a little. These various names should be reduced to two processes, which are, indeed, somewhat distinct, *viz.*, mulching and surface-dressing. *Mulching*, in the practical gardener's acceptation, means applying half-rotten manure over a tree's roots, to prevent them becoming dry. It is intended to obviate the necessity for the watering pot. *Surface-dressing* is specially intended to induce, and preserve, surface roots.

Now, there are more ways than one of performing these operations. As for mulching, to preserve moisture, that needs little description; it seems specially intended to avert solar influences, which we invite, in these times, to tender fruits; and is indeed confined chiefly to trees of coarse or hardy habits, and which depend not so much on ground heat. With regard to surfacing, we must remember two things: first, that the material should have a capacity for receiving and transmitting warmth; and secondly, that it may prove ultimately an abiding medium, adapted to the needs of the roots thereby induced. I find nothing superior to chopped loamy turf and vegetable matter, such as half-decayed tree leaves; these, in about equal quantities, furnish an excellent material. If the loam is very adhesive, mix some charred rubbish with it. Indeed, I prefer the latter course, as it makes the whole darker; and doubtless assists in the absorption of heat, a material point with tender trees.

I here advise that a few main points be kept well in view. In the first place I urge that spring is the most eligible period. I would have this surface-dressing retain surface moisture, when it can be secured. This, however, pre-suppose that the trees are on sound platforms, or otherwise so situate as that no stagnation can possibly occur. It is of the utmost importance, with tender kind of fruits, to permit the solar rays; applications of this kind should, therefore, be withheld until the object be accomplished. And it is of importance that this covering should succeed on the heels of a liberal spring rain, provided the preceding period has been somewhat dry, which is frequently the cases. Surface-dressing in my opinion is, therefore, best applied in the spring, but as to weather we must of course leave a margin on its behalf.

We may now consider the thickness most eligible. It may have been observed that if the compost applied is one-half vegetable soil, such will diminish by decay into a very small compass; therefore, the loam alone may be counted on as permanent depth. If annual dressings are applied, I consider two inches sufficient; if biennial, three inches may be applied. Care should be taken, during the succeeding summer, not to cut away by any operation the surface fibres, which are sure to be encouraged thereby. If any weeds appear, hand-weeding may be resorted to.

Here let me point to the evil influence of sap or forked roots. If trees are carefully transplanted, and roots pruned whilst young, these roots will seldom occur; but if such has been neglected, care must be taken at the first planting to cut away all coarse and fibrous roots having a downward tendency.

The surface-dressing here recommended is of much value to all trained fruit trees; and in course of decomposition become filled with fibres. The spade is of course banished from the dressing, and as it solidifies, it becomes perfectly united to the body of the soil.

Whether, then, cultivators choose or find it convenient to use surface-dressing annually, biennially, or as they feel inclined, it is a principle of high importance to the culture of tender fruits, and I cannot recommend it too strongly to their notice.

EDITORIAL NOTES.

Much intelligent work is being done at the Bhadgaon Experimental Farm. From what we learn from the half-yearly reports, this farm has less theory and more practice in the conducting of the experiments than are displayed in other farms throughout India. During the half-year ending 15th July, 1881, the farm actually made Rs. 1,557 as profit after paying all expenses, including Rs. 500 towards the salary of the Superintendent, and over Rs. 1,000 to Government for rent and taxes. From the extent of the land under the control of the farm, this may be a very small profit; but it must be remembered that financial success is not looked for or expected. What is desired is that an effort be made to find out better modes of conducting farming operations; modes which shall bring assured success, and which shall not be beyond the resources of the ordinary cultivator. These, the Superintendent of the Bhadgaon Experimental Farm, Mr. Stormont, seems to aim at. The cotton fields, for instance, 154 acres in extent, yielded an average of 150lbs. of clean cotton per acre, an average not so high perhaps as is obtained in America, but immensely beyond the Indian average. Twelve-and-a-half acres of [illegible] yielded an outturn of 7½ cwts. of *jaggri* per acre, worth on the spot Rs. [illegible]. Considerable success followed

the cultivation of green crops for fodder; fifteen acres of *juar*, Lucernes, Guinea grass, and Teosinte gave 35 tons per acre. The principal part of this outturn was from Teosinte (*Reana luxurians*) which the Superintendent says, "stands unrivalled for a *kadwal* (annual) crop as Lucerne does for a perennial cultivation." This is a point the importance of which cannot be too frequently impressed on the ryot—the cultivation of a crop for cattle-feeding alone. We shall never have good cultivation till we plough deeper, and this can only be managed by a material improvement in the breed of draught cattle, and this must depend very much on the way they are fed. Until the ryot is out of the hands of the bunneah, we cannot hope for any improvement in this respect, the bunneah naturally insisting on the cultivation of those crops which will go to increase his own business. In connection with what is being done with fruit trees, the Superintendent gives us this legend:—

"The mango grove in course of formation is making satisfactory progress; the grafts received from Bombay have now taken root, and are growing well; from these a number of grafts have already been obtained, and it is proposed to plant the whole extent (15 acres) with the best kinds. For this purpose efforts are being made to propagate from the famous Borshat *amb* at Lahora; the fruit of this tree is celebrated for its fibreless flesh and delicious flavour, the seed being so much suppressed as to resemble half an ordinary mango stone; and as usual in such cases, being entirely unfertile, all recorded attempts to raise saplings from them having failed. In the early history of the tree, before its sanctity was impaired, a single crop of fruit, it is said, would sometimes realise as much as Rs. 600. The legend in connection with it is as follows:—About two centuries ago a Lahora *kunbi*, engaged in drawing water for his garden, stopped his *mhote* and seated himself on the well-top for the purpose of taking his midday refreshment, consisting of a piece of bread and a green mango. A holy *fakir* coming up, the *kunbi* religiously divided with him what he had, slicing the mango in two for the purpose. After eating, the satisfied *shah* blessed the half seed and planted it on the spot, charging the *kunbi* to water and attend to it, and it would grow up to be an unfailing source of wealth to his family for many generations. The steady fulfilment of the prophecy, it would seem, was only interrupted by the introduction of the survey, when the tree became the property of Government."

The experiments recently tried on the Cawnpore experimental farm have been of a more than ordinarily practical character. Two sets of experiments in deep ploughing and inversion of soil were tried, and though they were perhaps not quite conclusive on all those points on which information was desired, they were at least perfectly conclusive as to the general advantage accruing from deeper cultivation than at present obtains in India. Over eight experimental plots of 200 square yards, portions of which were carefully irrigated, and other portions left unirrigated, the following were the average results per acre, the crop being *sorgo*, grown as a green crop:—

Outturn of green crop	114·13 maunds.			
Cost of cultivation	Rs.	14	4	0
Value of produce	"	38	0	8
Profit per acre	"	23	1	8

With cotton similarly treated, the results were—

Outturn of cleared cotton	291 pounds.			
Cost of cultivation	Rs.	13	4	0
Value of produce	"	59	15	9
Profit per acre	"	46	11	9

The benefits of irrigation with deep ploughing were clearly shown during the course of these experiments, and the conclusions arrived at by Mr. J. B. Fuller, with regard to the *sorgo* experiments, were—

"*Inversion of the soil for a depth of six inches, two months before sowing*, increased the outturn by 72 per cent. when once irrigated, and by 100 per cent. when twice irrigated. *Grubbing to a depth of six inches, without inversion*, increased the outturn by 68 per cent. when once irrigated, and by 107 per cent. when twice irrigated, while *inversion of the soil to a depth of six inches immediately before sowing* diminished the outturn by [illegible] per cent. when once irrigated, and by 10 per cent. when twice irrigated."

And with regard to Cotton:—

	Increase per cent. On unirrigated plots.	Increase per cent. On irrigated plots.
Inversion of the soil to 6-in. two months before sowing ...	135	75
Inversion, but immediately before sowing	119	75
Grubbing to 6-in. without inverting the soil	27	16

These figures require but little comment. Taking first of all the unirrigated plots, we find that deep cultivation gives, in a season in which the rainfall was only ¼th of the normal, an outturn worth some Rs. 70 an acre, while the ordinary cultivation of the country could only yield Rs. 30. The condition of half-plots 1 and 2 was a matter of surprise to all who saw them; unirrigated as they were, the cotton plant stood thickly on them at an average height of 2½ feet, while in plot 4 (which closely resembled the cultivators' unirrigated cotton fields in the neighbourhood) no plant stood much higher than 9 inches."

This is the sort of experiments we require. In these instances the results, whether good or bad, are patent; there is no doubt as to the effect of deep ploughing under certain conditions, and if we are to benefit by the lessons of these experiments, we must first of all aim at improving our draught cattle, as good ploughing cannot be done by the present breed of Indian cattle.

A considerable amount of profitless guessing has been wasted on the subject of the locality of the "Garden of Eden," but speculation may now cease, as it seems clear this site must be found in the Islands of Seychelles in the Indian Ocean. Seriously speaking, these islands must possess all the qualities which go to make a model agricultural country. Mr. H. Cockburn Stewart, the chief Civil Commissioner, has made a report to the Lieutenant-Governor of Mauritius, which is full of interesting matter. The principal products of the islands are vanilla, cocoa, and Liberian coffee. One hundred and fifty acres are under vanilla, one-half of which is in bearing. This is a large area for such a valuable product. The out-turn of an ordinary plantation is 250lbs. per acre, which realises 80 francs per lb., and this, after paying all expenses of cultivation, leaves a net profit of Rs. 10 per lb., or £250 per acre. A thoroughly well cultivated garden yields 600lbs. per acre, which, with the relatively lighter cost of cultivation per pound, leaves about £800 per acre as net profit. Cocoa or rather cacao appears to grow well, although no exact statistics are given. One hundred acres are under cacao, which comes into bearing from three to five years after planting. Wonderful results seem to have followed the introduction of Liberian coffee. Plants 30 months old are, many of them, 10 feet high, and all are covered with young fruit. Only a small experimental plot has yet been planted, but the success which has been attained will certainly lead to an extension of the industry. Besides these three, which are considered the most important products, there are many others, and among them cloves seem to do well. They have hitherto been cultivated in a desultory sort of way, the lazy habits of the people not being conducive to good cultivation. It also appears that, to save themselves the trouble of plucking the fruit slowly and carefully, the natives have been in the habit of cutting down the trees to get at the fruit easily. Latterly, they have even been cutting down the trees for firewood. Efforts are being made to put the cultivation on a proper basis. Pepper, cinnamon and other spices grow wild, and no attention seems to be paid to them in any way. The soil and climate are admirably adapted for the cultivation of nutmegs, allspice, arrowroot, ginger, saffron and cardamoms, and Mr. Stewart says:

"I am taking every step in my power to impress upon the people of Seychelles the importance of this place as a spice-producing country, and using every endeavour to give an impulse to the nascent desire of the more advanced of the population to adopt such ideas."

He next goes on to say:—

"It is impossible to imagine a country more favoured by nature than Seychelles. Though near the equator, the great heat common

to the tropical countries is not experienced, and hurricanes so destructive to agriculture in Mauritius and Bourbon never visit these islands. The country is notoriously healthy and exempt from all epidemic diseases and endemic fever, and well watered by streams and rivers, and, as I have endeavoured to point out, peculiarly adapted to the cultivation of every known product of the East or West Indies."

Various other articles are mentioned as suitable for cultivation, but we need not go into further detail.

The Triplicane Literary Society of Madras has forwarded the inevitable memorial to Mr. Grant Duff, several matters mentioned in which might be somewhat annoying to Sir Richard Temple, who allows no opportunity to pass of speaking of the prosperity of the cultivators of India. We have extracted the following passage on the important subject of the collection of the land revenue generally, and of the material condition of the cultivators in particular :—

We crave your Excellency's pardon for taking this opportunity to dwell on some of the most important questions connected with the administration of this presidency. We believe the condition of the agricultural class will have soon to receive the consideration of your Excellency. In the midst of the blessings which the peaceful and civilised British rule has bestowed on the country, there are signs to show that the condition of the agricultural class has been far from thriving. One of these signs is the increasing difficulty in the collection of revenue. We give below a statement of the coercive processes that have been resorted to by Government for the past 26 years. This increase in the sale of real and personal property for the realisation of the land revenue, together with the fact that most of the land sold finds no purchasers, proves the growing impoverishment of the agricultural class. No temporary causes, or causes inherent in a transitional state of society, can account for this steady increase in the poverty of the people. The causes are the enhancement of the land tax at each settlement, the imposition of local cesses which, in plain terms, is enhancement of the same, the discouragement of the annual remissions for the bad seasons, and the unusual rigidity with which the tax is collected.

Fusli.		Value of property sold for arrears of revenue.			
1264	...	7,071	...	including North Canara.	
1265	...	14,776	...	do.	do.
1266	...	25,791	...	do.	do.
1267	...	8,327	...	do.	do.
1268	...	13,901	...	do.	do.
1269	...	31,972	...	do.	do.
1270	...	34,040	...	do.	do.
1271	...	21,337	...	do.	do.
1272	...	44,237	...	exclusive of	do.
1273	...	48,510	...	do.	do.
1274	...	31,880	...	do.	do.
1275	...	65,709	...	do.	do.
1276	...	81,219	...	do.	do.
1277	...	1,33,631	...	do.	do.
1278	...	1,05,490	...	do.	do.
1279	...	1,49,960	...	do.	do.
1280	...	3,04,179	...	do.	do.
1281	...	3,97,345	...	do.	do.
1282	...	4,07,685	...	do.	do.
1283	...	4,85,630	...	do.	do.
1284	...	5,59,978	...	do.	do
1285	...	4,49,012	...	including North Canara.	
1286	...	......	...	do.	do.
1287	...	3,69,000	...	do.	do.
1288	...	6,75,091	...	do.	do.
1289	...	17,33,229	...	do.	do.

To add to this would weaken the argument of the memorialists ; let the figures speak for themselves.

Few railways will confer such advantages as the proposed line from Raepore to Vizagapatam may reasonably be expected to do. When the Madras famine was raging, and its victims dying by hundreds of thousands, wheat was selling in Raepore at 80 seers per rupee, and in many instances the cultivators refused to gather in the harvest, the cost of doing which would have amounted to more than the value of the crop when cut and threshed. This proposed line being principally intended for the purpose of distributing the crops of the Central Provinces over the Coromandel coast, Vizagapatam has been wisely chosen. It stands about half-way between the mouth of the Hooghly and the port of Madras. A large trade has hitherto existed between the ports on this part of the coast and the grain districts, but on account of the general shallowness of the sea at or near the coast, the trade is largely in the hands of natives, who run coasting vessels all along the shore from False Point to Madras. At Vizagapatam, however, there is deep water, and large steamers can anchor close in shore, which will be a great convenience when Vizagapatam becomes a railway terminus. This line may be looked on as the first attempt to construct a railway for purely economic and commercial purposes, and apart altogether from military considerations. Hitherto, a speedy means of transporting troops of any given point has been a prime consideration. This line is, however, intended solely to tap the great grain districts, and make supplies freely available all along the coast. The line is to cost about £5,000 a mile, and will be about 400 miles long. This calculation is on the basis of a narrow-gauge line. Although this cannot be said to be a trunk or main line, we would recommend it to be constructed on the broad gauge, on account of the large traffic which may be expected in ordinary circumstances, and of the heavy demand which cannot fail to be made on its carrying capacity in the event of a famine in Southern India or Mysore. The extra cost of the difference between a narrow and broad gauge line would be more than recouped by the saving which would be effected by the speed with which grain could be pushed into a famine district in the course of one season only. This line will bring grain within the reach of the canal running from Madras to Ganjam, and cannot fail to cheapen and equalise the price of grain in that district. On the other hand, the ryots of the Central Provinces will secure a market for their crops, and their agriculture will prove profitable to them. At the present moment, the price of wheat in those districts is so low that it is scarcely worth growing.

Miss Isabella Mechi, writing from Tiptree Hall to the *Times*, says :—

"Among my father's last words were these words—' What is John Joseph Mechi? He must perish and return to the dust from which he came ; but the principles he inculcated are vital truths, and shall remain for ever.' In defence of these principles, will you allow me to say a few words ? Mr. Pell, in his letter in the *Times* of yesterday, sums up the results of my father's life-long studies and costly experiments in the expression ' farming eccentricities.' Surely the leading features of my father's teaching and practice—*viz.*, drainage of clay soils, deep cultivation, reduction of superfluous trees and hedgerows, enclosure of waste headlands, and concentration of capital—do not deserve to be swept away under the title of eccentricities. In reality, they are precepts of equal soundness and simplicity, capable of reduction to practice either by the small farmer working on his own holding, or by the landlord with larger capital and more extended opportunities. The next important point in my father's doctrine was the management of stock under cover on prepared food and with proper ventilation, thus securing their health, and at the same time economizing their manure. Another matter my father hoped to live to see carried through was the utilization of sewage. In my belief this will be done by-and-bye, when the man turns up with talent to invent a proper means of application, and energy to turn it to account. Our descendants will then probably look back with astonishment at our prodigal waste of material, and disgust at the abominable pollution of our finest river. Alluding to the circumstances of my father's death, and connecting them with his farming operations, Mr. Pell says ' the result was not a success.' I beg to state distinctly that my father's ruin was attributable solely and simply to the failure of the Unity Bank, in which, as a shareholder, he lost more than every shilling he possessed. To his successful farming, among other causes, he owed the delay of a catastrophe which had for some time been inevitable. It must remain a question of taste whether Mr. Pell has done wisely in affixing the stigma of ' agricultural loafers ' to the many high-minded and honourable men who from all ranks of society have attended the Tiptree

ing plant. The demand for it is constantly increasing, and the climate of Ceylon seems intended for it.

SOME dissatisfaction must be felt with the decision come to by the Viceroy regarding the rates of freight between the wheat districts of Upper India and the two principal ports, Bombay and Calcutta. The question arose from a reference to the Government on the equalisation of rates from Delhi and Agra to Bombay, by the Rajpootana line on the one hand, and by the Allahabad-Jubbulpore route on the other This naturally raised the point as to the Calcutta outlet, as the grain, once at Allahabad, was 278 miles nearer Calcutta than Bombay, the relative distances being 564 and 842 miles. Now to look for a moment at the relative distances for the Bombay traffic. From Delhi to Bombay by the old route and by the Rajpootana line, the respective distances are 1,232 and 969 miles, while from Agra to Bombay they are 1,120 and 927 miles respectively. We fail to see why the assimilation of rates on the Bombay-Rajpootana section is considered wrong, and the same assimilation thought worthy of adoption as between the old through routes—Allahabad-Bombay and Allahabad-Calcutta. Bombay has many advantages over Calcutta, the principal of which are its being so much nearer the United Kingdom, and its generally lower rates of freights. Calcutta on the other hand has the advantage of being 278 miles nearer the wheat districts, keeping the Rajpootana line out of the calculation. Calcutta, then, will have this advantage neutralised by the assimilation of rates. We keep the Rajpootana route out of the calculation for the present, because it will never offer serious competition to Calcutta so long as the present narrow gauge exists with its consequent double breaking of bulk. Perhaps the greatest advantage enjoyed by the East Indian line over the Great Indian Peninsula line lay in the greater liberality of its management; but that will be of no value under the proposed equalisation. We think his Excellency should have left each railway to make its own arrangements as to securing freight, subject of course to a check on anything like reckless trading.

AT the end of 1878 the Prince of Wales visited Luton, and was much interested in an exhibition in one of the plait-halls of the whole process of making straw bonnets. A stock of wheat stood near the entrance to the room, men cut it in the next corner, and elsewhere drew the fine straw from its sheath. Others bound it in bundles, and next drew the short straws from the bundles and cut them still shorter with a knife. Then the round sherry-cobbler straws were split up with the machine invented by the French prisoners, the women took them between lissom fingers, and out of a chaotic mass of split straws, the "sudden miracle of plait" came into existence. Afterwards girls stitched the plaits together with hands or on the machine and pressed the bonnets on the blocks. An attempt is being made in London to revive an exhibition which proved very attractive. Long rows of girls in white pinafores sit at counters in St. James's-hall, and plait and sew for the entertainment and instruction of visitors. It is a curious and interesting little bit of the gallery of hand industries. The trade is an important one and worthy of illustration. In 1871 it gave employment to 45,000 women and 3,500 men; and through large parts of Bedfordshire, Herts, and Essex, the wages of farm labourers have been for a long time sensibly augmented by the earnings of their wives and daughters in the straw trade. Cheap Chinese straw came to make the coarser manufacture unprofitable. Thereupon, British ingenuity set to work and invented new styles, which caught the fancy of the buyers, and could not readily be rivalled by the Oriental competitors. The straw trade of Dunstable, St. Albans, and Luton has been better since 1878, and the industrious workers have continued to give in two months a marvellous increase of value to plain straws from the chittim wheat of beds, making bonnets of the value of £45 out of a hundredweight of straw worth three shillings.

AN interesting account is given of the process of collecting rubber in a report just issued by the United States Consul at Carthagena. When the hunter has found a rubber tree he first clears away a space from the roots, and then moves on in search of others, returning to commence operations as soon as he has marked all the trees in the vicinity. He first of all digs a hole in the ground hard by, and then cuts in the tree a V-shaped incision, with a machete as high as he can reach. The milk is caught as it exudes and flows into the hole. As soon as the flow from the cuts has ceased, the tree is chopped down, and the trunk raised from the ground by means of an improvised trestle. After placing large leaves to catch the sap, gashes are cut throughout the entire length, and the milk carefully collected. When it first exudes, the sap is of the whiteness and consistence of cream, but it turns black on exposure to the air. When the hole is filled with rubber, it is coagulated by adding hard sand, or the root of the mechvacan, which have a most rapid action, and prevent the escape of the water that is always present in the fresh sap. When coagulated sufficiently the rubber is carried on the backs of the hunters by bark thongs to the banks of the river, and floated down on rafts. The annual destruction of rubber trees in Columbia is very great, and the industry must soon disappear altogether, unless the Government put in force a law that already exists, which compels the hunters to tap the trees without cutting them down. If this law were strictly carried out, there would be a good opening for commercial enterprise, for rubber trees will grow from eight to ten inches in diameter in three or four years from seed. The trees require but little attention, and begin to yield returns sooner than any other. Those that yield the greatest amount of rubber flourish on the banks of the Simu and Aslato rivers. The value of the crude india-rubber imported into the States annually is about $10,000,000.

LAST May, Messrs. Klunder and Co., Soorabaya, wrote to the Madras Government to say that they had forwarded a copy of instructions for cultivating "giant grass." This letter was communicated to the Superintendent, Government Farms, for remarks. The instructions referred to were, however, not received. The Superintendent reported that he had no personal knowledge of the grass in question :—"It is not an Asiatic species, but is indigenous in the region of country lying to the west of the Missouri River, United States, where it is found widely spread. Referring to this grass, in his report for the year 1870, the United States Commissioner of Agriculture wrote: 'The early pioneer, however, has already learned how soon the good native grasses are destroyed by the clipping and treading of domestic animals, and he sees with regret their places immediately occupied. . . . *Panicum cappillare, Panicum sanguinale*, &c. &c., worthless weeds and grasses that occupy the soil to the exclusion of every profitable production.' From this quotation, it would appear that the grass has not a good reputation in the country where it is indigenous. Of course, it is possible the grass may have since been improved by undergoing special cultivation and treatment. I cannot, however, recommend that Government should incur any expense in endeavouring to introduce the grass. At the same time, it may be worth while to get some seed and try it here. This I can readily arrange to carry out. I will also write to the Director of Botanical Gardens and Plantations, Batavia, Java, with whom I am in correspondence, and who, I know, will gladly afford any information in his power about the grass."

WE observe that the Maharaja of Mohurbunj and several other rajas, chiefs and zemindars of Orissa, have been agitating for a railway to their district. An influential committee has been formed, and a rough programme sketched out. Their proposal is a light railway connecting Pooree and Cuttack with Raneegunge. Unless it be to intercept the passage of pilgrims to Pooree from the upper provinces, we cannot see any advantage to be derived from fixing on Raneegunge as the point of connection with other lines. Pilgrims as a rule would not object to come to Pooree by way of Calcutta, and there is a shrine already in Calcutta which attracts large numbers of pilgrims; consequently, many of these travelling enthusiasts prefer coming by way of Kalighât. The line should, therefore, start at Pooree, and make Midnapore the other terminus. There are at present many convenient modes of reaching this latter place from Calcutta, and we hope very shortly to have Calcutta and Midnapore connected by the eastern section of

gatherings, and witnessed the experiments conducted at them. In conclusion, I may add that during the last suffering days of my father's life, his thoughts were not so much with himself or his trouble, not so much with family or friends, as with the cause he had long served and faithfully loved so well."

THE value (?) of English names for plants was well illustrated the other day at Glasnevin. While I was there a gentleman came in all the way from London to see the Flame-flower. A paragraph extolling the praises of this glorious plant, &c., had been going the round of the papers, and stating that a mass of it at Glasnevin was worth going a journey to see. Well, of course, as soon as he arrived he asked to see it. "The Flame-flower?" they said. "You must mean the Flame Nasturtium—Tropæolum speciosum." "Oh, no," he said, "nothing of the kind—I mean the Flame-flower; that's what the paper said." Then they said, "Oh, of course you mean the Torch-plant—torch and flame are the same thing;" and he was duly led towards a group of torches in full flame. But it would not do; it was not Tritoma at all. "Was it a scarlet Rhododendron or a Bottle-brush? or was it inside or out-of-doors?" Could not tell. At any rate, it was a large mass, and worth going a journey to see. And here he was at the end of the journey, and no one could show him the fire at all. From the glowing description he was half inclined to fancy that his hair would be singed almost as soon as he entered the gate; but, however, after all it turned out that it was nothing else but the rather numerous flowers of Tritoma, which does very well in front of the houses there. English names may be very well outside, but inside a botanic garden does not seem at present to be the place to look for them; the danger is that a plant may get more than one, the difficulty of discovering it by either of them is thereby increased. To give an instance: Recently the genus Funkia was duly rechristened Plaintain Lily—[Because it is not a Lily, and neither a Plantago, nor a Musa, both of which are called Plantains.—EDS.]; previous to that our American cousins had dubbed it Japan Day Lily; and still further back it had been published in English catalogues as the Japan Hyacinth, and also as Japanese Hyacinth Lily. From this it seems that the English synonym promises to be as voluminous as the botanical at times now is, and if it is necessary when publishing (cataloguing) a name to add all its *aliases*, the latter will not be the least important part.

ONE of the processes for preserving the natural colour of flowers consists, says *La Belgique Horticole*, in enclosing the flower or flowers in a glass jar provided with an air-tight, hollow, ground-glass stopper, the cavity of which is filled with quick-lime wrapped in leather. The object of lime is to absorb the small quantity of humidity already existing in the jar, or which might enter on the removal of the stopper. The dry air, deprived of its carbonic acid, occupying the jar seems to brighten the colour of the flowers, and preserve them in their natural colours.

Mr. Cornelis's other method consists in burying the flowers carefully in sand and then drying them. The most convenient receptacle that he finds for this purpose is a piece of paper wrapped in the form of a cone, the point being bent over so as to form a truncated cone. The desiccation may be effected at a temperature of 90° to 100°, but the method which gives the best results is desiccation in a vacuum in the presence of commercial sulphuric acid, or any other substance which absorbs water with avidity, such, for instance, as chloride of calcium or caustic potash. The flower once dried, which will be in eight or ten days, it must be removed from the sand with great care, for it is very fragile. The dust remaining on the petals is removed by allowing coarse sand to fall upon them from a small height. After this species of washing, the specimen has received all the treatment necessary, and in this state may be preserved indefinitely if it be enclosed in a hermetically-sealed jar along with a little quicklime.

The preservation of colour in dried flowers, however, will not in all cases be attended with success, the action of light upon them being very variable. Certain kinds stand the light perfectly —even the direct light of the sun; others are even influenced by a diffused light, and there are some again that are discoloured even in partial darkness. Three plants, *Abutilon selowi*, *Fritillaria imperialis*, and *Vanda suavis*, exhibit an unlooked-for phenomenon. When dried, these flowers become of a reddish-brown, but when they are exposed to the sun they assume a tint which is quite like their original one, except *Fritillaria* (the crown-imperial), which becomes violet.

A CURIOUS modification of the normal structure of plant stems has been observed by M. Prillieux on making the temperature of the ground about the plant higher than that of the air above. Beans and pumpkins gave the best results. The seeds were placed in earth in a large dish, in which was inserted part of a brass rod bent at a right angle, and having a gas flame applied to its horizontal end. The chamber was moist and cold. The seeds germinated well, but on coming above ground the plants acquired a peculiar shape; they grew but little in length and became unusually thick, the latter growth involving much tension in the surface layers, so that deep rifts before long appeared (mostly transverse) and made further growth impossible. M. Prillieux found the enlargement traceable mainly to an increase, not of the number, but of the volume of cells in the interior (cells of the cortical tissue and the pith). The excessive growth of the cells occurred not only in the cell wall, but in the nucleus, which was often multiplied. The excess of temperature of the ground over the air was about 10 degs. Again, the view adopted by the older botanists that light is either without effect on germination, or has an adverse effect, fails to harmonise with some results lately arrived at by Herr Stebler in the case of many seeds of agricultural importance, such as varieties of meadow grass *(poa)*, the germination of which he finds to be favoured considerably more by light than by heat. Thus, with two groups of 400 seeds each of *poa memoralis* in one experiment, there germinated in light 62 per cent., and in darkness 3 per cent. Similarly with *poa pratensis*—in light, 59 per cent.; in darkness, 7 per cent., and so on. Sunlight being a very variable force difficult of determination, experiments were further made with gaslight, and with the same result—that light favours the germination of certain seeds, especially grasses, and that these germinate either not at all, or very scantily, in darkness. The fact was verified by Herr Stebler in quite a series of seeds, *Festuca*, *Cynosurus*, *Alopecurus*, &c. In the case of seeds that germinate quickly and easily, such as clover, beans, or peas, he thinks light is probably not advantageous.

THE importance of agricultural pursuits in Ceylon is clearly shown by a recent return of the export trade of the Island Of the four principal agricultural products the following are the figures of exports for the past nine years:—

Year ending 30th September.		Coffee, cwt.	Cinnamon, lbs.	Cocoanut oil, cwts.	Coir, cwts.
1873	...	995,493	1,265,757	163,274	56 921
1874	...	617 842	1,265 844	116,199	66 769
1875	...	968,694	1,103,340	121 214	63,798
1876	...	720,427	1 520,631	194,306	59,985
1877	...	943 047	1,347,171	152,416	62,855
1878	...	620,292	1 557.478	112,825	70,828
1879	...	824,509	1,407,726	213,622	69,792
1880	...	669 614	1,870,018	316 508	69 990
1881	...	453 758	1 641,178	247,113	61,504

The importance of the cocoanut palm is seen from the large quantity of oil and coir exported. During the last year there were also exported 43,337 cwts. of *Copra*. The following table shows what is being done with new products, the figures representing the exports in lbs:—

		Cinchona.	Tea.	Cacao.
1875	...	18,731	...	...
1876	...	16,842	282	...
1877	...	56,589	1,775	...
1878	...	173,497	3,515	...
1879	...	373,511	81,595	...
1880	...	1 203,518	103,624	128
1881	...	1,207,72[illegible]	277 590	479

Cinchona promises well, and will [illegible] planters for the rather heavy losses they [illegible] sustained in connection with coffee. [illegible] sure to [illegible]

the Calcutta and Bombay through line by Midnapore, Sumbulpore, and Nagpore. Until this line is opened out, the Midnapore canals are available, and are at present extensively used for locomotive purposes. The pilgrim traffic to Juggernath is estimated at 300,000 annually. The estimate for the line is Rs. 30,000 per mile, and through a level country. Where the zemindars are anxious for the line, and will not therefore throw unnecessary obstacles in the way of its construction, we believe that this estimate need not be materially exceeded. The gauge would be the metre, and the pilgrim traffic alone is calculated to give a satisfactory return.

ILLUSTRATING his remarks on Fair Trade, Mr. Baxter quoted the following consumption per head of the population of several articles of daily use. We shall quote the figures for a different purpose:

	1870.	1875.	1880.	% increase in ten years
Bacon, lb.	1·98	8·26	15·96	706
Butter, lb.	4 15	4·92	7·42	76
Cheese, lb.	3 67	5·46	5·66	53
Potatoes, lb.	2·80	16·05	31·63	1,030
Wheat, lb.	122·90	197·08	210·12	...
Rice, lb.	6·71	11·68	11·14	71
Sugar (raw), lb.	41·40	53·97	54·22	109
„ (refined), lb.	5·83	8·88	9·46	31
Tea, lb.	3 84	4·44	4·59	62
Spirits, imported & excisable galls.	1·01	1 30	1·09	8

A glance at this will show that the people of Great Britain consume the largest quantities of those articles which it is most desirable they should consume largely. If these percentages are arranged in the order of their amount, it will be found that the greater increases are in those articles which are pure necessaries of life, while the smaller increases—small only by comparison—are in those articles which, while considered necessaries, are to some extent luxuries, such as refined sugar and cheese. It is satisfactory to find the consumption of spirits checked, and that the increase is in reality only nominal. Mr. Baxter's argument was that the free-trade policy of Great Britain admitted of the masses indulging in such articles to an extent not dreamt of in a former generation.

IN 1877 the number of jalap plants, *pomœa I Purga*, in the Ootacamund gardens was 100. These were grown for ornamental, and not economic purposes. Now we learn there were 25,000 at the close of 1880. After sundry experiments,—as jalap cultivation was unknown to the experimenters—three feet by two was fixed upon as the best spacing, or 7,260 plants per acre. There is nothing special about the mode of cultivation necessary; and with the exception of careful watering being absolutely required until the plants have made a fair start, they require only a slight hoeing and weeding now and again. The plant is propagated principally by tubers, and from what has already been done, it would appear to be a profitable undertaking. Mr. Jamieson estimates that an acre of jalap plants when in full bearing, which is after three years, will yield 1,000lbs. of jalap powder. He has already sold his produce at Rs. 2-4-5 per lb., and he puts the cost of cultivating, collecting, and drying the roots, and preparing the powder at Rs. 300, or 4 annas and 10 pies per lb. The annual profit, then, on an acre ought to be—

1,000lbs. powder at Rs. 2-4 0	... 2,250
Expenses	... 300
Net profit	Rs. 1,900

The Government of Madras, which has always been ready to encourage agricultural enterprise, is prepared to distribute tubers to such as may wish to give the industry a fair trial.

THERE is a vast amount of unutilized water-power in India. The Karakwasla water-power was advertised to let recently by the Bombay Government, we believe without finding any one to make use of it, and now we see a similar course is being followed by the Punjab Government with reference to the enormous water-power now running to waste at the falls on the Bari Doab and Western Jumna canals. After making a deduction of nearly 50 per cent. for unavoidable waste of power in converting the motion of the water into useful work, there still remains more than 25,000 horse-power available. This the Government are prepared to lease, for the first three years without payment, and afterwards at rates gradually increasing during seventeen years to a maximum of about six and-a-half annas per diem per horse-power, a rate equal to about a fourth of the cost of developing the same power by steam. Of the power available, there is at present less than one per cent. utilized, principally by the "Punjab Sugar Works Company" and the "Egerton Woollen Mills Company." The greater part of the power is available in the Gurdaspore district, in which the crops raised include, in acres, food-grains 511,000, pulses 115,000, drugs and spices 15,000, oil-seeds 22,000, fibres 26,000, sugar-cane 45,000 per annum. The falls are close together, so that if the machinery required a greater fall than is available in one place, two or several falls could be combined. Metalled roads pass near many of the falls, and a railway is about to be constructed from Umritsur to Pathankote, which will pass near most of them.

THE great use of cottonseed oil is as a substitute or adulterant for olive oil, whose place it is rapidly supplying. It is nearly impossible to detect good cottonseed oil from the best brands of olive oil by taste, smell, or any other process. This the olive growers of Italy have been unwillingly compelled to acknowledge. The usual adulteration of the olive oil is by mixing 25 per cent. of it with 75 per cent. of cottonseed oil, a fine table oil being the result. Often the cottonseed receives only a very small amount of some other oil to give it a "flavour." How much of the product of the cottonseed passes into olive oil, and is eaten with relish and delight by the epicures, it is impossible to say, but that the greater portion is so eaten is shown by the countries to which New Orleans exports this product. Of 6,000,000 gallons shipped during last season, 88 per cent. was exported to Mediterranean and French ports, and one-half of this to Italy. This is more than the entire olive oil production of France, and one-fifth that of Italy itself. It is evident that not only the people of this country, but the experienced epicures of Europe, may as well make their salads with the products of the cottonseed. It is thought that in time the prejudice now existing against cottonseed oil will be overcome, and our people, like those of Europe, take to cooking their food in oil, as the Hebrews do, instead of using lard.—*Textile Manufacturer.*

THE price of wheat in Manitoba, Canada, is 75 cents per bushel, which is equal to one dollar per maund. The price of wheat at Delhi is exactly the same as this. Yet Canadian and American wheat practically keep the Indian article out of the London market. The fact is, we have no competition in the carrying trade. The Railway companies demand more for conveying Indian wheat to the seaboard, than is charged for delivering American grain in Liverpool. India is thus hopelessly handicapped. Then, again, the freight is very much higher here than in America. We look forward to the opening of the Raepore-Vizagapatam Railway to help on this trade very materially. The railway distance is small, and Raepore can grow the cheapest wheat in India. This we do not see referred to as one object in sanctioning the construction of this line, but it will doubtless bring about a revolution in the grain trade, and for this reason we trust that the permanent way will be well made, the line constructed on the broad gauge, and all bridges built for a double line. The main object of the line is to bring grain from the rich producing lands of the Central Provinces to the north Madras littoral, and this will no doubt be a great point gained. The Indian wheat trade will never have fair play until the railways carry it at very much lower rates, and until vessels of large capacity be expressly built to carry it in bulk—vessels built more for carrying capacity than for great speed.

SOME time ago, we drew attention to the "ring" or "corner," which had been formed in Bombay, for the purpose of keeping freights up to an artificial level. The rate fixed on by the syndicate was 40 shillings per ton. After the adherence of another line, they found themselves obliged to make 60 shillings

the standard. A number of merchants set about meeting the combination by entering into an agreement with a Steam Company to run a regular line, and becoming bound to find freight for the steamers at 30 shillings. We find that this latter combination has been so successful that freights at Bombay are now as low as they have been for some time, and that there is every prospect of their falling farther. This is what might have been expected, and is exactly the fate which deserves to befall all who would benefit themselves at the cost of their neighbours in a manner subversive of all fair business. We learn from the home papers by last mail that the "cotton corner" men are likely to destroy their business entirely, as the Manchester spinners are again advocating the opening up of their river, so that vessels with cotton purchased in America may come right up to their mills. This has often been agitated before, but the spur given to the movement by the conduct of the "corner" will perhaps lend more power to the present effort.

The latest returns from China quote Patna and Benares Opium at 615½ to 617½ dollars, while Malwa new is quoted at 670 and old at 710. At the same time Persian was quoted at 560 dollars. Stocks were—

Patna	2,129
Benares	887
Malwa	679
Total Indian	3,695
Persian	1,808
Total ...	5,503 chests.

It will be seen from this that the value of the Persian drug is steadily improving. Taking it at 1, Patna and Benares are worth 1·103, New Malwa 1·196, and Old Malwa 1·268. The difference is therefore not so very great after all, and it behoves us to look to our manufacture, if we would retain our place in the China market.

The *Indian Amateur Rose Gardener*, which Messrs. Newman & Co. have sent us, is by the same capable hand that penned "The Indian Amateur Gardener." To all lovers of rose culture and propagation in India, written as it is specially for this country, this little manual, which consists of about ninety-six pages, should prove a very welcome handbook on the subject of which it treats. All the necessary information regarding suitable soils and manures, pruning and watering, budding, grafting, the treatment of cuttings, situations, hedges, design and grouping, together with a pretty full list of exhibition roses, and numerous miscellaneous notes, is set forth in such clear terms that amateurs, for whom the book is intended, will have little difficulty in following and practising for themselves the methods of treating this favourite among flowers. The four plates and twenty-nine woodcuts which accompany the text are a valuable addition to the book; and aid materially in rendering the directions lucid and easy to follow. The little book is very prettily got up, and not in any respect behind books issued by the better class of English publishers.

It has often been said that the Government would encourage the paper industry of India if suitable paper could be made, and that supplies are all purchased from home, because Indian paper is so inferior in quality. It is quite true that India cannot at present make that class of paper which is affected by Government officials, but it could make a paper which would be quite good enough for most practical purposes, if the official idea of the article was not so lofty. A Government servant cannot "have the honor to be" without a sheet of foolscap of the richest cream-laid paper, and an immense envelope. This ought to be changed, and if it were, India could make a paper which would suffice for a great deal of Government work. This abuse of good paper will never come to an end until the present system of "service" is abolished. Let every Government letter which is carried by the postal department be paid for at the usual rate, and it will then be seen how much each department is costing in postage and stationery; and besides, the Postal Department will then for the first time be able to make a true return of its business and earnings.

The Press Association has received from correspondents throughout the United Kingdom reports of the harvest prospects, which show that, though cereals have been greatly damaged by the recent wet weather, it is hoped that a continuance of fine weather may yet counteract the effect of the severe rain of August. In any case, however, the general produce must fall short of an average both in quantity and quality. Roots, on the whole, have been benefitted by the moisture, but potatoes in most parts of England are threatened with disease. From Ireland the reports are encouraging, the crop being among the best since 1846. The *South Wales Daily News* contains a report of harvest prospects in Wales and the West of England, from upwards of 100 of its correspondents in agricultural counties of its districts. The general result is surprisingly satisfactory. In only one district is the report altogether bad. From nearly all districts the reports show that the present fine weather has saved almost everything, and that the harvest will be much above the average of the last three years.

A summary of the agricultural returns of Great Britain for the year 1881 was issued from the Board of Trade last night. These returns are collected on the 4th of June in each year. The extent of land in Great Britain under wheat cultivation in 1881 was 2,806,057 acres against 2,909,438 in 1880, and 2,890,244 in 1879. Under barley there were 2,442,405 acres in 1881 against 2,467,441 in 1880 and 2,667,176 in 1879. Under oats there were 2,909,135 acres in 1881 against 2,796,905 in 1880 and 2,656,628 in 1879. Under potatoes there were 579,431 acres in 1881 against 550,932 in 1880 and 541,344 in 1879. The live stock returns show that there were 5,911,524 cattle in 1881 against 5,912,046 in 1880 and 5,856,356 in 1879. Of sheep and lambs, there were 24,582,154 in 1881 against 26,619,050 in 1880 and 28,157,080 in 1879. Of pigs there were 2,048,034 in 1881 against 2,000842 in 1880 and 2,091,559 in 1879.

The *Pall Mall Gazette* has started the question of the possibility of Tunisian wheat ultimately ousting the Americans from the market. There can be no doubt that wheat can be grown cheaply enough in Northern Africa, and the proximity of that region to Great Britain is advanced as a reason why freights should be cheap. Freights, however, do not depend so much on the relative distance between any two points, as on the amount of reciprocal cargo to be obtained. If a vessel has to go to Tunis in ballast for return cargo, the distance is really doubled, and to this has to be added the cost of ballast and of handling it. For this reason we find freights from the Levant to Great Britain very much higher than would seem warranted by the distance. We do not think that there will be sufficient security in Tunis for a considerable time to induce settlers to invest capital in that region, and consequently we should not anticipate any great expansion in the direction indicated.

One paragraph in the report of the Royal Botanic Garden for 1880-81 seems to us to call for remark. It is where Dr. King speaks of rheea. He says he is not sanguine as to the possibility of rheea cultivation becoming a commercial success in Bengal. We went to the garden to see the crop growing some two years ago, and we were not favorably impressed with its appearance, and when we saw it subsequently at the trials made by Dr. Collyer in Dhurrumtollah-street in March, 1880, it looked dwarfed, and had little resemblance to the same plant which we had so frequently seen cultivated in Dehra Doon. It appears to us from our inspection of the growing plant that it has been planted in land liable to inundation, and this did not give it fair play, as although it revels in water, it does not thrive in stagnant water. For this reason we think the question of the suitability or otherwise of, Bengal for this industry, has not yet been authoritatively settled.

Some years ago the town of Basingstoke was paved, and not many months afterwards the pavement was observed to exhibit an unevenness which could not easily be accounted for. In a short time afterwards the mystery was explained, for some of the heaviest stones were completely lifted out of their beds by the

growth of large toadstools beneath them. One of these stones measured twenty-two inches by twenty-one, and weighed eighty-three pounds, and the resistance afforded by the mortar which held it in its place would probably be even a greater obstacle than the weight. It became necessary to repave the whole town in consequence of this re-markable disturbance. A similar incident came under our own notice of a large kitchen hearthstone which was forced up from its bed by an undergrowing fungus, and had to be relaid two or three times, until at last it reposed in peace, the old bed having been removed to the depth of six inches, and a new foundation laid.

A CORRESPONDENT writes to acontemporary :—"The coffee rop evidently intends being very late this year; I hardly notice a ripe berry. The estates for the most part look as if we were in August instead of October. As a rule, by now most estates have commenced picking, and many have a ton or so in. At present, many people have [not even put up their tables, and the berries are all green and hard, and a month at least of picking. To be sure the monotony of tint is pleasantly (?) diversified by the golden glory of leaf rust, but we somehow don't altogether admire contrast. Cinchona is looking up. The young plants are getting on famously; I believe they do not care for too much rain, so that the extraordinary lightness of this year's monsoon has not affected them badly. It is enough to make one gnash one's teeth in impotent rage over wasted years and lost opportunities, to hear of Ledgeriana seed selling at Rs. 500 an ounce."

DURING the nine months ending 30th September the following were the amounts of tonnage launched from the Clyde ship-building yards :—

1874	...	... 193,400	tons.
1875	...	... 169,150	"
1876	...	... 145,922	"
1877	...	... 119,020	"
1878	...	... 174,143	"
1879	...	... 126,973	"
1880	...	... 173,230	"
1881	...	... 242,000	"

From the amount of orders on hand and vessels on the stocks there is every probability of this state of things continuing, and it is to be hoped that the insane striking which seems to follow good trade will be avoided on the present occasion.

THE *Times of India* has received a sample of jute fibre from Egypt from "an experienced correspondent," who says: "I send you a little jute fibre from jute grown in Egypt. The plants I saw cut, and the fibre stripped off six stalks before me by a machine invented by a Mr. Garwood, locomotive superintendent of the Egyptian railways. The fibre as you see it was ready in four days. The staple is, I am told, very good, and I am also told that any amount can be grown in Egypt: efforts are being made to grow it on a grand scale. Garwood's machine is one which can be carried by two men from place to place, is simple in construction, and can be made for about £10. It would be, I think, just the thing for hemp fibre on this side."

H. L. MAUD, writing from Leamington to the *Times*, says :— "It may be interesting and useful to some of your readers to know the effect of planting potatoes in the autumn instead of the spring. In October last I planted a small piece of ground in my garden nine yards square with 'Magnum Bonum' potatoes, nine inches deep in the ground. From this I have just obtained 560 lbs. of the finest potatoes for the table, and a full bushel of seed potatoes. I planted some of the same seed in the spring of this year, close by the others, and from them I have comparatively only one-fourth of the crop I have from those sown in the autumn. I have not a single bad potato. This speaks strongly in favour of autumn sowing."

THE quarterly report just issued by the Secretary of the Kansas State Board of Agriculture shows an acreage this year in winter wheat of 1,174,603 acres, a decrease of 231,254 acres. Compared with last year, the estimated yield this year is 23,152,899 bushels, or an average of nearly twelve bushels per acre. The acreage in spring wheat this year is 208,779, a decrease of 20,318 acres. The acreage in corn is 4,171,544, an increase of 617,158 acres. The acreage of oats is 338,108, a decrease of 139,697 acres. The decrease in the acreage is mostly in wheat, while there is a marked increase in corn and grasses. The acreage in cotton is 135,200 acres, an increase of 51,366 acres. There is also a large increase in flax, hemp, horses, mules, all kinds of cattle, and diary products.

A SHANGHAI paper states that Li Hung-Chang has lately presented a very remarkable memorial to the Emperor. He proposes to sanction the establishment at Hongkong of an opium monopoly. It is to be in the hands of a company with a capital of $20,000,000, which shall purchase all the opium exported to China from India, or as much of it as China may be able to consume, and then re-export it from Hongkong to other ports and places of consumption. The ostensible reason alleged by the Viceroy for this proposal is two-fold. In the first place, he says it would prove an economical measure, by enabling the Government to abolish the large number of *lekin* stations now existing all over the empire, and secondly, it would put a stop to the evasion and misappropriation of *lekin* dues which now prevails, and the large amount of smuggling that goes on.

IT is estimated that over 15 binders have been at work in the harvest fields of Great Britain, Mr. Walter A. Wood alone having 80 string-binding machines at Long Sutton, Lincoln, and all doing satisfactory work. On some farms the binder has worked through the whole harvest without giving five minutes' trouble. At a trial in August by the Long Sutton Agricultural Society, Wood's machine cut six acres of wheat in less than five hours, and did not miss tying a single sheaf at the rate of one sheaf every 2½sec., excepting at the time when the ball of twine ran short, and was replaced by another. There was, unfortunately, no competition, but the judges, Mr. J. G. Hobson and Mr. George Skelton, awarded the prize to Mr. Wood for the great ingenuity and practical value of his machine.

THE *Bombay Gazette* is glad to hear that a number of native gentlemen have been prompted by Mr. Wedderburn's article on the subject of Agricultural Banks, to take up the matter with a view to establishing such a bank, as an experiment, in a particular *taluq*. "It is proposed to make the venture a matter of private enterprise entirely, Government being asked only to afford facilities for making recoveries from defaulters. The Ahmednagar *taluq*, we believe, has been chosen as the most suitable, and a scheme is being prepared by Mr. Vishvanath Narayen Mandlik, which his Excellency the Governor has promised to take into consideration when his present tour is concluded."

IT has been proven by numerous experiments that the shorter the time between milkings the richer the milk. In one case when a cow was milked twice a day, 12 hours apart, the milk gave 12½ per cent. of cream and when milked five times a day, 17½ per cent. If, therefore, the time between the milkings varies, as commonly, the milking following closest to the previous one will give the richest milk. Cows milked at half-past six in the evening and at half-past four in in the morning will be pretty sure to give the richest milk in the morning, though this is partly caused by the more undisturbed time which they have at night when unharrassed by flies, &c.

IN spite of Mr. Plimsoll's mark, which can now be prominently seen on the sides of vessels, the loss of the steamer *Clan Macduff* seems to point to something else being wanted. This vessel was not said to be overloaded, but too great a proportion of her cargo consisted of unwieldy railway iron, which made her inelastic in a heavy sea, and unable to rise quickly when ingulphed for a time by a wave. This is a fault as fatal to safety or comfort as overloading, and surely an effort might be

It is important to notice, however, that some estates hold forth promise of even large crops, and that the general aspect is decidedly better than it was last year at a corresponding period

That this improvement is largely due to the more favourable season of the current year and the condition of the trees after the rest of last year, there can be no doubt, but to this must be added the equally true statement that careful cultivation and attention have had marked effects in enabling trees to set and ripen crop to a larger extent than they would otherwise have done, as is shown by comparing more neglected coffee

SUMMARY AND CONCLUSION

1.—*Hemileia vastatrix* is a parasitic fungus, the spores of which are capable of rapid germination on the moist surface of a coffee leaf The short tubes thus produced enter the breathing pores of the leaf, and in less than a week, in favorable circumstances, begin to form a mycelium which at the end of another week or so, have done sufficient damage to the leaf to produce yellow spots. During the third week the spores are usually produced each to act as before, if sown, &c

2.—A leaf of the coffee attacked at numerous points by such germinating spores rapidly succumbs to the ravages of the mycelium and falls long before it would normally have done so not only by directly robbing the tree of food prepared by the labours of the leaf but, further, by occupying space and shortening the period of usefulness of the leaf, it is too tree injured.

3.—The loss of matter and functional disturbance brought about by these continued and periodical ravages have for effect a diminished power to mature crop on the part of the coffee; and flower buds, flowers, and berries fall because the nutritive relations between the shoots leaves and flowers have become overthrown. More crop is borne as a rule, however where the trees contain more food material to support it

4.—The spores of *Hemileia* are carried by wind Whether a spore travels a long distance in one journey, or whether it is swept along in successive leaps, it may be carried from one estate or district to another. The shaking of the trees also disseminate spores, and they are driven from fallen leaves to the trees These spores, scattered on the foliage, become washed down to the lower surface, and germinate as before, provided the atmosphere, &c., be sufficiently moist.

5.—No special predisposition on the part of the coffee is required for its infection, and no other conditions are necessary to the spore than moisture and the presence of air, &c., as with any germinating seed

6.—The spores are in such countless numbers, germinate so rapidly, and some of them so easily escape the action of even the most efficacious remedies, that no good and lasting result can be obtained from external applications unless the sources of reinfection be removed No attempts to combat the disease by forcing ingredients into the tree have shown any trace of success, the mycelium cannot be attacked after it has entered the leaf

7.—Diseased leaves should be collected and destroyed, and every means possible employed to prevent the ingress of winds. Cultivation should be directed to these ends, and the pruning and manuring as far as possible arranged so that large masses of young foliage are as seldom as possible exposed as a surface of food material for the spores at those times when they are most blown about, as at the bursts of the monsoons In cases where the disease is threatening to denude the trees of leaves at the critical period when crop is ripening up, there can be little question of the use of lime, unless weightier considerations, based on the results of experience with that particular soil, forbid it.

8.—Manure can in no sense be properly looked upon as a cure for the disease. In so far as it enables a tree to clothe itself with dense foliage, the tree may be able to afford the sacrifice of a number of the leaves to the fungus; but the well-fed mycelium will in such cases produce more spores in proportion, and these may be the more readily distributed, and germinate on other leaves, and so the stock of fungus be actually increased Nevertheless, careful manuring is necessary for the production of crop without damage to the tree.

9.—The burning of fallen leaves &c., is almost universally condemned by planters as too dangerous. In cases where this cannot be done it is better to bury the leaves and prunings than to leave them tossing about. In doing this, the layers of leaves and prunings (which may be mixed with weeds) should be carefully covered with caustic lime and earth and not disturbed for several months. The suggestion that the leaves might be placed under pigs and cattle affords a less safe alternative, but even this plan is much better than leaving them to be blown about the estates. The sooner the leaves are gathered after falling, the more spores are destroyed with them.

10.—The origin of leaf-disease cannot be traced with certainty, but the evidence is so strong in favour of its having arisen from an invasion of spores out of the jungle, that this view may be considered highly probable. Once on the coffee, its spread would be very rapid, where such large unbroken areas extend. No trace of valid evidence exists for the views that the disease has been "induced by artificial manuring" or "caused by alterations in the sap of the tree," it is, beyond all doubt, the results of the action of a fungus derived from without, the spores of which were either imported into Ceylon (an improbable event) or came from the native jungles.

In conclusion, I beg to call your attention to certain important details in the following appendix.

I am, &c., H. Marshall Ward, B.A., Camb.,
Peradeniya, September 1881. Cryptogamist."

LETTER from the Director of the Royal Botanic Gardens, forwarding a third Report by Mr. Marshall Ward,—Cryptogamist. (No. 29) Royal Botanic Gardens, Peradeniya, 19th September 1881.

SIR,—I have the honour to forward to you a Third Report on Coffee Leaf Disease by Mr Marshall Ward. In this he sums up the whole results of his investigation, which has extended over more than twenty months.

1. Continuing in the steady course of direct experiment and observation, and avoiding everything in the way of conjecture or theory, the Cryptogamist has now established the main facts of the true nature of this parasitic disease beyond dispute Briefly, they are these. Leaf disease itself is purely local and in no sense constitutional; it is caused solely by the *Hemileia*, runs a short and definite course, and is so formidable from the cumulative effect of constant repetition. The whole direct damage done by the fungus to coffee is loss of leaves; other serious evils, however, and especially diminished crops, follow on from this. Cleared of many erroneous observations and inferences, the ordinary life history of *Hemileia* is now shown to be of extreme simplicity, and the necessary conditions for, and exact duration of, each stage from spore to spore again have been demonstrated with unfailing and convincing frequency. It is not too much to say that as regards the structure, circumstances and habits of *Hemileia* on the coffee leaf we are now completely informed, and probably no fungus-pest has ever before received so prolonged and continuous an examination

2. This being so I apprehend the stage to be now arrived at when remedial measures may be intelligently considered and blind empirical and haphazard experiments (so called) to be no longer justifiable We know that there is one sufficient cause of leaf-disease—the uredospore of *Hemileia vastatrix* that this is produced only by a previous one, is carried freely by the wind may retain its vitality for several weeks or months, and can germinate only in moisture. This then is a *vera causa*, and in accordance with the well-known medical aphorism, to remove this would be the true practice. Difficult and perhaps impossible as this may be under present circumstances, Mr. Ward here urges several preventive measures acting in this way, and it is, in my opinion, the one which promises the best results to the practical and inventive capacity of coffee-planters Valuable guides, also in the same direction, are found in the close relations here clearly formulated between attacks of disease and weather The portion of the report devoted to this subject deserves careful study for its obvious practical bearings, especially as to the question of the possibility of [illegible] the coffee tree in the most suitable condition for resisting the effects of the growth of the parasite at the seasons of its chief invasions

3. Next to removing the cause come curative measures Mr Ward has done well to insist strongly that to find an agent that will kill *Hemileia* is not the most important or indeed a difficult thing to do. But he has narrowed down the practically available chemical substances of this kind to a very few, and his experiments with them do not, in my opinion, lead one to expect that it is in this direction that the principal relief is likely to be found We may surely now well reject all notions of "cures" and specifics "Prevention is better than cure" is an old adage, and with our new vantage ground of knowledge of the extremely short period during which it is possible to get at the parasite at all, the short life of each individual *Hemileia*-plant, and the frequency and want of periodicity (in the almanac sense) in the attacks of the disease, it may well be doubted whether so much benefit is to be obtained by never-ending attempts to check each attack, as by a general combination to destroy spores and hinder their dispersion. I would particularly call attention to the experiments with lime and sulphur made by Mr. Anton at Harrow—in their careful accuracy models worthy of imitation of the mode in which such should be conducted—as illustrative of the temporary nature of the benefit obtained at so large an expense.

4. The only other course is by careful cultivation, judicious manuring, and attention to the individual trees, so to improve the coffee as to enable it to endure the disease, produce fresh leaves, and bear a larger crop, but Mr. Ward properly points out that the benefit so obtained is not due to lessening in any degree leaf disease; the parasite, indeed, is likely to be increased rather than diminished.

5. On the whole, I am convinced that the possession of this clear and connected history of the disease of the coffee-leaf in Ceylon is a great gain, and has given us a largely increased chance of dealing with its ravages.

6. As I have been requested by you to offer my opinion as to the desirability or otherwise of the Cryptogamist's appointment being continued over a third year, I have, in concert with Mr Ward himself, considered carefully the present position of the enquiry from all points of view. I may say at once that Mr Ward looks upon the present report as final in its character, and does not anticipate that any discovery of practical value would result from further work at *Hemileia*. Indeed the only point of any importance remaining unsolved is the history of the second kind of spore to which attention was called in the last report To that nothing can yet be added. From the purely scientific aspect of the enquiry, further information on this matter would doubtless be of considerable interest, but any practical bearing of the discovery of a second host-plant for the fungus is rendered unimportant, since the ordinary mode of its direct dissemination by the yellow uredospores has been so

made to remedy this by a careful system of inspection. Not only should a vessel be inspected when she is clearing for sea, but the stevedores' work should be carefully supervised.

The India-rubber industry in Mozambique seems to be developing rapidly. In 1873 only £443 worth of India-rubber passed through the Custom House. In 1876 it reached the value of £22,198, and last year, according to figures given by Mr. Consul O'Neill, it exceeded £50,000. It would seem, however, to have reached a climax until communications with the interior are properly opened up, the careless cutting of the trees by the natives having resulted in the destruction of enormous tracts of India-rubber forest.

"The wheat districts of Canada seem to have a bright future before them. The harvest in Manitoba, a telegram from Montreal states, is very abundant. The average yield of grain is extraordinarily high. The average of wheat per acre is twenty bushels, or ten bushels higher than the highest average ever reached in Minnesota, which is the wheat-growing State." This outturn is nearly double what we obtain in India, and the soil being virgin, may be calculated to produce a good return for a long time yet.

In Ceylon the area under cardamoms is rapidly increasing. They can be grown from a few hundreds up to 4,000 feet, although they bear best at from 2,000 to 3,000 feet. The cultivation is very simple, and a very moderate capital is required. Should a large quantity be produced, many fear there will be fall in the price. Those who are fortunate enough at present to have an acreage of cardamoms in bearing, are reaping a rich harvest.

The Dewan of Mysore has decided to form an Agricultural Department for Mysore, and is importing improved ploughs, water-lifts, and sugarcane mills from Cawnpore. An exhibition will shortly be held. Mr. Leonard, late proprietor of the *Bangalore Spectator*, will be appointed Secretary of the Agricultural Department.

The Chinese agriculturists are evidently averse to the introduction of the telegraph into their heavenly empire. The first telegraph line had been laid under difficulties; the agriculturists pulled up and destroyed the posts, and troops had to be sent to protect the work while in progress.

For the stings of wasps, scorpions, and centipedes, a learned *pundit* at Sylhet recommends the rubbing of the part with raw onion and salt. He alleges that the pain vanishes at once. Those of our readers who are inclined to experiment with the prescription had better, perhaps, begin with the wasps.

Cows cannot be cheated into giving liberal quantities of milk. What they give is in proportion to what they get.

OFFICIAL PAPERS.

COFFEE LEAF DISEASE.

FROM MR. MARSHALL WARD'S REPORT.

From H. Marshall Ward, Esq., to the Hon. the Colonial Secretary.

Sir,—I have the honor to present you with a further report on the progress of the investigation into the life-history of *Hemileia vastatrix* which I have conducted during my stay in Ceylon.

You will see that the nature of the fungus, and its causal relations with "leaf-disease" on the coffee in the island are satisfactorily determined; and that the knowledge now to hand, together with what has been put forward in my previous reports, leaves no doubts as to the bearing of the several points established upon the general questions which have been raised.

So far as coffee is concerned, the life history and anatomy of *Hemileia vastatrix* may be considered complete. The important periods occupied by the several phases of its life-history have also been ascertained, and a considerable number of developmental periods on the part of the coffee have been resolved and brought into correlation therewith.

I have, moreover, to call your attention to the real connection between climate and leaf disease, which is no longer to be looked upon as a vague supposition; but which I have shown to be of exactly the same nature as the relations existing between any other organism and its physical environment, and comparable to the equally important dependence of coffee or any other plant upon climatic conditions.

I have attempted to place the essential details of the history of this fungus, and its true relations to the coffee, &c., in the clearest form, and have omitted no fact which throws light on the difficulties experienced in understanding so intricate a subject. Having shown that the individual fungus plant is derived from without, and injures the coffee by robbing it of food—on the manufacture of which a large expenditure of energy had been employed—by occupying valuable space on the leaves and by producing profound disturbances in the functions of the plant, I further proceed to the examination of the obvious consequences of such damage on a large scale—the falling of leaves, blossom, and crop.

The distribution of the fungus has also occupied much of my attention, and the fact that it is conveyed from place to place by wind is now established by irrefutable evidence. Other important means of distribution are fully examined below, and the facts collected remove all difficulties in understanding the wide and rapid spread of the parasite by the quickly germinating spores. I further proceed to show what occurs on large masses of coffee, as cultivated over vast open areas in Ceylon; and you will notice that the application of the preceding knowledge to the more complex problems there presented enables one to explain facts or rather collections of facts, at first apparently difficult of explanation. One important point I would especially direct your attention towards: what is known to the planters as an attack of leaf-disease, followed by the fall of leaf, is not a simple matter, but the combined or successive effects of several generations of the fungus.

Much of my time has been devoted to experimental research into the efficacy of certain substances in destroying the fungus, and the advantages and disadvantages possessed by such of these as can be employed will be indicated below. It will be seen, however, that the problem of combating this disease is not a mere matter of quality of chemicals and their efficacy in killing the fungus; in any scheme for mitigating the ravages of the pest, provision must be made for removing sources of re-infection, and at the same time keeping up the strength of the coffee tree. Moreover, whatever the application to the diseased leaves, it is clear that its continued action can only be counted upon for a short time after each renewal.

I have pointed out the importance of manuring and pruning, from the point of view suggested by the above, and it seems necessary to call particular attention to the value of whatever break-winds or tracts of forest or patana, &c., may separate estates from diseased areas. That the planting of other trees on estates and among the coffee, is an important aid to the same effect will, of course, be apparent. "Leaf-disease" appears to affect different estates in different degrees on account of variations in soil, climate, and other physical peculiarities; but I would draw attention to the explanation of this. Careful cultivation and natural advantages of soil, climate, &c., enable certain estates to stand forth prominently as though "leaf-disease" did not affect them, or only to a slight extent, while poor nutrition, the ravages of insects, &c., have in other cases their effect as well as "leaf-disease."

These attendant conditions, though they may complicate the problem before the individual planter, have, of course, however no connection with the origin of the parasite which causes "leaf disease." Manure, again, can in no way be looked upon as either a cause of the disease or a cure for it: its proper action is that of a food.

The question whence the fungus originated admits of no direct answer. I have, however, placed before you a strong array of facts tending to prove that *Hemileia* existed in Ceylon long before it was discovered on the cultivated coffee; if, indeed, *Hemileia vastatrix* proves identical with *Hemileia Canthii*, there can be little room for doubt that the former passed to the coffee from jungle, as I have long suspected to be the truth.

A review of events during the past year shows that the expectations held by planters during the earlier months of the season, have not been fulfilled and it must be recorded with regret that the general and magnificent blossom which appeared so promising in March last, have, with few exceptions, given results far below what was expected from them. Notwithstanding the favourable weather, and the rarity of the fungus at the time, a very small proportion of the flowers came to the stage of young fruit, and it is to be feared that a much smaller fraction will become ripe crop. As an illustration of this I may quote the following from the remarks of a correspondent in one of the daily papers early in the year:—

"The prospects of a really good year could not have been more perfectly fulfilled from the succession of fine blossoms that came out, and apparently we had weather to set them beautifully. Hope against hope has been disappointed; the greater number of these blossoms come to nothing, and then at most only gave the crop that is now showing, and that, I fear, will prove deceptive, although many estates have estimated from 25 per cent to 50 per cent. over last year. The failure of the blossom is a mystery, for on examining the cluster that have set, and are maturing on one side of an eye on a branch, on the other side of the same eye you find blossoms have entirely failed—in fact, when fresh blossoms came out of the same eye where the clusters were, they also failed, while later blossoms on the same branch set all right. This cannot be laid down to leaf-disease, or want of manure."

completely demonstrated. The Cryptogamist does not consider that another year's sojourn in Ceylon would be profitably spent either to the Colony or to himself in this search, which would be possibly futile (since the discovery of such a plant, if it exist here, is greatly a matter of chance) or, if successful, offers so slight a probability of contributing to the main purpose of the enquiry. In this opinion I fully concur. I may add, however, that though Mr. Ward may be no longer in Ceylon next year, we may perhaps have yet the benefit of some researches on the nutrition of plant cells, commenced here in connection with coffee, but requiring for their completion work in the well equipped laboratories of Europe and facility of reference to living authorities and published memoirs. This work though not strictly any part of the leaf disease enquiry, bids fair to be of special value to the growers of our staple product.—I am, &c.,

HENRY TRIMEN,
Director, Royal Botanic Gardens.

COLONEL BEDDOME ON CINCHONA IN CEYLON.

I HAVE the honor to inform you that I have lately paid a short visit to Ceylon in connection with Chinchona.

2. ROUTE PURSUED.—I was only able to spare a fortnight, so that my visit was rather hurried; but I was able to see a good many estates at different elevations and with different soils. I also obtained much information from Dr. Trimen, who accompanied me from Perdeniya through some of the estates in Kotamale and Dimbulla as far as Nuwara Eliya, whence he was obliged to return. I afterwards visited the Government plantation and nursery at Hackgalle, estates about Nuwara Eliya, Con lanolla and Uva Pussellawa, and returned to Peradeniya through some of the estates in the Ramboda and Pussellawa Districts.

3. THE PATA.—I was much interested to find the "Pata de gallinazo" of Mr. Cross, thespecies hitherto known here as "Magnifolia," about which I have written so much, widely distributed in the island, chiefly amongst the "Succirubral" trees, between 3,000 and 5,000 feet elevation and maintaining its uniform character and strong rapid growth. This species is in Ceylon generally known as "Hybrid" though it has other names, and is sometimes called "Condaminea." Most planters appeared easily to recognize all their different individuals of it as one and the same plant, and always spoke of them as their "hybrids," but were delighted at a reaction against the hybrid theory and to think it a distinct species which could be propagated from seed, as many of them think with me that it is probably, within certain elevations, the Chinchona of the future; some planters were inclined to look upon each individual tree of this as a separate hybrid, and all distinct one from the other, though all most uniform in appearance. In one estate in Lindula, known as Agrakanda, I found that the analysis of the bark of three different trees of this "Pata" had been reported on by Mr. Howard. It was as follows:—

No.	Quinine.	Chinchonidine	Quinidine	Chinchonine.
IV	6·77	1·84	trace	trace
V	3·66	4·06	do.	do.
VII	4·08	2·84	do,	do,

4. These were all large, strong, healthy trees. No. VII, the largest was a little over 29 feet high and 2 feet in girth, breast high. I do not think correct data as to age was available, but they appeared to be not less than 10 years.

5. This analysis is most interesting, as showing what a very large percentage in quinine some of this species can give, and also as showing how variable the yield is from different individuals, which is, as far as I can see, equally the case with all the other species of the genus.

6. I found Dr. Trimen exceedingly interested in this species, and he had been cautioning the planters against the hybrid theory. I believe that he is now fully convinced that it is a perfectly distinct species and an undescribed one; and he intends, I believe, to describe and figure it in his Journal of Botany.

7. PUBESCENS.—I also saw trees of our "Pubescens" (or the downy variety of the "Pata") particularly in Pussellawa, but they do not appear so abundant as the glabrous species.

8. RED BARK.—The growth of "Succirubra" is exceedingly good in many parts that I visited, and I often saw it growing well in deserted coffee where in the soil must have terribly deteriorated. If all old deserted coffee plantations could be planted up with "Succirubra" it will be a great thing for both India and Ceylon; except at the lower elevations, however, tee "Pota" grows event better than the "Succirubra," and is the tree to plant at any rate anywhere above 4,000 feet.

9. CROWN BARK.—I was not fortunate in seeing any good "Officinalis" plantations of any age or size. I was not, however, able to go to Haputale or Uva, the two best distrtcts, I believe, as far as soils and climate go. I saw both at Nuwara Eliya and in Condapolla, and elsewhere large plantations of "Officinalis" of very young growth, looking exceedingly healthy, (when sufficiently protected by an eastern exposure), but the soils every where much inferior to what we have on the Nilgiris, often very shallow or with a clayey subsoil which induces early decay, chiefly from canker; and the planters do not look to longevity for "Officinalis" in these soils, but they uproot at 4 or 5 years of age, and replant. We have nothing of this sort in India, and I trust it may never be necessary, but the whole conditions of soil and climate are different. We have not planted any tracts with a subsoil of impervious bly, and we have a period of drought which, I think, will turn out to be beneficial to "Officinalis" (though probably not for some other species) and antagonistic to canker; whilst in Ceylon, in addition to a very heavy monsoon, with often no sunshine for very long periods, they have rain all the year round, which induces early maturity and the too early flowering of the trees. So profitable is the Crown bark at present prices that even in face of this early maturity and early decay, the planters are making large profits. On one estate which I visited in upper Ramboda, called Frotoft, 45 acres of "Officinalis" had been uprooted at 4½ years of age, and the trees had yielded 25 tons of dry bark which was sold at 4s. per lb. (=£11,200), and it was said that 1s. per lb would even have paid. There is, of course, much doubt how often soils like this can be replanted; but uprooting in this case was imperative as the trees were all beginning to go out even at this early age from canker, and this is said to be generally the case, and that coppicing even cannot be resorted to, as it is generally the root canker. I was even told in several estates that whole nurseries had gone out from this cause. This must, I think, be simply the damping or rotting off of the roots of the seedlings from the use of too rich or damp soil in the beds, and the want of silver sand. On another estate called Lool Condura (in the same vicinity), which I did not visit, I heard that two crops had already been taken off by the same method of uprooting, with very favorable results financially, and that the estate had been plante d up a third time. All these estates are considerably below 6,000 feet and consequently at an elevation much below what we grow "Officinalis" at, and this early decay may possibly be averted at the higher elevations about Nuwara Eliya, &c; the growth there is all very young at present. On one estate called, I think, Thallipody, not far from Nuwara Eliya, I found that the "Officinalis" trees had been shaved (Java method) before they were barely three years old. The proceeds were said to have cleared the estate of all expenditure, and the trees, small as they were, were certainly nearly all renewing their bark! In another estate in this locality I saw "Officinalis," which had been put down as close as 2½ X 2½, growing very well. However, there is an opinion amongst some of the planters that close planting can be overdone, and so cause unhealthy growth from an early age that may not be easily rectified by subsequent thinnings; it is a question on which actual experience is much required.

10. BELTS OF TREES AS BREAK-WINDS.—Near Nuwara Eliya, I saw an "Officinalis" plantation in a high, bleak, exposed situation, which was exceedingly interesting on account of the systematic way in which belts of *Eucalyptus globulus* had been planted as a break-wind. At a chain apart throughout the plantations, single rows of these trees, each tree at 6 feet apart, had been put down at the same time as the Chinchona; they had been topped when young, and grown out with a bushy habit, and the Chinchona was growing, comparatively, exceedingly well, where there could have been nothing but most wretchedly-stunted growth without this protection. I think this plan can with great advantage be introduced into several portions of our plantations on Dodabetta and at Naduvatam and Pykara, and I would draw the attention of Chinchona planters generally to the great importance and value of these or similar break-winds, and I know of no tree that would answer better than the Blue-gums at high elevations

11. CALISAYAS.—I had no opportunity of seeing any good plantations of Calisaya such as, I believe exist in Maskeliya and other parts of the island which I had not time to visit: however, I saw some fine trees mixed with other Chinchonas and Coffee in different estates at low elevations. Considering the fine appearance and growth of one that I saw growing on the estate called Agrakanda in Lindula (about 4,000 feet), I think it probable that finer Calisaya will be grown in Ceylon than in India, and that with this species the moist climate of the island has the advantage against our droughts; but I have had very little experience with Calisaya. The analysis of this tree by Mr. Howard had given 5·64 per cent. of quinine, 1·22 of chinchonidine, ·44 of chinchonine, and only a trace of quinidine. Two miles from Nuwara Eliya, at the head of the Rambodа pass, I saw a a most remarkable plantation of what were called "hybrid Calisaya." The elevation is too high, I should think, for the species, being about 6,000 feet, and the trees are all quite shrubs, 4 to 6 feet high, densely branched from the base. The plantation is, however, looked upon as one of great value by some experienced planters. I recognised our var. Javanica, but there were quite a crowd of other forms that I have not seen in our plantations (we probably had some of them, and they have died out) and which would completely puzzle any botanist. It is quite possible that we have here only a single species, a very protean one, producing all these varieties from the same seed; but it is, I think, more likely that there are many really different species mixed, species which have not as yet been worked out by a botanist; either of these views are, I think, preferable to the hybrid theory. On the subject of classification Dr. Trimen has written the following valuable remarks (*vide* Mr. Owen's "Chinchona Planter's Manual"):—

"The genus Chinchona presents us with a very well-marked and striking instance of a clearly-defined natural group, in which the individuals composing it, instead of as usual, being with more or less facility thrown, into different sets marked out by clear distinctive characters, (and thus forming the 'species' of the naturalist), offer themselves as a crowd of forms closely connected in different directions, but showing only trifling

modifications of structure, of a sort usually regarded as of but little systematic value Such genera are not very uncommon, and the botanist of Europe is but too familiar with cases in *Salix* (willows), *Rubus* (blackberries), and *Rosa* (wild roses).

"This state of things is natural, and has not arisen under cultivation. In 'Chinchona' the great majority of the described forms have been found in the Andes themselves, where the genus has a range of over 2,000 miles from north to south, and at altitudes from 2,600—11,000 feet, but chiefly between 5,000 and 8,000 feet. It would appear that every district of this extensive area has its own peculiar Chinchonas, and very few species are known to range widely through it: none to occur throughout. A very similar statement might be made with regard to the fruticose *Rubi* in Europe"

12 Really careful experiments with the seed of each marked variety or species would be exceedingly interesting and would probably clear up the doubt whether they are distinct species or all forms of one very protean species; but if the latter be proved to be the case, the botanist will have a most difficult task in the classification of the genus. Analysis is all important in a plantation of this sort, if profit is to be looked to, and the same may be said of the ordinary form of Calisaya or of Javanica or any other of its forms, as it has been proved that farms apparently quite similar in every way may in some individuals be very rich in quinine, and in others have no trace of it The planter has, therefore, to be cautioned against any indiscriminate growth of Yellow barks at this stage of our knowledge, as not only is this an established fact, but we at present know little about the elevation or climate adapted for these species.

13 LEDGERIANA.—Dr Trimen informs me that both he and Mr Moens of Java consider this species as quite a distinct one and not as hitherto supposed only a variety of "Calisaya," and that he has lately described it as such in his "Journal of Botany." He also pointed out to me that the flower pedicels always have a drooping habit not seen in "Calisaya," and that the flower buds want the knob-like apex characteristic of "Calisaya"

The enormous profits of the Ledgeriana plantation in Java under Mr. Moens and the visit last year of that gentleman to Ceylon, have given a great impetus to the planting of this species in Ceylon. I had not an opportunity of seeing the best or oldest grown in Ceylon, but I saw some large trees and many of young growth, and also experiments with Mr. Moens' system of grafting this species on "Succirubra." I however learnt that no analysis of this bark in Ceylon could in any way be compared with that in Java, and it is probable that the deep, rich, volcanic soil in the latter place is the real cause of the wonderful results. Mr Moens has obtained as much as 13 per cent. of pure quinine from one tree of this species, and Dr. Trimen tells me that he (Mr Moens) destroys all trees which on analysis do not give a very high yield and that he grafts from the richest on to "Succirubra," and that he has a small area of these grafts which are giving most surprising results and astonishing every one. Dr Trimen also informed me that this grafting on "Succirubra" was resorted to owing to the great difficulty of propagating on this species by cuttings; but Mr. Grant in the Ouchterlony valley (I was over his establishment lately) was most successful with cuttings under glass with bottom heat, scarcely having a failure, so I cannot, I confess, see the advantage of the grafting if cuttings can be grown easily in India, and I believe not only Mr Grant but also Captain Cox has had no difficulty in grafting process besides could hardly be resorted to for large areas. It is, however, important I think, that we should have some experiments on this plan when we open ground for "Calisaya" and "Ledgeria at a lower elevation. Mr. Moens' plan is described as follows in the Chinchona Manual above referred to:—

"This system has been largely pursued by Mr. Moens in Java for the multiplication of Ledgerianas, with great success. For a description of the method we are indebted to 'Viator' and Mr. Kay Shuttleworth who visited Java, and there saw the operation performed. Succirubra being the commonest and most rapid-growing Chinchona is chosen for the stock Succirubra plants about a year old are chosen, and to economise space are stumped at a point six or eight inches above the soil. This is done just above a joint A flat cut is then made in the stem under the bark, which is not removed, sufficiently deep to make a surface large enough to allow a Ledgeriana shoot (cut through diagonally, the cut being one to one and-a-half inches long), to fit cambium to cambium to the Succirubra, the bark of the Succirubra overlying the cut being left intact. The Ledgeriana shoot must be cut just where the hard mature wood ends, and where the branch begins to be tender and succulent from the newness of its growth; it is then fitted carefully into the cut in the Succirubra stem, the flap of bark put over it, and the whole bound firmly with Berlin wool. String pulled out of an ordinary sack will do almost equally well The operation is simpler if the 'Succirubra' has a double stem, one of which is then cut off diagonally at the fork, leaving a flap of bark at the upper end of the cut; the Ledgeriana shoot is then cut so that it shall correspond in shape and size with the cut surface of the Succirubra, but a flap of bark is left hanging from its lower end. The two cut surfaces are then fitted together, the flap of Ledger bark overlying the 'Succirubra' stem, and the flap in the Succirubra overlying the ledger cutting, and thus giving a better hold to the binding. The pots which contain the grafted plants are then laid on the sides, graft uppermost, in propagating frames, and kept until the bark begins to unite and new leaves to show, when they are placed upright The Succirubra is cut off just above the graft as soon as the plants are fairly united, and there is no fear of this further mutilation of the tree injuring the young graft the bandage being removed at the same time. Four weeks is the time that generally elapse before this can be done It has been proved that a good graft grows faster than an original Ledgeriana tree, and that the qualities of the stock never in the slightest degree affect the tree it bears.

"A skilled laborer can graft from 200 to 250 Ledger cuttings on 'Succirubra' stem every day, and the operation is therefore evidently not a very expensive one. There can be no doubt as to its advisability in all cases where individual trees of special value are to be propagated from.'

14. CRISPA.—I saw abundance of what Dr. Trimen calls the "Crispa variety of Officinalis," and it is the same as we have abundantly represented in the Dodabetta plantations, not differing from ordinary "Officinalis," except in its rather smaller leaves, and often running into the ordinary form so as not to be distinguishable

15. URITUSINGA.—I saw no "Uritusinga" in Ceylon amongst the older Crown barks, and I am unable to distinguish this variety from "Officinalis" when they are young

16. BACKGATE GOVERNMENT GARDENS.—As a Chinchona plantation, these have been utterly neglected; the older trees have almost all died out, or been cut down and the coppice not attended to; they were scarcely worth a visit; there were however numerous nurseries for seedlings of various kinds

17. GRASS LAND.—I saw scarcely any grass-land planting; unlike the Nilgiris where nearly all the grass land rejoices in an open and gravelly soil, the grass land (or Patenas, as they are called in the Central Provinces, have generally a black peaty soil quite unfit for the growth of Chinchona and similar to what we have in swampy ravines only. I dare say there may be suitable grass-land soils in parts that I did not visit, but I only saw some small patches, but in those "Officinalis" was growing well where planted, but it was quite young.

18. IMPORTANCE OF ANALYSIS AND OF THE SERVICES OF A CHEMICAL ANALYSER.—My visit to Ceylon and the advantages I have had of discussing matters with Dr. Trimen, and also of hearing Mr. Moens' views through Dr. Trimen, has made me alter my opinions very much with reference to the value of analysis and I think it now all important that very great attention should be paid to this subject in our plantation' particularly with reference to "Officinalis" and the "Pata" (Magnifolia); individuals of which have been proved to differ so one from another in their yield of quinine. We should find out the individuals which give the richest yield, and propagate largely from these, and these only, both as to seed and cuttings, continuing the experiment through several generations. Though the experiments might not be altogether satisfactory at first, and though we might find that the seed and even the cuttings of the richest yielders might often give very varied results when planted on over large areas, I feel sure experiments of this sort must be in the right direction, and if persevered in, would ultimately give very good or even startling results, as with Mr. Moens, and we should then be able to distribute the very best (and only the very best) seed and rooted cuttings to the public. This however, can never be carried out satisfactorily unless we have a qualified Chemical Analyser for our plantations as well as a thoroughly practical gardener; but surely in a question of such importance, the expense should not be considered or allowed to interfere

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SELECTIONS.

INDIAN WHEAT.

FROM certain official papers placed at our disposal, it is gratifying to notice the interest taken by her Majesty's Secretary of State for India in the question of wheat cultivation in this country. In forwarding to the Government of India a copy of a report on the result of the examination of 192 samples of wheat sent him, and which is "to form a supplement to the report by Dr. Forbes Watson," the Secretary of State observes to the Council of the Governor General that "it would be interesting if a report could be furnished giving some description of the nature of the soils in which the better classes of wheats indicated in these reports are grown, as well as of the system of cultivation followed. It would be desirable to know whether the best wheats are raised on irrigated or on manured land, also whether the land has been long cultivated with wheat crops, and what is the average weight of crops per acre. It has been alleged," continues the Secretary of State, "that the productive power of the soil in some parts of India has begun to fail, and it would be ascertained whether there is evidence of this in respect to the quality and quantity of the wheat crop raised." Mr. Alexander Smith's report to Doctor Royle at the India Office is dated from Cornhill Chambers, 29th October 1880, and it incloses notes of "valuation and classification of four parcels of wheat samples received from Doctor Royle, and a copy of the Mark Lane Corn Exchange Price List of 11th October 1880. Mr. Smith, a corn-factor, we take it, observes of the wheats that they are "much superior to the bulk ordinarily received from India in this market both in point of—1st, cleanness (i.e., freedom from earth, earthy dust, weevil cutting, and admixture of other grain,) 2nd quality, and 3rd, size of berry; and this is particularly the case with 1st, the long-berried hard wheats, and 2nd, the wheats classified as resembling Australian, Oregon, Spanish and Californian." What seems to be most wanting on the part of agriculturists and wheat exporters from India, Mr. Smith says, are "care and cleaning machinery" The Indian soil, he says unhesitatingly, is capable of growing the best descriptions of wheat, India could always "command the top prices of the day for its wheat shipments," if growers here could only secure clean seed of the proper description. No very difficult task this, we think, for securing and maintaining the character given to some of the shipments from Bombay as showing "a marked improvement in quality on that usually received from Calcutta." The Order of the Government of India is to the effect that copies of Mr. Smith's letter and of the "Supplemental Report on Indian Wheat" be forwarded to all the local Governments and Administrations, with "a request that the Government of India may be furnished with information on the points indicated in paragraphs 2 and 3 of the despatch," which are embraced in the extract from the Secretary of State's letter we have given above. Copies of the same were to be furnished to the Foreign Department for the purpose of being sent to the Chief Commissioner of Mysore, and other officers subordinate to it. The Officiating Chief Secretary to the Government of Madras forwarded this order to the Board of Revenue, requesting that information might be obtained on the points indicated in the Secretary of State's despatch to the Government of India, and the Superintendent of the Madras Government Farms thus replies to the Board's official memo,—" I can add but little to what is stated" in the Madras Board of Revenue's Official Memorandum of 11th June 1878. "The figures given regarding the amount of seed used, the yield, and prices obtained in the various districts are, I fear, valueless from the various reporters not having distinguished between *spelt* or *husk* wheat, and the *common* or *naked* wheat. A return of 500lbs, of the former per acre may represent a smaller yield than a crop yielding 35 lbs of the latter. Both of these varieties are grown in the wheat districts of South India. Spelt wheat is seldom met with decorticated in the bazaar, it is usually being sold in the husk." Mr. Robertson proceeds to say that "the wheat crop of Southern India is a very insignificant one," but that the distribution of good seed from Central India might procure better results. He notices the absence of lime as a valuable agent in promoting the quality of wheat, and deplores the non-employment of bone-manure in any form in the wheat culture of Southern India Mr. Robertson goes on to describe deterioration both in quality and quantity of the wheat raised in the Kaity and other wheat districts of the Nilgiris, and quotes the authority of the Reverend Mr. Metz, who resided in the Kaity valley for nearly thirty years, to support what he says, In spite of the exertions of two Collectors of the district, the same deterioration has been observed

in the barley-crop under similar conditions." The Acting Sub-Secretary of the Government of Madras called upon Collectors who furnished the replies contained in the Board's Proceedings of 11th June 1878 for further information, and the Madras Government, in recording these proceedings, 'pending further report,' observe that "the Collectors named have not been asked for any information on para 2 of the Secretary of State's despatch" We presume they have since been called upon to supply this information.—*Madras Times.*

TEA AND COFFEE AT JOHORE.

WE would recommend all who take an interest in planting to drive over to Tanjong Putri, Johore, and make an inspection of the tea and coffee plantation of H. H the Maharaja of Johore. It will show those interested what can be done in these two products, and enable them to form some estimate of what the ordinary soil of the country in low lands is capable of producing. The plantation in question may be termed an experimental one. It is within two or three miles of the town and there are about two acres of tea and the same amount of coffee planted. The coffee *is Liberian*, and the trees are about two years old. The plants are six or eight feet high and the branches cover a circle of of about ten feet in diameter. They are one and all loaded with berries in different stages of ripeness. So covered with berries are they that it will probably be necessary to thin them, and it is somewhat surprising to learn that although the ground has been used by gambier and pepper growers no manure has been required for the coffee. The tea has been planted quite recently, and a portion of the plants have been cut about one month and show a wonderful growth of young leaves, which, as is pretty generally known, produce the finest quality of tea. Various kinds of tea plants have been planted together, but the bulk of the seeds came from the Indian tea countries, though all of the plants seem equally healthy and strong. On the ground there is a shed for cooking and preparing the tea leaves. The kiln dried tea is very similar to Assam, and the same leaves sun-dried give a decoction similar to the tea used by the Chinese. In both cases the flavour is an agreeable one, and should take well in the local and home markets. The undoubted success of both tea and coffee so near our own door is truly remarkable, and leads one to anticipate a possible prosperous future for the waste lands of our island as well as Johore. Close to the plantation we have described, H. H the Maharaja has taken in hand to clear a large patch of primeval jungle of its undergrowth, leaving undisturbed the high forest trees. This is intended for cocoa which has been tried to a considerable extent in the open country, but it is thought that it may do better in the shade, as there the tree itself, as well as the subsoil, will be protected from the rays of the sun. It is interesting to see the Yakoons of the jungle working away heartily—feeling the smaller trees, and they seem to be well suited for the work—being muscular and active in their movements. Either residents or strangers have the opportunity of spending an agreeable day at Johore in visiting the plantations we have described, and H.H. The Maharaja, who is an enthusiastic planter, has always been kind enough to give those who take an interest in such matters all the information and assistance in his power.—*Straits Times.*

HOP-GATHERING.

TO those inclined to look on the dark side of the harvesting this year, we would recommended a visit to the southern counties, where their eyes would be gladdened by the sight of orchards gleaming with apples and plums, and hop-gardens heavily laden with full clusters of their various kinds of fruitage.

If Christians were to follow the seemingly paradoxical advice of the poet, to be.

"Thankful for all God takes away,
humbled by all He gives,"

there would be ample scope for both feelings in the two-fold aspect of the results of this year's harvest.

A few words on the hop-gathering may not be out of place at the present season. It is indeed, a busy time, and one much looked forward to by "young men and maidens, old men and children," to say nothing of the hard-worked mothers, who may be seen in the early morning trudging along with their families, each member who can carry ing something for the day's outing. The cottages are locked up; not a soul stays behind.

Let us follow them into one of the gardens, which belongs to a respectable farmer, who prefers choosing his pickers from the parishioners and not engaging "them furriners," under which appellation are classed all outsiders, whether Irish, or those from "the s teres," or "the Londoners"

And, first, we are struck by the extreme quietness of the field. Hardly a sound is heard. Now and then a baby cries, and there is sometimes a low hum of voices in talk at the different bins. At intervals the song of birds is twittered—and there is cackling of cocks and hens—and an occasional cry of "Poles," when the pole-puller is required to cut the stems of the hop-plants, pull up the poles, and place them near the several bins, which consist of long bags of sacking fastened on to wooden frames. There is also an absence of music, although occasionally there is a faint sound of a song somewhere. To quote the same poet, in his beautiful poem of "The Gleaners," it would be well if some of the pickers followed this advice:—

"The work with singing aid,
With ready mirth all sharper tones abate."

But if, as we have read and "heard tell," there is loud laughter, bad language, and drunken drawls at "the hopping," that conduct must be the exception, and not the rule; it certainly does not obtain in the type of hop-garden that we are describing.

The bins are placed in parallel rows; to each bin is allotted "a standard," consisting of about fifty poles on either side. When these are stripped the pickers move on to another "standard." and so the garden is by degrees shorn of its beautiful green avenues of clustering festoons, and all that remains are ordered heaps of poles, with clinging faded foliage.

At intervals the measurer comes round with a large basket measuring a bushel, and has a book, if he is "a scholar,' and leaden tallies if he is "none." One book is kept at each bin by a picker to tally with that of the measurer. Great is the interest taken by the workers in noting whether the measurer is "stiff-handed"—viz., favouring the master—or "feather-handed," that is, favouring the pickers. In a good season, the price for picking "prolifics," which is a large, early hop, with scanty leafage, is 1s. for eight bushels, whilst that for picking the smaller kinds, with plenty of bine, respectively called "Joneses," "Goldens," "Colegates," and "Grape," is 1s. per six bushels. When sack after sack has been filled, they are piled on a cart, and taken off to the oast-house, where they are dried and closely packed in large sacks called "pockets" for the London market, where some kinds have fetched five guineas and more per cwt.

But now to pass on again to description. In general, the women and girls stand at their work all the day long, dressed in the oldest garments they possess, even these covered by a bibbed apron of sackcloth. On their heads are Japanese hats trimmed with white muslin, or Turkey red, which contrasts prettily with the pale green of the hops, whilst some of the women wear print sun-bonnets.

At one bin may be seen an aged grandmother perched up on a "hopping-stool," and at her side little children picking, oh! so diligently, whilst others are minding a baby under an umbrella, and others again indulging in a little play from which, however, they are inevitably called off to go on with their ant-like, or rather locust-like labours; for the multitudinous little sounds of stripping the hops recall the descriptions of the ravages of an army of locusts.

Another notable feature in the hop-garden is the presence of midges and wasps, and many a "terrified" girl would fain wield the midsummer fairy's wand, and exclaim:—

"Weaving spiders, come not here,
Hence, you long-legged spinners, hence!"

In this garden there is a bin engaged by young ladies, who are going to give their earnings to the parish church, and we find that it is by no means an unusual or Quixotic act.

It is healthy, happy work; rain and sun guarded against, even the most delicate can gain nothing but good by passing three weeks in the open air, inhaling the wholesome smell of the hops, and feeling that she is doing honest, useful work. No "fineweather pickers" these; rather the first to come and the *last* to leave, for *noblesse oblige*.

A fashionable London physician, called in to prescribe for some Belgravian maiden, with nothing serious the matter, but only jaded and faded prematurely by successive "seasons" of incessant pleasuring, might devise a worse remedy than a "season" of hop-gathering!

Let her rusticate with some of her family in a pleasant house or lodgings, and join in helping her country sisters. How she would enjoy the luxury of giving earnings to some poor widow, who, perhaps, could only engage half a bin or some anxious wife or mother who has been obliged to stay at home to nurse husband or child and to forego her cherished hop-picking which was to provide bits o' things in the shape of warm clothing or boots and shoes for the on-coming winter. Many a kind and noble young heart beats under silk attire and sorely yearns to be put in the way of personally helping others.

Here is a programme of a day among lady hop-pickers:—

Rise at 6-15. Breakfast at 7. Be in the garden at 7-30, carrying their own dinner provided the day before Dine at 12 by a brook-side shaded with beech and oak, the steep Banks covered with ferns and hedge-row flowers. To work again at 1 until 5.30 or 6. Return home to tea. To bed at 9.

Not too tired, however, in the evening to resume the usual employments or accomplishments; figures being rendered all the more "lithe and buxom" by the quick five-finger exercise of hop-picking, and in no wise marring the delicate passages of Mendelssohn or Scarlatti, and voices made all the richer for the pure air inhaled in the garden, rendering some delicious melody of Schubert or a pathetic English ballad none the worse for the long day's work.

Is the moral of our tale to be that the most frivolous of earth's daughters may go farther and fare worse than enjoy a hop-gathering in dear old England?—*Guardian.*

AGRICULTURAL SELF-HELP.

AN English reader, unfamiliar with Indian affairs, would be greatly puzzled by such a statement as that seven-tenths of the agricultural populations of a province as large as France were heavily in debt to money-lenders, and nearly one-half of them "irretrievably so" Yet this is what Sir John Strachey once upon a time affirmed in a striking Resolution on the state of the ryots in the great province over which he ruled as Lieutenant-Governor. How can a country, the vast majority of whose inhabitants is in that deplorable state, contrive to get on? Is it possible to sell up a whole population? These, and like questions, would no doubt be asked by readers familiar only with the social conditions and the legal procedures of the West. But the explanation is simple enough—too simple in fact. The Indian money-lender is in the position of a part-proprietor of the soil. He holds a perpetual lien over the produce. He transmits his claims to his descendants, and both he and they, if they cannot at any particular moment realise the full value of their legal claims, contrive in the long run to extort from their debtors rates of interest which even the money-lending touts of London would regard as magnificent. But it does not follow from this that the *sowcar* is a fiend in human shape. Even the author of the great, though still incomplete, measure for the relief of the Deccan ryots, admits that the Deccan money-lenders are by no means the race of insatiable blood-suckers they have often been represented. Improvidence on the part of borrowers is just as blameworthy as extortion on the part of lenders. Still this money-borrowing grievance constitutes a great social evil, and the worst of it is that this evil is rather intensified than weakened by our hard-and-fast systems of imported law. And many of the thinkers whom the Civil Service has produced, are of opinion that the desired amelioration in the condition of the Indian ryot can only be achieved by self-help through such means as agrarian reformers have within the last two or three generations placed within the reach of the peasantry of Germany, Denmark, Austria, and even some portions of the decaying Ottoman empire. The methods which local Governments have devised for the granting of agricultural loans are notoriously complicated and harsh in their operation. What is really required is agricultural banking by private enterprise. An experiment of this nature would no doubt be welcomed by a Viceroy whose name promises to be permanently associated with some of the most important social improvements which will distinguish our contemporary history of India.

The experience of the States to which we have referred is full of encouragement to Indian reformers. The difficulties which stood in the way of the Prussian and other statesmen who improved the condition of the the cultivating classes were far more formidable than any [illegible] encountered in India. [illegible] systems of [illegible] brought the [illegible] to the very lowest level of degradation.

The Danish landlords, for example, objected to agrarian changes because they would no longer be at liberty to flog their serfs male and female. Nor, again, is it proposed that the Indian ryots should be helped to acquire sole possession of their holdings. The idea of Indian tenure is joint ownership between the State and the cultivator, with the elimination of the classes of rent-receiving drones. But otherwise the state of the European peasant during the pre-reform period, and even now, resemble in every particular, and with the most wonderful closeness, that of the Indian ryot. Here is a passage from the report of a British Consul on agriculture in South-Eastern Europe:—"The tenant never has capital, he must therefore borrow whatever money he may need for the year's operations. Upon this money he must pay compound interest at rates varying from two to five per cent. a month, and it is always secured on his share of the coming crops. If he cannot clear off the debt in the current year, the balance due is carried, with compound monthly interest, to the next year's account which may still further run on accumulating, until it involves the wretched man in difficulties from which he despairs of ever escaping. Thus fettered, he becomes spiritless and demoralised, he labours feebly and without heart, feeling that he is the serf of a usurer, and that, however abundant the harvest, he will get from it no more that a bare subsistence." The Hon'ble Mr Hope might have described the ryots of the Mahratta country in similar terms. The means employed to remedy that state of things in Europe are—(1) loan banks for the purpose of advancing money for improvements, and (2) rent charge banks for the purpose of enabling the tenants to become proprietors in their own right within periods varying from eighteen to forty or forty-five years. The Raffeisen "agricultural loan unions of Germany, so called after the inventor of the system, the "Credit Agricole" in France, the "Caisse des Proprietaires," and "Caisse Hypothecaire" in Belgium, and the "Provincial Credit Institute" of Galicia are successful types of loan banks. The general plan is for the agricultural community of a district to become responsible for improvement loans borrowed by any of their members. The banks, on such good security, can lend at very easy rates, and receive the periodical instalments, from the district agricultural committee, who in turn collect them from the borrowers. The usual arrangement is to charge so much—say, from four to six per cent.—for interest, and an additional small percentage to form a sinking fund, so that principal and interest are both paid off after the lapse of a certain number of years. The loan banks enabled the Prussian cultivators to reclaim two millions of acres during the twenty years ending 1860. The State rendered some assistance; but five-sixths of the work was done by private enterprise.

The *modus operandi*, as regards such a country, for example as the Deccan, is very well illustrated by Mr. Wedderburn, of the Bombay Civil Service, in a small pamphlet which he recently published—"Bapu Bin Rama holds 50 acres of land, some good and some bad. He pays the Government assessment, and the expenses of cultivation, and after maintaining his family is left with a margin of profit—say Rs. 120 a year. But he owes the money-lender Rs 1,000 at two per cent. per mensem, that is, a yearly charge of Rs 240; so that he is not solvent. He struggles on, however, the balance of interest accumulating from year to year, till becoming hopeless he relaxes his efforts, and ceases to pay anything to his creditor. The case then becomes serious for the money lender, who, under the Deccan Agriculturists Relief Act, finds it impracticable to recover against the land. He does not see his way to recover either principal or interest. So he gladly sells his claim to the Bank for cash at 8 annas in the rupee. The Bank having bought the debt for Rs. 500 recovers this amount from the cultivator by annual instalments of 12 per cent., that is, Rs 60 a month, or half his margin of profit. The cultivator thus becomes at once solvent." It is to be observed that India has the advantage over Europe as regards what we call ready-made facilities. Prussia, Denmark and Austria had to create their joint associations. But in India, joint responsibility is an immemorial fact in the village constitutions. It is obvious that, under the guarantee of a whole community perfectly familiar with his character resources, and position an Indian ryot would have greater power to execute improvements than he possibly could have on his personal security. Improved agricultural machinery, which would be too costly for one ryot and too effective for his special use, might also be introduced by associations of this sort, and turned to common use. But we may take another opportunity of entering more fully into the details of such a scheme.—*Indian Herald.*

THE SCIENCE OF AGRICULTURE.

MR. BUCKMASTER of South Kensington lately delivered a most interesting lecture on "Agricultural Scientific Education." It is now proposed in rural parishes to establish classes for teaching the science of agriculture, a subject which was added to our list three or four years ago, but which had not received very much attention. The teachers of these agricultural classes must be qualified either by passing an examination in the subject, or by the diploma of the Highland Society, or they must be graduates of some recognised University. The pupils must receive not less than twenty lessons between the examination of one year and the examination of the succeeding year and the instruction must be given according to a syllabus prepared by the professional examiner in this subject. The pupils must be instructed in the nature of soils. This is a subject on which we all need more information. It is the raw material in which the farmer has to work, and it should be a part of his business and education to study this raw material and to know all that he can know about it. The distribution and formation of soils, their classification, substances found in the ashes of plants, the sources from which these substances were obtained; active and dormant matter in the soil, conditions which regulate the conversion of dormant matter into a state available for plant food, influence of the mechanical condition of the soil on the growth of plants, good and bad management of farm-yard manure, artificial manure, phosphates, superphosphates, ammoniacal manures, nitrates, salt, chalk, lime, soot—their use and special properties, drainage of land, its influence on temperature and health of stock, rotation of crops, good courses of crops, bad courses of crops, chemical composition of the substances used as food, materials necessary for the growth of the body, maintenance of animal heat, formation of fat, muscle and bone, the economical uses of foods, mixed foods, and general rules for the preservation of health. The examination will be within the range of this course of instruction, and every qualified teacher will receive a payment of £1 or £2 for every pupil who passes the examination, and this payment comes out of the annual Parliamentary grant for education. The pupils are encouraged by prizes of books, certificates, and bursaries. Such was a general outline of the scheme for promoting the establishment of classes for teaching the science of agriculture. It may not be all that some think necessary, but faithfully carried out, it was capable of accomplishing a useful educational work in a direction not hitherto attempted, for there was nothing in the education of Scotland which had any reference to its industries. The agriculture of the future must every day become more and more thoughtful and scientific. Cheap bread and cheap meat may not be inconsistent with profitable agriculture. No one will pretend to say that he knows all that is to be known on this subject, or that the earth produces all that it is capable of producing. Agriculture, like every other civilised industry, could make but slow progress until those sciences on which the industry depends were more generally cultivated and understood. It is our increased knowledge of geology, chemistry, and physiology, which enables us to understand and explain many things which were regarded by our forefathers as unaccountable mysteries—(applause). The laws which regulate the growth of a blade of grass or the transformation of [illegible] are just as fixed as the law of gravity. It should be part of the education of every farmer to study these things, to try and understand them and turn them to useful purpose in his daily work. All new methods of cultivation, and every new manure have had one subject—viz., to increase the productive power of the earth and to make it bring forth more abundantly. We have largely added our national resources by the importation and manufacture of artificial manures of which our forefathers knew nothing. We have economised labour in every direction by the introduction of improved machinery. We now stand on the threshold of still greater changes, which are only to be limited by the highest intellectual effort of our nature. It is impossible to make any progress in any industrial art without a knowledge of those laws and principles upon which the art is based. To manage your land in this particular way, to grow this particular crop in succession to some other crop for no other reason than our forefathers used to do it, and they used to do it because their forefathers did it (applause)—with a creed of this kind no industry can make progress, and the higher nature of a man, instead of being quickened, must stagnate in his daily work. The progress of agriculture like that in every other industry, is a constant struggle with natural laws and natural forces. It is only by knowledge that we can subjugate these forces to our use and make them our willing subjects and slaves. Science discovers laws; art applies them. The science of an industry is for the most part a distinct thing from its practice but the most successful farmer is he who is able to unite in his daily life science with practice. There can be no such thing as two kinds of agriculture—one scientific and the other practical. All practical agriculture to be successful must be scientific, and yet there is no opinion more deeply impressed on the minds of some men than the very common belief that science and practice are opposed to each other.

WOOL *vs.* WHEAT.

IN the January number of this journal, under the heading of "Does the Continuous Grazing of Land with Sheep Cause it to Deteriorate in Value? Mr R. Wilkin introduces the subject of the exhaustion of soils by wool and wheat growing respectively, and invites a discussion on the subject. Since the correspondence which has taken place in *The Australasian*, however, appears to have been carried on without consideration as to the precise nature of the exhaustion which takes place in wool and wheat growing. It has been thought that it might be interesting to the readers of this journal to have the main facts bearing on this most important subject brought before them, and this paper is contributed for that purpose, with the hope that it might aid to some extent the comprehension of the problem presented by this correspondence.

Consideration will first be given to the nature of the exhaustion produced by ordinary sheep farming. Mr R. Wilkin mentions a hypothetical case of one sheep to the acre removing 10lb of material in one year, but as this would not represent the maximum exhaustion to which the soil might be subjected, but feeding at the rate of one sheep to the acre, we will take another example, and suppose a sheep to be born on an acre of soil which is to support it for the first year of its life. If at the end of this period the sheep be removed the constituent elements of its body will represent the exhaustion to which the soil has been subjected, and this will probably be the greatest amount possible at this rate of grazing, since more food constituents are assimilated during the first year of the sheep's life than in any subsequent one. Supposing when the sheep is removed at the end of the year it weighs 75lb., this weight would be approximately made up, computing our analysis on the data furnished by Messrs. Lawes and Gilbert in their classical feeding experiments, as follows:—

COMPOSITION OF BODY OF SHEEP WEIGHING 75 POUNDS.

				lb.
Nitrogenous substances	...	...	...	11·25
Non nitrogenous substances (fat &c.)	.	...	...	13 50
Mineral Matters	..	..	...	2 62
Water	...	...	...	47 63
Total	...	...	...	75 00

This then represents the greatest possible loss incurred by an acre of soil per annum, by sheep grazing at the rate of one sheep to the acre. The influence which this removal would have on the general fertility of the soil, when carried over longer periods depends, of course, on the general composition of the soil and on its capability of preparing plant food. Since no experiments however, appear to have been made, as far as the writer can learn, as to the ultimate effect which sheep grazing has on the soil, it will be advisable to compare the loss just mentioned to that incurred by wheat growing, in which such experiments have been made.

If we take an acre of soil producing a wheat crop of 30 bushels of 60 lb. each, and disregarding the straw which we will assume to be returned again to the soil, this acre will sustain a loss of 1,800lbs. and this basing our calculations on the analysis of Dr Emil Wolff, might be considered to be constituted as follows:

COMPOSITION OF THE GRAIN OF ONE ACRE OF WHEAT, VIZ., 30 BUSHELS OF 60 POUNDS EACH.

				lb.
Nitrogenous substances	...	..	..	284 0
Non-nitrogeneous substances	...	...	...	1276 6
Ash	..	...	..	80 2
Water	...	..	...	259 2
Total		...	...	1800 0

Comparing the results of the above analysis with those of the previous one, we find that nitrogenous substances and the ash, the constituents of greatest importance as far as the soil is concerned, are removed in the following ratios:—

	Sheep.	Wheat.
Nitrogenous substances	1 ...	28,8
Ash	1 ...	11,6

giving a general comparative view of the two cases of exhaustion. It is not necessary here to enter into a comparison of the amounts of all the various elements which are removed in these two cases, but perhaps it might be advisable, seeing that a great deal of stress is laid by some of the writers in the correspondence before referred to, on the amount of potash removed in the fleece of the sheep to compare the amount of the constituents removed in the two cases. The amount of potash removed in a crop of wheat such as we have under consideration would be, according to Dr. B. H. Paul, about 9lb. If we assume our sheep to yield a fleece at the end of the year to the weight of 8lb., the wool would contain about 18oz. of wool soap, or suint, and this would represent about 6oz. of potash or one-twenty-fourth of that removed in the grain of the wheat crop.

In the experiments of Messrs. Lawes and Gilbert wheat has been continuously grown on the same land, without manure for between 30 and 40 years, and although the amount of produce has been gradually decreasing it has been shown that the exhaustion is mainly due to the deficiency of nitrogenous plant food.

If we consider the main portion of the herbage furnishing the sheeps feed to be composed of the grasses the drain on the food constituents of soil in wool-growing, will be similar to that of wheat, since both are gramineous plants, and require nitrogenous matter as their special food constituents. The question of exhaustion in the two cases, however, is not merely one of degree, since conditions exist is sheep grazing which are entirely absent in wheat-growing.

In sheep-grazing, the food constitutents returned to the soil in the form of excrements have a most important influence on its ultimate fertility; it is true that in the first case they are obtained from the soil, but when returned again after passing through the body of the animal, they are in such a condition that admits of their ready assimilation by plants. The excrement of sheep are richer in plant-food constituents than those of any other of our ordinary farm animals, from the fact that only 5 per cent. of the albuminoids or nitrogenous food constituents are retained by the animal as permanent increase, whereas 95 per cent. are returned to the soil to be again assimilated; and again, if we take the total food consumed by the animal in the dry condition, we shall find that it only retains twelve per cent as permanent increase. Independent of the value of the excrements due to their being in a condition admitting of ready assimilation they are also valuable from the fact that the nitrogenous portion on decomposition exerts a most beneficial action on the mineral constituents of the soil, on account of the property which it possesses of rendering certain of these, especially the phosphates, into an available condition. Although soils contain the constituents of plant food in large quantities, the question of actual quantity has not so important an influence on the subject as the amount which exists in an available form, and the capability of a soil of converting its constituents into an available condition determines its fertility. Consequently the action of excrements of the sheep would be to enrich the soil in available plant food constituents, in other words to give it increased fertility. Instances of this are well known, and several are mentioned in The *Australasian* correspondence. The only limits to this increased fertility would be the amount of the various mineral food constituents contained in the soil, whether these were in sufficient quantity to meet the demands produced by the increased luxuriance of the plants.

To render our subject somewhat more intelligible, it might be advisable to ascertain the amount of the various plant-food constituents contained in an acre of soil. An acre of soil 12in. deep has been computed to weigh 2,688,000lb., and if we calculate this amount of the analysis of one of our medium Canterbury soils, the proportion of the several constituents will be as follows :—

COMPUTATION OF THE CONSTITUENTS OF AN ACRE OF MEDIUM CANTERBURY SOIL.

	lb.
Adherent moisture	88,704
Organic matter and combined water	247,297
Silica and Insoluble matter	2,154,184
Alumina	92,736
Iron peroxide	68,276
Phosphoric anhydride	1,612
Sulphuric anhydride	1,344
Lime	4,838
Magnesia	7,796
Potash	16,396
Soda	4,838
Total	2,688 000

The above table might be taken as representing the latent resources of the soil, and the duration of the period of fertility will depend upon the amount of the various constituents present, but it is not at all probable that when exhaustion takes place, it will be general, but of only one or two of the more important constituents. Several instances of this kind of exhaustion are on record, prominent among which are the pasture land of Cheshire, which had through the constant removal of dairy produce become exhausted of their phosphates. The drain on the soil, however, in this case, is much greater than that caused by sheep-grazing. For the sake of comparison it might be mentioned as a fact that a milch cow, yielding three gallons of milk per day, would, in 14 days, remove, in the milk alone, more mineral matters than one sheep would during its lifetime.

A consideration of the foregoing remarks with regard to the mineral constituents of the soil will, it is thought, tend to show that the probabilities of their exhaustion by sheep grazing are but very small. It must also be remembered that the causes which led to the formation of soils, viz., the disintegration of rocks, are still at work, and that soils are gradually being augmented in their mineral constituents from this cause, and it remains an open question as to whether the amount so gained may not be sufficient to compensate to a large extent, the loss incurred by sheep-grazing at the rate we have mentioned.

It only remains for us now to consider the exhaustion of the nitrogenous food constituent, the one to which the exhaustion of soils by wheat is mainly due. As far as the grasses of the herbage are concerned, this nitrogenous food is the most important of any, since it is the constituent which they require mostly for their full development. The only source of nitrogen in vegetation other than that existing in the soil itself, is the small amount that is deposited from the atmosphere in rain, dew, &c. The amount obtained from this source has been estimated and found to vary according to different experimenters, from 6·68 to 10·8lb. per acre per annum. If we compare this amount with that removed by our hypothetical sheep per acre we shall find that it is more than sufficient to cover the loss incurred. In the analysis of the body of the sheep the item nitrogenous matters refers to albumenoids, which contain only about 18 per cent. of nitrogen, consequently the actual nitrogen removed would be about 2lb. per acre, or roughly, about one-fourth of that annually received from the atmosphere.

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—*New Zealand Country Journal.*

ARTIFICIAL INDIGO.

THE new dyestuffs exhibited by this firm at the recent General-German Patent and Design Exhibition may be divided into three groups: artificial indigo, naphthaline dyes, and chloraniline dyes. The first of those excites, for the moment, the greatest interest, because the discovery of the synthesis of the king of dyes is the most recent discovery in the coal tar industry, and is undoubtedly the most brilliant one since the discovery of artificial alizarine. The name of its discoverer, Prof. Bayer, which was already widely known before this, his greatest achievement, has now passed beyond the limits of his professional circle.

At the present day, discoveries in the chemistry of dyes are founded upon calculations sustained by a knowledge of chemical facts and laws. The success of experiments based upon these calculations proves or disproves their correctness. When the results are unfavorable, it is a proof of the flaws that still exist in chemical theories, in spite of their present complete development.

The synthesis of indigo could only be accomplished after an accurate knowledge of its constitution had been acquired. Many chemists have been employed in its study, but Bayer completed it. In the German patent granted him March 12, 1880, he designed the constitution of indigo in these words: "There is a certain arrangement of atoms which is peculiar to indigo and its color derivatives, and which is built up from one molecule of benzol containing a side-chain of two carbon atoms, and on this latter a nitrogen atom in the ortho position."

In his attempts to find out simple bodies whose transformation products furnished similar arrangement of atoms, he found that certain derivatives of cinnamic acid on proper treatment with chemical re-agents were able to produce the desired bodies. Formerly cinnamic acid could only be made from certain resins such as storak, tolo, and Peru balsams. Of course a technical use of this costly material for the production of so cheap a dye as indigo could never have been thought of, but cinnamic acid had already been made synthetically by the action of acetyl chloride upon benzoidehyde and more cheaply by treating chloride with acetate of soda. This chloride of benzol and the aldehyde obtained from it, are made from toluol, a hydrocarbon very abundant in coal tar. Since Bayer's discovery experiments have been undertaken on a large scale to make indigo from cinnamic acid derivative. The most important of those, and the only one now under consideration, is the orthonitrophenylpropiolic acid. In a dry state this is a yellowish white powder, and when treated with alkaline reducing agents furnishes indigo directly.

Nitrophenylpropiolic acid is best prepared as follows:

1. Cinnamic acid is nitrified with nitric acid. This produces a mixture of the ortho, meta, and para acids.

2. To separate these three acids from each other and isolate the only one that is used for making indigo, the ortho acids, they are converted into the methylic ether. This is accomplished in the usual manner with the acid of hydrochloric acid and wood spirits. The separation is effected by fractional chrystallization of the others. The most abundant companion of the ortho acid is the para acid, and a patent has been granted for its use in the manufacture of a beautiful red dye.

3. The methalic ether of this orthonitrocinnamic acid is next saponified, *i. e.*, treated with dilute soda lye, and thus converted into methylic alcohol and the soda salt of the acid, and from this latter the acid is set free by means of another acid, and then dried.

4. By treatment with alkali the bromine is abstracted along with hydrogen to form hydrobromic acid. The cinnamic acid deprived of two atoms of hydrogen, is thereby converted into a new substance, the orthonitrophenylpropiolic acid.

Of course it is necessary to recover as far as possible the expensive material, the bromic and methylic alcohol, used in its preparation. The complicate process requires a considerable outlay for apparatus and labour.

The essential factor that governs the price of the manufactured material is, of course, the yield of dye. This depends, in the first place, upon the purity of the materials used; then next upon the various processes working smoothly, and in this case, too, it depends upon whether a body is to be produced that corresponds exactly with natural indigo, or one that is homologous with it, or some substitution dyestuff.

These near relatives of indigo may, in all probability, possess the same properties as the true indigo, so that it is supposable that the production of one or other of the many bodies theoretically possible offers greater chances for its cheap production than does now the manufacture of orthonitrophenylpropiolic acid, which yields true indigo.

To explain the difficulties that attend the cheap production of this body, we need only recall a few facts, namely, how difficult it is to employ pure material on a manufacturing scale, that chemical reactions rarely run smoothly, but are generally accompanied by secondary reactions, and that it is one of the most difficult problems of scientific and practical dye-making to produce that isomere in largest quantity which is needed. So in the above process the toluol employed in making the cinnamic acid contains the higher homologues xylol and cumol, in nitrating and brominding substitution products are formed instead of addition products, etc. All these undesirable accidents necessitate expensive purifications, which stand in the way of smooth manufacture.

The expense of making artificial indigo might have proved an insuperable objection if one lucky circumstance had not come to the aid of this industry. Heretofore the cotton-printers were only able to use indigo in topical printing for dark shades at a very considerable expense, which was greatly out of proportion to the price of natural indigo, and at the same time he had great difficulties to overcome in this operation. Only a few calico printers knew how to do this, while most of them were compelled to dye the goods in the indigo vat, and then bite out the spots which were to be printed in some other color.

Any preparation suitable for printing on the goods capable of producing equally fast colors would be very welcome to the calico-printer, even if it was much more expensive than indigo. The orthonitrophenylpropiolic acid seems to fulfil all these conditions. It comes into the market as a 25 per cent. paste, which can be used to produce indigo directly upon the

fibre. It differs from reduced indigo—indigo—indigo white in this respect, that it forms the dye by reduction, losing an atom of oxygen while the other is converted into indigo blue again by absorption of oxygen. It is very easy to produce the deepest shades in printing with this new product, either by mixing the printing material with a suitable reducing agent, or, what is preferable, first impregnating the cotton with a reducing agent, and then printing upon it.

The color is developed in twelve to twenty-four hours spontaneously in the cold. The reducing agents employed at first were grape and milk sugar: now potassic xanthogonate is employed. The reducing agents act only in alkaline solution, but the weaker the alkali the finer the colors; hence alkaline salts, like borax are preferable.

The disadvantage of mixing the reducing agent with the printing material is that the color is developed too rapidly, and the advantages of a dye formed *in* the fibre is lost, while finished dyes cannot be fixed without albumen.

The reducing agents in use previous to xanthogenate of potash had the disadvantage that heat was necessary in developing the color. Then, too, it was difficult to ascertain the correct time and temperature, for if either was exceeded at all, the color suffered and might even be destroyed.

One disadvantage of the new product which has not yet been overcome is that the color cannot be developed by superheated steam, and hence it cannot be used along with other steam colors. It is to be hoped that this will be overcome in time by suitable reducing agents.

As remarked, indigo can be readily prepared from orthonitropropiolic acid; this can easily be converted into indigo-carmine in the usual manner. It acts just like natural indigo, but the color is handsomer than the best Bengal indigo. We have said already that the production of indigo is not yet to be thought of. But since the calico industry is able to pay a price for the new product which is proportional to the cost of its manufacture, there is abundant opportunity of collecting experiences of all sorts in its manufacture, to improve the methods, and also discover new ways of reaching the desired goal. The progress already made in this domain justifies the most brilliant expectation.—*Scientific American.*

THE DEPARTURE OF THE BIRDS.

AMONG the tokens of the waning year which just now meet the eye of the experienced observer as he makes his way through the woods or over stubble field or down is the visibly diminished numbers of our summer birds. The list of those which have left us is indeed already considerable, and many more will have vanished before the pale gold of the beeches shall have deepened into a ruddy brown. Their place, it is true, is in some degree supplied by our autumnal visitors, for the marvellous instinct which leads these creatures to change their quarters with the changes of average temperature, or rather perhaps with the varying conditions of shelter and subsistence which these changes bring about, is always active, and there is perhaps hardly a period of the year when some movement of birds is not in progress in these or more northern latitudes. We have our spring immigrants, and our autumn immigrants, and of these both in coming and departing, some are early, some late. To these are to be added the birds of passage, who, not caring to sojourn among us, yet twice a year at their appointed seasons favour us at least with that passing call which furnishes us with the poverbial expression a "flying visit." Observers of an old-fashioned class were wont to add to those certain birds which were supposed—like the tortoise or the hedgehog—to go into winter quarters—to hang themselves up in chimneys and in dark sheltered corners of old barns, there to await in dumb forgetfulness and torpor the awakening touch of Spring. Foremost among these supposed autumnal absconders was our old and dear friend the swallow, with his kith and kin; and the disappearance of the cuckoo, the nightingale, and the landrail was in like manner attributed to this imaginary habit. But though you will now and then meet even now allusions to the "hybernation" of birds, naturalists have become pretty well agreed that the swallow simply

> Flits and finds
> What season suiteth him; in summer droughts
> Wings northward, and in winter makes his home
> In sheltered valleys nearer to the sun.

The other alleged hybernators are in this respect pretty much of the same habit. Whether all birds come and go more or less is a question as yet undecided, but the tendency is to believe that there are few if any exceptions. Some birds, and those among the most precious in the eye of the poet and the field rambler, are, as we all know, always with us. The golden plovers that have been seen this week wheeling round in the air in great flights by Feltham and Ashford in Middlesex, and settling down thereabouts in the dusk to their meal of slugs and earthworms in the market gardens, are to be observed, for example, at most times somewhere in these islands; but it is just now that they leave the moors and find their way to such rich feeding grounds. Before long they will take wing again to hover in dark clouds about our coasts or in the great salt marshes towards the mouth of the Thames, where in wild weather their plaintive monotonous piping is a familiar sound. All that we can say even of these is that many of them remain with us all the year through. The starlings, too, who make themselves happy even in our smoky capital and may be seen at early dawn digging with their yellow bills into the turf of the enclosures of some of our inns of court, find it advisable in cold winters to get down into Devonshire and Cornwall where the moister air tempers the wintry forests; and the vast flocks of them that are seen in these Islands in severe winters are supposed to have migrated here in search of food, to return northward in the spring. If we have a friend among the birds whose constancy is proverbial, it is assuredly the robin, who when the first touch of frost hardens the field will be emboldened to hang about our garden crofts; but even robins are apt to vanish in long-continued hard weather, save only the few that haunt our doors for crumbs, and in our shrubberies greet the red, misty winter sun with their delightful note. Though their migration has often been denied, careful observers have seen them at such time passing south, not in bands, for the redbreast is, as we all know an unsociable bird, but in pretty quick succession, manifestly departing for milder climes. Any way, the number of our redbreasts is well known to be subject to considerable variations.

The cuckoo has already been gone for some weeks; her stay among us lasts but a bare three months, and the wandering voice which comes with such welcome suggestions when leaves are young is soon hushed. The nightingales, which are rather plentiful round London, and may be heard in season in the shrubberies about the great reservoirs at Stoke Newington, where the beautiful kingfisher also haunts at scarcely three miles from the Bank, come with the cuckoo, and cease their song before the end of June. They wing southward as soon as autumn is approaching to the winter quarters on the shores of the Mediterranean, in North Africa, Egypt, or Asia Minor. The swallows may still be seen skimming the fields or ponds in many an English village, orchard or old lock. They spend six months with us, or even more, but are now just on the point of departure. In the summer season, when flies and drones and the little beetle of the scarabeus kind which they hunt so relentlessly, are plentiful, swallows may be seen all over Northern Europe—even, according to the reports of trustworthy travellers, as far towards the Pole as the inhospitable Nova Zembla, but when food begins to fail they must obey the inevitable law. The reason why his cousin the swift so generally confounded with him is the first to go must be doubtless sought in the difference of their habits. More than a month has already passed since the swift was seen skimming round our belfreys, and is now doubtless to be found in Algiers or in Tunis unless scared away by the thunder of the war. The house martin, on the other hand, lingers still, and will be seen later than the swallow, whom Gilbert White has noted as haunting the old cottages about Selborne, on one occasion as late as the fifth of November. The sand martin, who perforates the steep sides of our railway cuttings, in sandy districts near London, as at Weybridge, for example, where they swarm even within the confines of the station, is generally the earliest of the swallow tribes both to come and go, and can hardly now be met with in this country. The turtle dove, which the sportsman so often startles among the turnips in the early days of partridge-shooting, is also gone. The redbacked shrike, which the Germans call the "warger," or strangler, and our country folk the "butcher bird," because of his cruel predatory habits, is also among the departures, so are the grasshopper warbler, the wood wren, the sedge warbler and red warbler, and the wryneck. Among those who are either gone or going are the meadow pipit, the redstart, the wheatear, the blackcap, the whinchat, the white throat, the chiff-chaff, the willow wren and the yellow wagtail. To compensate us for these losses, at least till the time shall be ripe for a further movement south, there are now beginning to arrive flights of fieldfares, missel, thrushes, redwings, woodlarks, redpoles, twites siskins, brambles, snow buntings, and some others. But though our woods are far from having become as yet "bare, ruined choirs whereon the dead leaves hang," our birds, as we have said, have still sensibly diminished. The wintry rains of the last few weeks, and now the cold night mists, have, we fear, in not a few cases determined our feathered visitors to delay no longer.—*Daily News.*

WATERPROOFING.

WITHOUT considering the process by which cloth is waterproofed with such substances as India-rubber, oils, wax, and varnishes, there are several processes in practical use by which cloth is rendered non-absorbent of water—and for all practical purposes waterproof—without materially affecting its colour or appearance, greatly increasing its weight, or rendering it entirely airproof. These processes depend mainly upon the reaction between two or more substances, in consequence of which a substance insoluble in water is deposited in the fibres of the cloth.

The following are several of these processes:

LOWRY'S PROCESS.

Soap	...	...	...	...	2 ounces.
Glue	...	...	...	...	4 ,,
Water	...	...	...	...	1 gallon.

Soften the glue in cold water, and dissolve it together with the soap in the water by aid of heat and agitation.

The cloth is filled with this solution by boiling it in the liquid for several hours, the time required depending upon the kind of fibre and thickness of the cloth. When properly saturated, the excess of liquid is wrung out, and the cloth exposed to the air until nearly dry; then digested for from five to twelve hours in the following solution:—

Alum	...	...	...	...	13 ounces.
Salt	...	...	...	...	15 ,,
Water	...	...	...	...	1 gallon.

It is finally wrung out, rinsed in clean water, and dried at a temperature of about 80° Fahr.

Paul's process requires a small quantity of oil, but in other respects resembles the last. It is given as follows:—

Sodium carbonate (com'l)			...	...	1 pound.
Caustic lime	...	...	...	...	½ ,,
Water	...	...	...	...	2½ pints.

Boil together, let it stand to settle, then draw off the clear lye, and add to it—

Tallow	...	...	...	...	1 pound.
Resin	...	...	...	...	½ ,,

previously melted together. Boil and stir occasionally for half-an-hour then introduce—

Glue (previously softened)			...	...	8 ounces.
Linseed oil	...	...	...	...	8 ,,

and continue the boiling and stirring for another half-hour.

In waterproofing one-half ounce of this soap is mixed with a gallon of hot water, and in this the goods are soaked for about twenty-four hours, according to thickness and character. The pieces are then allowed to drain until partly dried, then soaked for six hours or more in a solution prepared as follows:

Aluminium Sulphate		...	...	...	1 pound.
Lead acetate		...	...	...	½ ,,
Water		...	...	...	8 gallons.

Shake together, allow to settle, and draw off the clear liquid.

Wring out after rinsing, and dry at a temperature of 8[illegible] Fahr.

Beinvaux uses, instead of glue and oil as above, the gelatinous portion of sea-wrack grass, with a small quantity of a drying oil and common resin-soda soap.

In Reiman's process, the cloth is passed slowly by machinery through a tank divided into three compartments, the first containing a warm solution of alum, the second a warm solution of lead acetate, and the third pure water, which is constantly renewed. The cloth on passing from the latter is brushed and beaten to remove the salt adhering to the surface, and finally hot pressed and brushed. In this case, lead sulphate is deposited in the fibres.

In Townsend's process, two solutions are used as follows:

British gum	...	...	...	...	20 pounds.
Soap, White		...	...	...	10 ,,
Water	...	...	...	...	16 gallons.

The solution is boiled for some minutes, and if colour is required, one pint of logwood liquor is added. The second solution consists of a saturated solution of alum in water, or—

Zinc sulphate	6 pounds.
Water	9 gallons.

Bullard's process is somewhat similar to Raiman's. In this, strong aqueous solutions of sulphate of aluminum and lead acetate are used alternately.

Berlin waterproof cloth is said to be prepared by saturating the cloth in a solution of acetate aluminum and copper, then dipping it successively in water, glass and resin soap.

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday, the 27th October, 1881.

W. H. COGSWELL, Esq., *President*, in the Chair.

THE Proceedings of the last Monthly Meeting were read and confirmed.

The following gentlemen were elected Members:—

The Rajah of Bood, Cuttack; Major W. Dalrymple, and Mr. C. Y. Downing.

The names of the following gentlemen were submitted for Membership:—

Col. Hicks, M. S. C., Deputy Inspector General, Police, Waltair,—proposed by Mr. H. G. Turner, M. C. S., seconded by the President.

T. C. Hill, Esq., Superintendent of Telegraphs, British Burmah Division, Rangoon,—proposed by Mr. W. Palmer, seconded by the Secretary.

Alex. Whyte, Esq., Junior, Raneegunge,—proposed by Mr. C. Dess, seconded by Mr. G. L. Kemp.

H. J. Madge, Esq., Government Surveyor of Steam Boilers,—proposed by Mr. W. H. Cogswell, seconded by Mr. J. W O'Keefe.

Baboo Aubinash Chunder Banerjee, Zemindar, Bally,—proposed by Mr. W. Stalkartt, seconded by Baboo Peary Chand Mittra.

Rejoined—H. G. Turner, Esq., Madras Civil Service, Waltair.

CONTRIBUTIONS.

1. Report on the Government Gardens at Saharunpore and Mussoorie, for year ending March 1881. From the Superintendent.
2. The Madras Journal of Literature and Science for 1880. From the Editor.
3. Journal of the North China Branch of the Royal Asiatic Society, 1880. From the Society.
4. Journal of the Bombay Branch of the Royal Asiatic Society, 1881. From the Society.
5. Transactions of the Asiatic Society of Japan, Vol. 9, Part 2. From the Society.
6. A small quantity of Mahogany seed. From the Superintendent, Botanic Garden, Trinidad.
7. Five seers of wheat barley, From Captain J. F Pogson.
8. A case of Araucaria plants. From J. A. Anderson, Esq.
9. A small assortment of flower seeds for the Society's Garden. From Messrs. Sutton and Sons.
10. Ten plants of *Musa textilis*, From the Government of Bengal.
11. Specimens of the wood of *Eucalyptus obliqua*, From Dr. George Henderson.

GARDEN.

A Report from the Garden Committee was submitted and adopted, alluding to a large collection of ornamental plants recently received from Mr. W. Bull, and offering certain suggestions thereon; and recommending a few alterations in some portions of the Garden. A large number of mango and litchi grafts are now available.

DIRECTIONS FOR SOWING PITHECOLOBIUM SAMAN SEED AND FOR TREATING THE YOUNG PLANTS.

The Secretary submitted the following, received from Dr. King, Superintendent, Royal Botanic Garden:—

"The seeds of Pithecolobium saman should be sown at intervals of 2 inches apart on ground which has been previously dug to a depth of 12 inches.

"The seeds having been sown as above, ½ inch of soil should be sprinkled on them. No water should be added for three days, but watering should then be commenced, and be carried on sparingly for a week and subsequently freely. The seed will germinate within three weeks.

"When the seedlings have grown to a height of 4 or 5 inches, they should be trans planted into beds prepared as for the seed, and so situated as to secure that the young foliage be not too much exposed to the sun. The plants should be put out at intervals of 15 inches and should be freely supplied with water. Manure is quite unnecessary at any time. The plants may remain in these beds until they attain a size suitable for putting out in the sites which they are intended permanently to occupy."

CULTURE OF THE EUCALYPTUS TREE IN THE PUNJAB.

Sundry specimens of *Eucalyptus obliqua*, forwarded by Dr. George Henderson, were brought to notice, and the following communication addressed by him to the Quarter Master General in India, under date 20th September, 1881, was submitted:—

"With reference to your No. 2698, dated 9th July last, I had the honor to forward to you some days ago, samples of Eucalyptus Timber grown at Rawul Pindi, and I now send you the following opinions as to the value of this timber. I do this direct to save time, and will forward copies of the correspondence through the usual channel."

Proceedings of the Institution of Civil Engineers, Vol. 56, 1878-79, Railway Construction in Australia, page 39—

"The sleepers are jarrah-jarrah (*Eucalyptus marginata*) imported from Western Australia which is believed to be one of the most valuable and enduring timbers in the world. It is not liable to the attack of white ants if cut at proper season, and sleepers have been taken from some of the Railways after lying in the ground for twelve years in as good a condition as when they were first laid. The sleepers are 8 feet 6 inches long, 8 inches wide and 4 inches deep, and sawn but not split from the log. The seat for the rail is adzed by machinery on the ground."

"Tredgolds Carpentery, by Hurst, page 475.—White gum, Eucalyptus obliqua—This tree is chiefly to be found in Tasmania, where it attains the height frequently of 150 feet with a diameter of nearly eight feet at about three feet from the ground. The bark of the tree is perfectly white, hence its name The white gum is sometimes used in ship building; but is especially valued for house-building, and for most of the purposes to which the blue gum is applied. The weight of a cubic foot and the transverse strength are about the same as those of blue gum.

"Jarrah or Australian Mahogany (Eucalyptus rostrata?) This is also one of the gum trees which is chiefly to be found in Western Australia, where it grows to a height often exceeding 200 feet. The colour is much darker than the blue gum, and very much resembles mahogany.

"It is used for all the ordinary building purposes as well as for hydraulic works, such as piers, jetties, &c., and for ship-building.

"This timber which was employed in the whaling jetty at Freemantle was found after sixteen years to be in as good condition as when first used.

"It has a most valuable property, that of resisting the attack of the seaworm and white ant, which are said never to penetrate more than the outer or sap wood."

In 1866 I sent a specimen of Eucalyptus timber grown at Lahore to Mr. R. Bocquet, then Locomotive Superintendent, and now Agent of the Punjab and Delhi Railway.

Mr. Bocquet's report on this timber was published by me in the proceedings of the Agri-Horticultural Society for May, 1866, and is as follows:—

"Your specimen of the Eucalyptus would, I should say, make first rate timber for carriage-building purposes, especially as it attains such a magnitude. The grain is particularly close and straight, and I perceive that it is buoyant in water, which oak and sal are not."

I shall feel obliged by your submitting this letter and the samples of wood to his Excellency the Commander-in-Chief.

In a demi-official letter, Dr. Henderson adds—that almost all the trees he has at Rawal Pindi were reared from seed grown in India from plants sent to Abbottabad in 1865 and 1866 from Lahore.

Among the specimens is one of a goblet which Dr. Henderson remarks "was made from a tree of *Eucalyptus* (*obliqua*) which was planted by me six inches in height in March 1878, and the tree was cut March 1881, being then 22 inches in girth and 36 feet high."

NEW FRUIT FROM AFRICA.

Mr. N. Bellitty sends the following extract from the proceedings of the Royal Geographical Society for July last, regarding a remarkable fruit met with by Mr. Johnson, while exploring in Central Africa, and which he thinks worthy of introduction into India:—

"Mr. Johnson mentions eating the *Suku* fruit. I too ate it, when we were short of food; it is about as large as a small pear, only rounder with a russet rind and three large grooved stones inside. The flesh is soft and melting, more like a pear than any other European fruit. The stones each contain a small plant fully formed, and with deep green leaves which bursts its shell almost immediately that the fruit falls, which it always does as soon as it is ripe. It is an African custom to cut down a fruit tree to get at the fruit, so the *Suku* is wise, for if its fruit is on the tree, it cannot be fit to be eaten."

Letters were read—

From P. Michee, Esq., Purneah, for tobacco seed which he is cultivating on a large scale, with an experienced Curer, and promising to communicate results. Complied with.

From the Secretary, Agri-Horticultural Society, Sydney, applying for certain good varieties of sugarcane. Compliance promised when in a position to do so.

From the Secretary, Agri-Horticultural Society of Lahore, returning thanks for seeds supplied.

From the Secretary to the Agricultural Institute, Bijnore, to the same effect.

From the Superintendent, Botanical Garden, Hongkong, promising compliance as soon as possible, with request for a supply of Litchi grafts to renew garden stock.

From the Secretary, Department of Commerce and Agriculture, enquiring for the botanic name of the "Japan pea" alluded to in last month's proceedings. The Secretary mentioned he was at present unable to give this information, but had promised some of the seed when received from Japan.

Some other letters of thanks for seeds and publications and enquiries for information were submitted. For the contributions above recorded, the best thanks of the Society were accorded.

MINERALOGY.

A BALTIMORE dispatch informs us that a cartload of antimony, ten tons in all, was on the 14th of July received by C. L. Oudesluys and Co., from the southern part of Utah Territory, being the first antimony received in the east from the mines of that section. The antimony was mined about 140 miles from Salt Lake City. The ore is a sulphide, bluish gray in colour, and yields from 60 to 65 per cent. of antimony. All antimony heretofore came from Great Britain and the island of Borneo, and paid an import duty of 10 per cent. *advalorem*, and there is also some from Sonora. It is believed that with proper rail facilities to the mines of the West, there will be no need of importations.

THE quantity of petroleum now produced in Pennsylvania is something astounding. At the present moment we learn that the quantity in stock is one thousand million gallons. [illegible] quantity may be obtained by reflecting that

at the present Calcutta rate of consumption of ten million gallons, the above quantity would supply this city for 100 years. This oil is stored in immense iron tanks, some of which had as much as 14 million gallons, and on several occasions the oil flowing from the wells was allowed to run to waste from sheer want of vessels to contain it. It is little wonder under these circumstances that kerosine oil is so cheap all over the world.

In a recent report on the mineral resources of Turkey, Consul Wrench alludes to the auriferous deposits of that country, and mentions that in some places ores have been found, some of them associated with tellurium, worth from £2,000 to £5,600 per ton, and that there is an argentiferous gold mine, situated near Sirdjiller, about 12 miles from the Dardanelles, of great value. The quartz reef constituting the mine shows itself above ground for about half a mile, is about 40ft. to 60ft. broad, and is proximate to the sea. Some specimens of quartz collected by the Consul showed no trace of gold to the naked eye, but on analysis gave from 8 oz. to 43oz. to as low as 19 dwt. of gold per ton, together with a nearly equal quantity of silver, and the roof appeared auriferous throughout.

The following, from the *Scientific American*, cannot fail to be of interest to those who use kerosine:—"Properly refined kerosine oil should be nearly colourless by transmitted light, and slightly fluorescent by reflected light: its density should be about 43° B, but the specific gravity alone is not a trustworthy test. The 'flashing point' is determined by dipping a lighted match into a small quantity of the oil; and safe oil so treated should flash under 100° F., but should extinguish the flame. The 'burning' test consists of heating a small quantity of the oil in a tin saucer in which is also placed a suitable thermometer, and noting at what temperature the oil takes fire; this should not occur under a temperature of 125° F. It is thus important to know, when kerosine is advertised as up to a test of so many degrees Fahrenheit, whether the 'flashing' or the 'burning' test is meant: for example, oil of 110° flashing test would be very good, while if the burning or igniting point was as low as that temperature it would be unsafe. Out of 736 samples of kerosine tested officially in New York, only 28 were really safe."

In view of the interest now taken in Indian mining, we may quote the silver-lead mining statistics of the United Kingdom:—

Year.	Lead Ore. Tons.	Lead. Tons.	Silver. Oz.
1876	... 79,096	58,667	483,422
1877	... 80,850	61,403	497,375
1878	... 77,850	58 020	397,471
1879	... 66,877	51,635	333,671
1880	... 72,245	56,919	295,518

A large portion of this was obtained from the lead mines in the south of Scotland. We think it was a pity that the attempt to work a mine for these minerals in Bengal should have fallen through, and it seems strange to us that the dishonesty of the agents should have interfered with a thorough and unprejudiced report being made on the mine in question, as the dishonesty of its agents need have had no connection with the value of the property. We have heard that the whole scheme was a *bogus* one, and we have also heard that the property is a valuable one. Besides we have seen good ore, said to have been taken from the mines. All these things were capable of proof or disproof, and we are surprised that this has not been seen to.

It almost seems as if we shall have to change all our ideas of geology, if the recent discovery of coal in Staffordshire turns out to be as it is reported. For many years past scientific men differed in opinion as to the probable duration of the existing coal seams, and while many and conflicting opinions are held as to the time when the supply will fail, all are agreed that it is only a question of time. It is true that other seams are available, but at such enormous depths that their existence may, for all practical purposes, be ignored, until at any rate the resources of science provide some better mode of ventilating than at present prevails. It was left for recent research to find out this Staffordshire coal field, which, it appears, lies within 18 feet of the surface. While our geologists have been busy searching for new fields in the lower depths, they have neglected this and possibly many other similar fields at the very surface. So far as yet discovered, the field is only one acre in extent, but the seam is of the amazing thickness of 42 feet. The quantity of coal therefore in this one acre amounts to 1,829,520 cubic feet, or over 100,000 tons. This is not a bad beginning, and if a few more such fields be discovered, we may look for a considerable reduction in the price of coal. A shaft will not be necessary, as the superincumbent soil will simply be removed, and the coal quarried out, the miners filling up with rubbish as they go along.

The quantity of kerosine oil imported into India has become startling in magnitude. We can well remember when such a thing was unknown in India. The great increase of late years has been caused by the extension of its use among the native portion of the community. The quantity required by the European inhabitants will not increase to any great extent, as their number is so far limited, and we must therefore look to native consumption to account for such an extensive increase of late years. In passing through the bazaar, and the native portion of the town generally, the increasing use of kerosine lamps—of a sort—cannot but strike one, and we presume the reason is that they find the oil cheaper or better than the ordinary country burning oils. Some are surprised that gas should not be more generally used by Europeans. But the fact is that kerosine oil is very much cheaper than gas. This, of course, should not be the case. We are well aware of the difficulties attending gas-making in India, so far away from the cannel coal which forms the raw material at home. Indian coal is used here, but it might be a question whether it would not pay to import home cannel coal. Allowing for freight and other charges, we suppose that gas might be provided here at a rate 63 per cent. higher than in large cities at home. In Glasgow the rate is 3s. 8d. per 1,000 cubic feet, 63 per cent. added to which would make Rs. 3. Were gas charged at this rate, it would be more commonly used. This is a question for the Gas Company, whose existence seems to be called for to supply gas for street lamps, as practically only a small percentage of private houses use gas. The imports of mineral oils for the past six years have been as follows:—

		Gallons.
1875-76	... ...	621,530
1876-77	... ...	439,123
1877 78	... ...	2,405,405
1878-79	... ...	3,775,674
1879 80	... ...	7,828,247
1880 81	... ...	10,000,026

The increase of 1880 81 over 1876-77 is at the rate of 2,177 per cent.

INDIAN KAOLINS.

(From a Correspondent.)

Will you permit me to state, through the medium of your columns, that we have used Mangalore Kaolin and Bangalore Kaolin, at the School of Arts, and both are deficient (in common with other Indian Kaolins), in those peculiar chemical proportions necessary to produce porcelain. As several gentlemen have been good enough to send us specimens of clay, it may not be uninteresting to your readers generally, to explain the salient points connected with the manufacture of porcelain.

Kaolin, or China clay, as most people know, is a white substance, resembling chalk, and consisting of disintegrated granite, or gneiss. Its principal ingredients are alumina and silica (sand). The latter is partly free, and partly chemically combined with the alumina forming silicate of alumina. The free silica, by repeated washings, can be separated from the alumina; but the silicate of alumina, being chemically combined, cannot be chemically separated. Of the two ingredients, alumina is plastic and non-fusible; and sand non-plastic and fusible. The sand by itself could not be moulded into shape. The alumina by itself could not be fired. The office of the alumina, therefore, is to hold the particles of sand together until they melt and melting, they in their turn hold the particles of alumina together. Porcelain is the result. Now all the Indian Kaolins we have tried contain so much silicate chemically combined in the form of silicate of alumina, that they cannot be moulded into shape without the addition of common plastic clay, which is full of a fusible ingredient, causing the whole mass to melt at a temperature below that necessary to produce transparency. The result is "Wedgwood ware," the highest form of "stoneware." It seemed just possible that our potters in India lacked the skill necessary to throw true short porcelain bodies; but this point I have now settled by bringing out some of Minton's clay prepared for throwing. Our potters, I am happy to say, have thrown it just as well as the most skilful European workmen.

It is unreasonable to suppose that a country abounding in gneiss formations does not possess the finest Kaolin beds, but so far as we known they have yet to be discovered. If gentlemen willing to assist us would kindly take the trouble to treat any white substance they find according to the following directions, they would satisfy themselves as to the nature of the material discovered. Put a little of the clay in a wine glass, and pour acid on it: if it effervesces it is simply chalk. If it receives the acid as chalk would receive water, it is clay. Half-fill a large tumbler with it and then fill up with water. Work it well about, until it is of the consistency of thick soap; let it settle for a moment, and pour the contents into another tumbler. The sand will have settled in the bottom of the first; fill up with water again, agitate it and again let it settle, this time for a longer period, repeat this process five or six times, until all the free sand is separated from the clay, then let it stand for a night. In the morning pour off the clear water, strain the residuum through pocket handkerchief, knead the ball of clay resulting and ask any village potter to make a small bowl with it. If he fails to do it, the clay cannot produce a true porcelain body. It is no doubt within the resources of art by other combinations, probably hitherto unknown, to produce the sought-for article, and to this branch of the subject, we are now directing our attention; but until we have, as the basis of our operations, a careful quantitative analysis of our clay, the search would not be productive of anything more than interesting amusement to ourselves.—*Madras Mail*

THE NATRON LAKE OF LOONAR.

There is this very startling announcement made in the Administration Report of the Hyderabad Assigned Districts for 1879-80 just published. It is reported that the Loonar Lake, hitherto remarkable for its saline deposit, now does not retain its former productiveness, it is represented that this is due to a masonary embankment on the heights towards the villages side having given way, whereby large quantities of

mud and earth are drained into the lake annually during the rains. The strata thus formed prevent the lake from reaching the required depth so as to make it fit for depositing salt by dilution with the salt impregnated mud, and that with a view to remove this defect an estimate has been called for, for repairing the bund.

We would deprive our readers of much interesting information connected with this remarkable lake if we did not place in their hands the facts in our own possession. In 1856 Dr. George Smith, the then Residency Surgeon, who described this lake said it lies in the circar of Meihker, Sowbah of Berar. It is situated at the bottom of a crateri-form depression, which forms a singular and unexpected interruption to the general undulatory character of the District. This crateri-form shape of the hollow, if the opinion of some geologist be correct, is the crater of an extinct volcano, and the interest this will make us feel, is deepened by the fact that in all probability it is the only one in all Southern India. The action, however, even of a large crater like this must have been comparatively limited; other vents and fissures, which have left no permanent mark of their existence, must have given exit to those vast sheeted masses of porous and solid rocks constituting the trappean plateau of the Deccan. It may be also interesting to remark that at the south-east angle of the plateau, the existence of numerous hot springs seem to indicate the persistence of igneous action. But to return to our subject, this lake is almost surrounded by woods, in the thick masses of which, at the time we are writing about, were found small deserted and ruined Hindu temples, built of the common compact trap of the District. Many years ago an officer upon entering one of them was seized and severely injured by a tiger. In 1856 this lake is represented as a still sheet of water, emitting an intolerable stench of sulphuretted hydrogen especially during the heat of the day when the gas rises in millions of bubbles to the surface of the water. The lake is of green color, owing to the abundance of conferva on portions of its surface especially near the edges. The mud close to the margins of the lake is thick black salt, and tenacious from the mixture of regur, salt and alum. When dry, fan-shaped black glassy crystals of carbonate of soda are seen. The lake at the time in question seems to have extended its bounds a good deal, as numerous dead trees were standing within its margin, and because every tree touched by this lake dies, and also by the fact that a bowrie of sweet water protected by a low wall is now completely surrounded by the water of the lake. Reptiles, fish, and insects are never found in the lake, but flocks of teal and duck dot its surface. The water has a salt and nauseous taste, and its emanations are said to give rise to fevers of intermittent and remittent types.

At two points near the centre of the lake distant from each other about half a mile nearly are two saline springs, which have never been known, even in seasons of extreme drought, to become dry. It is supposed that the muriate of soda from this source, coming in contact with the carbonate of lime found abundantly in the other springs of the lake, and in the surrounding rocks, whence it is washed down by the feeders of the lake, causes the deposition of the carbonate of soda or natron salt in a state of greater or less purity. The purest varieties, containing upwards of fifty per cent. of the neutral carbonate, being found close to the saline springs themselves, whence it is raised by diving. The depth of the lake near these springs varies from 5 or 6 feet in the hot months, to 12 or 14 during the rains.

The salt is raised by divers, who proceed towards the centre of the lake, in canoes—the divers remain under water several seconds, and come up with their hands full of salt. When the lake was very shallow in 1836 the salt was scooped up by the iron pans and towas, on which natives bake their bread. The process of raising salt was therefore rude, but the salt is much prized and finds a ready sale in both Berars, Nagpore, Candeish and Poonah. Such then was the history of the Loonar lake in 1857, and we trust that the embankment, when repaired, will tend to restore it to its former productiveness in saline deposits for the salt is useful in fixing the red dyes of cloth, and another species is used for making bangles, and for this manufacture two factories existed when each man made 6 to 700 daily; the eyesight of those men, however, fails soon owing to the entire want of protection from the glare of the glass furnace.—*Madras Athenæum.*

FORESTRY.

RECENT botanical research has shown that the trunks of trees undergo daily changes in diameter. From early morning to early afternoon there is a regular diminution till the minimum is reached, when the process is reversed, and the maximum diameter is attained at the time of twilight; then again comes a diminution, to be succeeded by an increase about dawn—an increase more marked than that in the evening. Variations in diameter are believed to coincide with the variations of tension, but they are shown to be inverse to the maximum of the temperature, the one corresponding roughly to the minimum of the other, and so on. In connection with these investigations it may be remarked that the height of a man is greater in the morning than in the afternoon, and again, that, other influences being suspended, the barometer is higher in the morning than in the afternoon.

THOUGH the agricultural capabilities of British Columbia may not be so great as other parts of Canada, its mines are doubtless very rich, and from a recent report of Professor Dawson, of the Dominion Geological Survey, its forests are of great importance. Many first-class mills have been established in various parts of the country, and the total annual product is stated to be about 200,000,000 feet, of which 25,000,000 feet is exported to other countries, 25,000,000 feet used at home, and 150,000,000 feet sent to California. Professor Dawson estimates that 110,000,000 acres (or two-thirds of the whole province) are covered with timber. The Douglas Fir, or Oregon Pine, is the most valuable commercial tree. It frequently exceeds 8 feet in diameter above the ground, and rises to to a height of from 200 to 300 feet, forming large and dark forests. The Western Hemlock and Red Cedar are the other important trees of the province, both of which, the latter especially, grow to a great size. When the great plains of Canada become populous, the mines and forests of British Columbia should be of great importance, and their produce ought to provide a large and profitable traffic for the Canadian Pacific Railway.

IN the jungles on the east coast of Cape York Peninsula much valuable timber exists, especially the highly prized red cedar (Cedrela Australis, Mueller) and bands of lumberers penetrate their gloomy recesses for the purpose of felling the trees and rafting the logs for export. It is calculated that from two of the rivers, known as the Mossman and Daintree, four million feet of cedar had been exported between November, 1874, and April, 1878, and that three million feet were at the last named date lying ready for shipment, besides another lot of half a million feet at the Johnstone river. The market value of cedar in the log is from 35s. to 40s. per 100 feet in Melbourne. The market value in Brisbane was stated at the Queensland Exhibition of 1878 to be £7 10s. to £8 10s. per 1,000 superficial feet. The value of this minor industry therefore can easily be calculated. This tree is a mere variety of the Singapore cedar (Cedrela Taona, Roxburgh), which ascends the Himalayas to 8,000 feet. It attains a height of 200 feet and the foliage is deciduous. The Rev. Dr. Woolls noted in New South Wales trees so large as to yield 30,000 superficial feet of timber. This light, beautiful wood, easily worked and susceptible of high polish, is much in request for furniture, for the manufacture of pianofortes, for boat building, and a variety of other work. The timber from the junction of the branches with the stem furnishes the choicest veneers. The bark contains a considerable quantity of tannin which produces a purplish leather.

AN ENGLISH FOREST.

THE beechnuts are already falling in the forest, and the swine are beginning to search for them while yet the harvest lingers. The nuts are formed by midsummer, and now, the husk opening, the brown angular kernel drops out. Many of the husks fall, too; others remain on the branches till next spring. Under the beeches the ground is strewn with the mast as hard almost to walk on as pebbles. Rude and uncouth as swine are in themselves, somehow they look different under trees. The brown leaves amid which they root and the brown-tinted fern behind lend something of their colour and smooth away their ungainliness. Snorting as they work with very eagerness of appetite, they are almost wild, approaching in a measure to their ancestors, the savage boars. Under the trees the imagination plays unchecked, and calls up the past as if yew bow and broad arrow were still in the hunter's hands. So little is changed since then. The deer are here still. Sit down on the root of this oak (thinly covered with moss), and on that very spot it is quite possible a knight fresh home from the Crusades may have rested and feasted his eyes on the lovely green glades of his own unsurpassed England. The oak was there then young and strong; it is here now ancient, but sturdy. Rarely do you see an oak fall of itself. It decays to the last stump; it does not fall. The sounds are the same—the tap as a ripe acorn drops, the rustle of a leaf which comes down slowly, the quick rushes of mice playing in the fern. A movement at one side attracts the glance, and there is a squirrel darting about. There is another at the very top of the beech yonder out on the boughs, nibbling the nuts. A brown spot a long distance down the glade suddenly moves, and thereby shows itself to be a rabbit. The bellowing sound that comes now and then is from the bucks, which are preparing to fight. The swine snort, and the mast and leaves rustle as they thrust them aside. So little is changed; there are the same sounds and the same movements, just as in the olden time.

The soft autumn sunshine, shorn of summer glare, lights up with colour the fern, the grounds of which are yellow and brown, the leaves, the gray grass, and hawthorn sprays already turned. It seems as if the early morning's mists have the power of tinting leaf and fern, for so soon as they commence the green hues begin to disappear. There are swathes of fern yonder, cut down like grass or corn, the harvest of the forest. It will be used for litter and for thatching sheds. The yellow stalks—the stubble—will turn brown and wither through the winter, till the strong spring shoot comes up and the anemones flower. Though the sunbeams reach the ground here, half the green glade is in shadow, and for one step that you walk in sunlight ten are in shade. Thus partly concealed in full day, the forest always contains a mystery. The idea that there may be something in the dim arches held up by the round columns of the beeches lures the steps onwards. Something must have been lately in the circle under the oak where the fern and bushes remain at a distance and wall in a lawn of green. There is nothing on the grass but the upheld leaves that have dropped, no mark of any creature, but this is not decisive; if there are no physical signs, there is a feeling that the shadow is not meant. In the thickets, perhaps—the shadowy thickets with front of thorn—it has taken refuge and eluded us. Still onward the shadows lead us in vain but pleasant chase.

Those endless trees are a city to the tree-building birds. The round knot-holes in the beeches, the holes in the elms and oaks; they find them all out. From these issue the immense flocks of starlings which, when they alight on a isolated elm in winter, make it suddenly black. From these, too, come forth the tits not so welcome to the farmer, as he considers they reduce his fruit crop; and in these the gaudy woodpeckers breed. With starlings, woodpigeons, and rooks the forest is crowded like a city in spring, but now in autumn it is comparatively deserted. The birds are away in the fields, some at the grain, others watching the plough, and following it so soon as a furrow is opened. But the stoats are busy—they have not left, nor the weasel; and so eager are they that, though they hide in the fern at first, in a minute or two they come out again, and so get shot. With all the shooting, they are not exterminated, like the marten and polecat. They are protected certainly by the burrows through which they travel, yet with so many guns against them, and the constant danger of traps it is remarkable that they do not disappear. They are friendless; even the hawks (at least the kestrel) have found special pleaders; but the stoat does not get a hand held up for him. Shot, worried by dogs, occasionally trapped, still they exist, and are not apparently much diminished in number. The destruction of the rabbits would be perhaps

the signal for their diminution, and with the rabbits the foxes would be endangered. On the other hand, the wild cats—domestic cats that have lost their homes—do not increase. Though constantly added to, they never become numerous, perhaps because they never escape shot long enough to be thoroughly acclimatised to a wild life. If the list of cats shot in the forest were kept, it would sound as if it were infested, but each of these represents a poss'ble family destroyed. It is a litt'e curious that, cunning and stealthy as they are, the cats do not contrive to escape and continue their kind like the stoats.

Like the fields, which can only support a certain proportion of cattle, the forest, wide as it seems, can only maintain a certain number of deer. Carrying the same thought further, it will be obvious that the forest, or England in a natural state, could only support a limited human population. Is this why the inhabitants of countries like France, where they cultivate every rood, and try to really keep a man to a rood, do not increase in number? Certainly there is a limit in nature which can only be overcome by artificial aid. After wandering for some time in a forest like this, the impression arises that the fauna is not now large enough to be in thorough keeping with the trees. Their age and size and number, the breadth of the arboreal landscape requires a longer list of living creatures and creatures of greater bulk. The stoat and weasel are lost in bramble and fern; the squirrels in the branches; the fox is concealed, and the badger; the rabbit, too, is small. There are only the deer, and there is a wide gap between them and the hares. Even the few cattle which are permitted to graze are better than nothing; though not wild, yet standing in fern to their shoulders and browsing on the lower branches, they are, at all events, animals for the time in nearly a natural state. By watching them it is apparent how well the original wild cattle agreed with the original scenery of the island. One almost regrets the marten and polecat, though both small creatures, and wishes that the fox would come forth more by day. These acres of bracken and impenetrable thickets need more inhabitants; how well they are fitted for the wild boar! Such thoughts are, of course, only thoughts, and we must be thankful that we have as many wild creatures left as we have. Looking at the soil as we walk, where it is exposed by the roots of a fallen tree, or where there is an old gravel pit, the question occurs whether forests, managed as they are in old countries, ever really increase the fertility of the earth? That decaying vegetation produces a fine mould cannot be disputed but it seems here that there is no more decaying vegetation than is required for the support of the trees themselves. The leaves that fall—the million, million leaves—blown to and fro, at last disappear, absorbed into the ground. So with quantities of the lesser twigs and branches; but these together do not supply more material to the soil than is annually abstracted by the extensive roots of trees, of bushes, and by the fern. If timber is felled it is removed, and the bark and boughs with it; the stump, too, is grubbed and split for firewood. If a tree dies it is presently sawn off and cut up for some secondary use or other. The great branches which occasionally fall are some one's perquisite. When the thickets are thinned out, the fagots are carted away, and much of the fern is also removed. How, then, can there be any accumulation of fertilizing material? Rather the reverse; it is if anything taken away and the soil must be less rich now than it was in bygone centuries. Left to itself the process would be the reverse, every tree as it fell slowly enriching the spot where it mouldered, and all the bulk of the timber converted into fertile earth. It was in that way that the American forests laid the foundation of the inexhaustible wheat lands there. But the modern management of a forest tends in the opposite direction. Nothing turns on it but the fact itself for the soil is too thin to be of any agricultural value, at least for cereal crops. It may not, however, be amiss to state that if it is wished to improve a soil by the growth of timber, something must be left in it besides the mere roots. The leaves, even, are not all left: they have a value for gardening purposes; though of course, the few cartloads collected make no appreciable difference. There is always something going on in the forests; and more men are employed than would be supposed. In the winter the selected elms are thrown and the ash poles cut; in the spring the oak timber comes down and is barked; in the autumn the fern is cut. Splitting up wood goes on nearly all the year round, so that you may always hear the axe. No charcoal burning is practised, but the mere maintenance of the fences, as, for instance, round the pheasant enclosures, gives much to do. Deer need attention in winter like cattle; the game has its watchers; and ferreting last for months. So that the forest is not altogether useless from the point of view of work. But in so many hundred acres of trees these labourers are lost to sight, and do not in the least detract from its wild appearance. Indeed, the occasional ring of the axe or the smoke rising from the woodman's fire accentuates the fact that it is a forest. The oaks keep a circle round their base and stand at a majestic distance from each other, so that the wind and the sunshine enter, and their precincts are sweet and pleasant. The elms gather together rubbing their branches in the gale till the bark is worn off and the boughs die, the shadow is deep under them and moist, favourable to rank grass and coarse mushrooms. Beneath the ashes, after the first frost, the air is full of the bitterness of their blackened leaves, which have all come down at once. By the beeches there is little underwood, and the hollows are filled ankle-deep with their leaves. From the pines comes a fragrant odour, and thus the character of each group dominates the surrounding ground. The shade is too much for many flowers, which prefer the nooks of hedgerows. If there is no scope for the use of "express" rifles, this southern forest really is a forest and not an open hillside. It a forest of trees, and there are no woodlands so beautiful and enjoyable as these, where it is possible to be lost awhile without fear of serious consequences; where you can walk without stepping up to the waist in a decayed tree-trunk, or floundering in a bog; where neither venomous snake nor torturing mosquito causes constant apprehensions and constant irritation. To the eye there is nothing but beauty; to the imagination pleasant pageants of old time; to the ear the soothing cadence of the leaves as the gentle breeze goes over. The beeches rear their Gothic architecture, the oaks are planted firm like castles, unassailable. Quick squirrels climb and dart hither and thither, deer cross the distant glade, and, occasionally, a hawk passes like thought.

The something that may be in the shadow of the thicket, the vain pleasant chase that beckons us on, still leads the footsteps from tree to tree till by and by a lark sings, and, going to look for it, we find the stubble without the forest—stubble still bright with the blue and white flowers of gray speed well. One of the earliest to bloom in the spring, it continues till the plough comes again in autumn. Now looking back from the open stubble on the high wall of trees, the touch of autumn here and there is the more visible—oaks dotted with brown, horse chestnuts yellow, maples orange, and the bushes beneath red with haws.—*Times*.

FOREST FIRES IN THE UNITED STATES.

THE forest fires which have recently desolated certain sections of the United States appear, says a writer in the *Standard*, to be more than of ordinary magnitude. Over most of the settled parts of North America the timber has been cut down so recklessly that long stretches of unbroken forest-growth are getting rare in localities to the east of the Mississippi. Already the State Governments have become alarmed at the rate at which their most valuable natural crop is being destroyed, and in some cases, after it is too late, are devising measures whereby the trees, which have been so unadvisedly hewn down in places where the soil was not really required either for mining, building, or agriculture, can be re-planted. The northern parts of Michigan are, however among the few tracts which are still to some extent covered with their primeval forest. In this district little rain fell for nearly two months, and as a result fires broke out here and there, but at first they seem to have done comparatively little damage. After a few days, however, a storm of wind swept over the peninsula, carrying with it the flames, which in a few hours consumed everything in their course. The terrified settlers fled panic-stricken, trying to hide themselves in wells and caves and pits to obtain shelter. But their efforts seem to have been in vain, for, while many escaped, the latest reports represent the country as one blackened waste in several townships, scarcely a house remaining to mark the site of flourishing farms or happy homes, the crops consumed, the fences burnt up, and the owners, in too many instances, burnt alive. It is estimated that upwards of five thousand families are ruined. The dead are already known to number about two hundred, but it is believed that fully thrice as many have perished.

The great forest fires of 1881 will doubtless leave their permanent mark on the country, and, even were there no danger of another outbreak, they are certain to throw it back for many years. Such woodland fires are, of course, no new feature in the history of the United States, though of late years they have been less extensive than formerly, owing to so much of the country being cleared, and the means of controlling them having, by the increase of the population, become more abundant. They are often attributed to hunters or Indians leaving camp fires unextinguished. Undoubtedly this was, at one time, often the cause of great stretches of wood and prairie being fired, and in some cases it may be so still. The wayfarer in those wild regions is not over-anxious for what the morrow may bring forth, and to take pains to "drown out" the wood fire at which he has boiled his kettle before starting off on his morning's tramp—merely out of regard for the possible consequences—will hardly be a circumstance likely to enter his mind. However, the agency of man is not the only cause of forest fires. No sight is more familiar in a forest region, where most likely human foot has never pressed before and where there are neither Indians nor hunters, than mile after mile of country dotted with the blackened stumps which stand grim monuments of the flames that at some recent period have swept across the region. Such spots are often found in the wooded regions of the less known parts of North America. It is also a common subject of observation that flames will be seen bursting out in the woods high up on the sides of mountains where there are no hunters, and have been none for months past. These sudden fires are noticed invariably after a long continuance of hot weather, when the air is close and sulphurous, and the moss on the bark of the resinous pine and fir trees as dry as tinder. They are then ready to be ignited by a flash of lightning, or, as is quite as often the case, by the heat generated by two trees rubbing against each other.

It, as not unfrequently happens after a summer of forest fires, heavy rains fall, a conflagration of this sort is speedily drowned out. But should a high wind arise, as has been the case in Michigan, the flames might roar along on the lee of the breeze until they encounter a prairie, a lake, or some other burnt tract, when the fire will gradually die of natural exhaustion. If a party travelling on "the plains" of America see to their horror the flames of a prairie fire on the horizon behind them, their only hope of safety is to instantly rush ahead and ignite the grass in front of them, so that by the time the advancing fire in the rear overtakes them, there will be a cleared spot on which to take refuge. The most curious feature about both forest and prairie fires is that no sooner has one passed over a district than plants and trees of different species from those which formerly grew there spring up. In Vermont hickory has covered spots where before the forest was destroyed by fire, not a single tree of that species was known. The country round the head waters of the Delaware, Allegheny, and Genesee rivers, now covered with hemlock, beech, and sugar maple, was originally an oak forest; and in Georgia oak and hickory lands, when cleared, invariably grow up with pine. In the region about Green Bay, Wisconsin, overrun by the fires of 1871, dense growths of poplars and beeches succeeded the firs and deciduous trees destroyed. In the vicinity of the Slave Lake the land laid waste by fire produces nothing but poplars, in place of spruce, pine, and white birch, though none of the new trees were previously seen on the ground they now cover. In Alabama pine, under the same circumstances, is succeeded by oak; and—not to multiply examples of a curious fact—in Nebraska ash, elm, and box elder follow cotton wood, and in Florida blackjack oak, the long-leaved pine. The seeds of these trees seem to be lying dormant in the soil until stimulated into life by the passage of the flame, as was the yellow rocket, which made gay the waste places of London after the Great Fire, though the plant had previously been unknown in the district. Hence—and in a misfortune so sad it is pleasant to find some cause for satisfaction—the Michigan fire is not likely to permanently injure the land. If it has destroyed houses, fences, barns, cattle, crops, and, unhappily, their owners also, it will have aided in clearing some ground that needed clearing, and it may possibly end in giving an artificial fillip to the soil over which it has swept.—*Journal of Forestry*.

AFFORESTATION AND WATER-SUPPLY.

VOLTAIR'S CANDIDE tells us, '*il faut cultiver son jardin*;' and a much more ancient authority inculcates the same lesson by his censorious allusions to the condition of the garden of the sluggard. And what are the gardens of a nation but its woods and forests; and what nation of modern time, in its neglect of these sources of pleasure and wealth has not incurred the blame deservedly bestowed by moralists upon those who recklessly destroy, without attempting to replace the beneficent gifts of nature? Did not "Poor Richard", say that "the plant grows while the man sleeps," and that it is the forester's duty for every tree he fells to plant two saplings? It may be, however, questioned whether the majority of writers, from Solomon to Franklin, who have touched on this matter, viewed it in other than its merely economic aspect. They

thought, and rightly, that a tree cut down and expended was a draft on Natures bank which should be met by another deposit. The climatic effects of disafforestation was not realised in their far from perfect knowledge of physics. We believe that Humboldt was the first to indicate the control that vegetation exercises over the water-supply In 1817, in a speech delivered before the Chamber of Deputies, Chateaubriand said: "Everywhere where trees have disappeared, man has been punished for his improvidence. I can tell you, better than any other, gentlemen, what depends upon the absence or presence of forests, because I have seen the solitudes of the New World, where Nature appears to be born, and the deserts of old Araby, where creation seems to expire. The same eloquent writer says:—"Forests precede population: deserts follow it."

A very few years ago the late talented editor of the *Japan Times*, in a series of articles on this same subject endeavoured to draw the attention of the Government of this Empire to the importance of forest conservancy and improvement. Without referring further to his essays, we can revert to his theme, the rather that nothing really complete has been done in the direction he indicated, and that the necessity of providing by plantation a check upon denudation, though evidently recognized, has yet not been encountered with vigour.

There are indeed, certain forests in Japan, the property of the State, where not only is the felling of timber restrained by very carefully devised laws, but ample provision is also made for preventing any failure in the stock of young trees. There, however, the law stops, for though districts in special localities are marked out, and the owners of woods and forests are cautioned not to cut timber there without reference to the local authorities, no penalties are provided for infringement of the prohibition, if prohibition it may be called, seeing that its observance depends upon a spontaneous recognition of its expediency. The presence or absence of a tree in these districts is in fact only considered with reference to its effect upon some bank or water-course, and not at all in connection with its sanitary influence as a living thing.

Not that the people of Japan can be charged with indifference to the state of their forests. For many and many a day it has been their habit to "reap only where they sow," or in other words to plant one, two and sometimes even as many as five saplings for every tree felled. Such at any rate is the evidence of tradition, but we are sometimes disposed to fancy that the good folk in the rural districts give themselves a little more credit than their practice warrants, for it is within our immediate knowledge that considerable districts to the north of Tokiyo have been well nigh denuded of trees during the past decade, and as for Tokiyo itself, how much remains to-day of those gloriously wooded parks, where a few years ago the pines counted their rings by hundreds and the cedars stood knee-deep in variegated bamboo-grass? The iconoclastic era that demolished all this is past indeed, but so are the "kings that flourished" before it. The days when labour and material were at the back of every local magnate are recalled by nothing in the present, and we might almost say, that the fall of feudalism did not change the polity of Japan much more than it altered the face of the country. If we consult history we shall find that the plantation and preservation of trees was made the subject of a proclamation by the Emperor Ojin, sixteen centuries ago, and that in those days there were woodrangers in each province, whose duties were deemed sufficiently important to be controlled by no less a personage than the Emperor's son as Chief Superintendent of Forests. Four hundred years afterwards (673 A. D.) we find evidence of a similar policy in the sumptuary laws of the Emperor Temmu, and it was only from the beginning of the thirteenth to the end of the sixteen century—the age of almost unceasing civil war—that woods and forests seem to have been left entirely to their own devices. During the Regency of the Tokugwa Princes the matter was again brought under official supervision, and the feudal barons, following the example set by their puissant chief, extended to the forests in their domains, a protection that was only possible in days when might was right

Japan has therefore been exceptionally fortunate in this respect and yet her situation at present is not comfortable. When speaking two months ago, of the action contemplated by the Forests Bureau, we noted a act that will bear repetition, viz., the total number of trees in Government private forests is about three thousand millions, while the number annually required for use is not much short of two hundred millions, so that Japan only possesses at present a stock of timber sufficient for from fifteen to twenty years consumption. Under these circumstances the authorities may well feel uneasy, and anything we can say in favour of energetic legislation will certainly not be amiss.

This state of affairs is not to be altogether wondered at, however much it should be regretted. Similar complaints reach us from other directions—from all the countries of America, from Australia, from India and China, in which latter lands the reckless destruction of vegetation has been responsible for the desication of streams, change of channels, irregularities of waterflow, floods, droughts, famines and the population. Only of late years has the requiste action been taken even in Great Britain to prevent the disappearance of timber from hill-side and fell. And now in France perhaps, the most needfully cultivated country in the world there are loud complaints that sufficient care is not taken to balance the present consumption with a thoughtful regard for the needs of the future. A study of the connection of the watersheds of Japan with the forests and how the former have been affected within memory of those now living by the diminution of the latter would be highly interesting. It would add largely to the stock of knowledge existing on the subject generally, and could be conducted in connection with the surveys that are being constantly made for railway projection, geological, and other purposes.

The disafforestation which has been going on, to a great extent unchecked, in some parts of France, has had demonstrably disastrous consequence in the Alpine regions. Nearly forty years ago a French Engineer, M. Surell, in an *Etude sur les torrents des Hautes Alpes* demonstrated that the existence—the maintenance—of the soil of mountains depends absolutely upon the existence and maintenance of the forestral vegetation with which they are clothed. He indicated that to conserve religiously that growth in all places where it exists already and to replace it where it has disappeared, are duties devolving upon Governments. There is matter for astonishment that this maxim should be so generally recognised and so imperfectly acted upon, as pious reverence for forests, woods, and trees is descernable in the mythologies and traditions of all peoples. In old Gaul and British, the sacred groves were the sanctuaries and temples of Druidism. At the period of the Roman conquest those countries were little else than tracts of forest and, intersected by devious paths and dotted with occasional clearings. And now the clearings have quite unnecessarily, not thinned, but almost extirpated the timber. Saxon, Gaul, Norman, and French man, monarch and noble, realised and appreciated the value of wood and foliage. It remained for the manufacturing age to strip the uplands of their ornament and wealth. The damage done will have to be repaired, or present and future generations alike will suffer.

Look at central and southern France. The mighty Alps, on their swelling flanks and in their vast ravines, have present traces of the great forests whereof comparatively modern history speaks. Here and there are found the buried trunks of enormous pines, the fossil bones of old leafy dwellers on the mountain side, which to-day is bald and barren stripped naked by man or his flocks, and kept uncovered by sun and storm. In the Pyrenees so much land has been reclaimed, so much wood burned and chopped and wasted, that now there is not enough left for fuel, and whole districts have had to be abandoned through that want alone. The destruction is attributed in great part to abuse of pasturage. A certain statistician, M. Perthuis, estimates that the actual hand of man has only done about one twenty-fifth part of the damage, the balance being attributable to the teeth of his creatures. In the regions of the South the Roman laws were preserved nominally but without police. Thus the forests became communal and were delivered a prey to the rapacity and improvidence of the inhabitants. Matters were not so bad in the north where the old feudal adage, *Nulle terre sans seigneur*, obtained more rigorously; and the forests and chases were better protected than in the south where the denudation of the mountains was almost complete, and produced the most disastrous effects, deeply effects felt and bitterly regretted to-day, and from which other hilly countries would do well to learn a lesson.

Terrible inconstancy in the water-supply is the principal evil wrought by reeckless disafforestation. Mr. Surell calls the French Alps the "classic land of torrents." It is easy to trace the damage torrents have wrought in that region. Let loose by rains from the mountain summits, and unrestrained by leaf, or root, or herbage, they rush down upon the plains, carrying with them earth without cohesion, rock and rubble, flooding the valleys and annihilating the results of man's industry. Population and cultivation have disappeared in places. Comparing the records of the fifteenth and eighteenth centuries, one authority holds that in four centuries Haute Provence had lost half its cultivable soil, and fully justified the reproach of being "without land and without inhabitants." The necessity of rewooding the denuded slopes is so apparent that strenuous efforts are already being made under Government control, and competent authorities predict with confidence their ultimate success.

Forests are better than dykes. We repeat that neglect of forest conservancy is to prepare the way for an irregular and uncontrollable water supply. A Provincial engineer at the close of the last century ascribed the formation of torrents to two causes, disafforestation and clearings, producing seven different disasters; to wit, (1) destruction of the forests; (2) annihilation of the growth of the herbage which covers the mountains (3) ruin of the estates on the banks of the rivers; (4) damage to the navigation of rivers through that alteration of channel and contour which results from strong floods; (5) law suits arising between landowners on opposite shores through the alteration of the rivers; (6) the bars which are formed at river mouths, and are a serious obstacle to navigation; (7) diminution of the springs which feed streams and rivers in their natural condition. On his part Mr. Surell propounds these four theorems from his own observation.

1.—The presence of a forest prevents the formation of torrents.
2.—Disafforestation renders the soil a prey to torrents.
3.—The development of forests tends to the extinction of torrents.
4.—The decay of forests imparts a new violence to torrents and perhaps causes them to be renewed.

Meanwhile private effort can come largely to the aid of the State. It should always be borne in mind—if we may be allowed to re-state a truism—that he who makes two blades of grass grow where one grew before is a benefactor to his contemporaries; and that he who plants an acorn may, by that act, have sown the seed of a fortune for his descendants.—*Japan weekly Mail.*

GARDEN.

KEEPING CAMELLIAS CLEAN.—The importance of keeping the foliage of camellias clean cannot be over-estimated. To have the leaves coated with smut or scale or any other insect, is simply to mar the beauty of the plants as well as to lead to disappointment in the production of the flowers. The plant should be gone over at the present time, if dirty, with a sponge or brush with soap and water, cleaning every leaf, beginning with those at the top of the plant and cleaning downwards. If they are dried afterwards with a sponge or dry cloth they will present a lustrous appearance that is both beautiful and healthful.

AZALEAS.—These should be looked over carefully just now see that they are also thoroughly clean. If they are infested with thrips, which they often are immediately after being housed for the winter, let them be attended to at once, or the result will be bare, leafless plants by and by, and a poor display of flowers. Fumigation with tobacco smoke is the best cure for thrips, which are the most common enemy of the azalea. The process should be repeated every alternate night till the insects are all killed, and each morning after fumigation they should be well syringed, letting the water be directed to the under sides of the leaves mainly. If red spider should also be present, let some tobacco water, soft soap, and, sulphur, be mixed with the water for syringing every time it is used.

SINGLE-FLOWERED DAHLIAS.—These undoubtedly beautiful flowers are attracting much attention from flowear. They are lighter and more elegant than the older varieties, and they have, in some instances at least greater brilliancy and purity of colour than those. They can be reared and propagated by seed, and be flowered the same season, which is a great gain, thus doing away with the troublesome process of propagation by means of cuttings. If the seeds are sown in February they will flower freely in the following July August, September, and October. The seeds must be sown in brisk heat, and the plants be encouraged to progress without checks from any cause. As soon as they are large enough to handle, let them be pricked of from the seed pan or pot into small pots of say, 2 inches diameter. When they have established themselves in these—and they ou ht, not at this or any stage prior to planting out be allowed to become pot bound—give them a shift into a large sized pot. From first to last they must have the most liberal culture, and they are most worthy of it. We know nothing more satisfactory for cutting or for general decoration than these among plants capable of being cultivated in the open air in summer time. The following is a selection of the best in culture at the present time:—

Coccinea, brilliant scarlet.
Paragon, deep maroon, margined purple.

White queen, pure white.
Yellow queen, fine bright yellow.
Vivid, intense scarlet.
Cervantesi, bright yellow.
Yellow beauty, golden yellow.
Gracilis, scarlet.

VALLOTA PURPUREA.

THIS is without exception one of the most beautiful of autumn or early winter flowering bulbs, and withal one of the most easy to cultivate. How purpurea happens to be applied to it as a specific name, we can form no idea, except, indeed, it be because the colour of the flowers is not purple, but good brilliant scarlet, with the least possible dash of purple in its composition. This would only be one amongst many of the examples of misleading inaccuracy in the use of botanical names which perplex the uninitiated public when they turn their attention to a science whose many attractions are mared by the repelling array of technical terms with which its professors load it. But all their efforts in this way cannot obscure the sparkling beauty of such a plant as the present subject. Yet it is not so well known in ordinary gardens as it might be expected, from its great beauty and easy culture, to be. It is, in common with many of our most beautiful bulbous plants, a native of the Cape of Good Hope, and a member of the well-known and beautiful group of amaryllids. The snowdrop and snowflake, the daffodil and other narcissus, are comparatively humble, yet very beautiful members of the same family, which will serve to illustrate the character of these vallotas and other amaryllidis, but fail to give any idea of their sparkling beauty and the noble form and size of their flowers.

Vallota may be grown in any size of pot, from four and a half inches upwards. In pots so small as those named, only one bulb can be grown successfully, and such pots are only resorted to by growers for market in large towns, and in large private gardens for special purposes of decoration. In larger pots a greater number of roots may be grown, the matter of five in a six-inch pot, and so on, increasing in number as the size is increased. The roots should be potted when growth commences, but they do not require potting every year, although they will be the better for being top-dressed every year. If, however, the drainage is kept in good order, they should not be disturbed by being shaken out every year. The offsets from the bulbs increase very rapidly, and tend to rob the flowering bulbs of their strength by overcrowding the pot, and depreciating the quality of the soil at the same time. They are very generally left in this state, struggling for existence too long; and too often excellent stock is lost entirely, or it becomes so debilitated that it requires years to bring them back to vigour. When they are potted they should be placed in a warm greenhouse or cool stove to make their growth, keeping them close to the light, and taking care not to over-water them till they have taken possession of the soil. After they have completed their growth, they should be placed in a cool house throughout the summer, still giving them the fullest exposure to the light, and supplying them with liquid manure twice a week. It is the custom of many to dry them off, which, however, is an error. We question very much whether any bulbous plant should be dried off at any time, but have no doubt whatever as to the unwisdom of drying off vallotas. They should be watered as carefully during their rest period as at any other time. The soil they succeed best in is a good loam of a strong character, approaching to clay; some bone meal added to this is the only addition in the shape of manure which they require; the quantity should not exceed the full of a seven-inch pot to about a bushel of loam. As the supply of water should be very ample, the drainage must be ample also.

ORANGE CULTURE IN SYRIA.

AN official report states that the two districts in which oranges are the most plentiful are those of Jaffa and Sidon. The trade began to assume considerable proportions some forty years ago, when the new Government of Egypt took shape, and is now one of the most profitable industries in the two towns above mentioned. At the present moment Jaffa possesses some 340 gardens, averaging from 2,000 to 2,500 trees in each. The crop of fruit from these may be put down at about 16,000,000. A garden costs from 40,000*l*. to 50,000*l*., and brings in 4,000*l*. to 5,000*l*. per annum. For several miles round Jaffa extends a fertile plain on which water is always to be found at a depth of 40ft. or 50ft. With capital and enterprise, much of this might be planted, and the orange trade doubled in a short time. The present system of irrigation is that of small wells, from which the water is drawn by mules, but experiments have proved that very little engineering skill would be required in order to turn the streams of the river Andjah, some four miles from the town, over the plain. The land near Jaffa would then be cheapened in proportion as the value of that freshly watered rose. At present unplanted land close to Jaffa able to support 2,000 trees is worth £30 to £120 an acre; out at two or three hours' distance it will fetch only 4*s*. to 5*s*. a deunum. The export is carried on chiefly by sailing boats for Egypt and Constantinople, and by steamers for Russia, Trieste and Marseilles Exportation in cases is a comparatively recent introduction, which has given considerable impulse to business with Europe. The orange gardens of Sidon are cultivated on the same principle as those of Jaffa. An acre of land at Sidon is generally valued at from £240 to £280, and is capable of bringing in an income of about £24. The exportation begins in September, and is at first almost exclusively directed to Russia till the winter closes the Black Sea ports, when it is continued to Trieste and Egypt, European cargoes are packed in paper and close cases, the rest are sent in open crates. Each case contains some 300 oranges or lemons, and last years export is reckoned at 20,000 cases, all of which fetched very high prices especially lemons in Russia. The average prices are for 1,000 lemons 150 to 170 piastres, while, for 1,250 oranges reckoned as a trade 1,000, the cultivator receives 70 to 80 piastres.

ON PLANTING ROSES.

MUCH has been written on the cultivation of the rose, and various, not to say contradictory, have been the opinions expressed as to the requirements of the queen of flowers. With some, the soil is the all-important element of success; while others hold that climate is of higher importance. Again, the time of planting and the time and the mode of pruning are by certain successful growers considered more essential to success than is generally believed. It must be conceded that every one of the conditions that rose growers hold important to the successful culture of their favourite flower, must be observed in the general sense. No plant responds more gratefully to an intelligent application of its cultural necessities. But few plants, commonly cultivated, have had a larger number of nostrums proposed for it, especially in regard to soil without necessity. And while it may be granted that a free interpretation of the requirements of the rose as conceived of by some is admissible, it must also be stated that a great deal too much has been made of the difficulties which attend rose culture in certain exceptional circumstances. If the soil is too heavy it will not do; whereas it is well known that some of the finest roses ever produced in this country have been from plants growing in some of the densest yellow clay thoroughly drained and richly manured. Given good drainage, and we believe clay or strong loam to be the favourite soil of the rose, especially so in the southern and warmer parts of our islands. In the north it may be feared that the strong growth induced by such soil would not ripen well, and in that case could not flower well or freely, so that a lighter or more sandy soil would be the best in cold, late districts, and where the winters are severe. But in regard to soil, the simple points to remember are to have it thoroughly drained and well enriched with good holding manure, such as cow or stable dung. Manure is of more consequence than the mechanical condition of the soil; but the lighter and more sandy this is the more manure will be necessary. Extremes should also be avoided if possible, very sandy and very retentive clays being equally unfavourable; but as roses must be grown everywhere, the best must be made of each case as it occurs. In the clay endeavour to disintegrate its adhesiveness by mixing with it sand, old lime rubbish, charcoal, or any other mechanical corrective in such proportion as may be wanted to effect the purpose in view. Sandy soil would want to be treated in the opposite way; clay or heavy loam should be added to it to give it better holding power.

Planting should be done in the autumn, as early as the growth is ripened sufficiently to prevent shrivelling of the bark. It is very usual to wait till the leaves have all fallen; but it is unnecessary to do so provided they are all ripened, that is, not soft and recently formed. The ground ought to be thoroughly worked by trenching, and the manure put in and well mixed some time previously. Cut away all bruised and broken branches and all bruised roots before planting, so that there may be nothing to do to the plants after they are planted calculated to disturb or loosen them in their new position. Standards, and even dwarf sorts, should be staked as soon as planting is completed, to prevent their being shaken by the wind. Pruning should not be done till spring. Finish up by giving a good mulching of manure, not too much reduced, 3 or 4 inches thick. Standard roses, owing to the fatal effects of last winter's severity on the stock in the hands of nurserymen, will be very expensive, a dozen plants costing little less than a hundred would do in ordinary years. The chances are that very few, indeed, will be planted. Dwarf roses also, from the same cause, will be somewhat dearer than usual—*N. B. Agriculturist*.

HERBACEOUS CALCEOLARIAS.

A CORRESPONDENT of the *Gardeners' Chronicle* has sent to that journal the appended brief, but very practically-useful cultural directions, which may prove of value also to our readers:—

Of all soft-wooded greenhouse plants none are more showy and useful than herbaceous calceolarias, which have been so much improved of late years that the flowers have not only increased in size, but are very remarkable for their rich colouring which, among the best strains, is as varied as it is beautiful, and although a large collection may be grown it is very rare that two plants among the whole will be found to yield flowers alike. This great diversity adds much to their value, and renders them doubly interesting, as one never tires of looking them over and examining their peculiar markings, which take so many forms and shapes and are so fantastic in character as to attract the eye of the most casual observer. Were it not for the difficulty many experience in raising the plants, no doubt herbaceous calceolarias would be much more grown than they are, and it is with a view of assisting those that have failed with them that I am about to pen a few remarks on the best way of making a start, as it is the seed-sowing and the attention for a short time after that required the principal skill. One of the chief things towards securing success is the preparation of the soil, and the fillings of the pan or pot in which the seed is to be sown, which should first of all be well drained with crocks and over these some moss placed to keep them free and open, when the final filling may be carried out and the surface of the soil made perfectly smooth and firm. The next thing is to water the soil through a fine-rose pot, when after having stood to drain for a few hours, all will be ready for sowing the seed. This should be done by opening the packet at one end, and gently shaking it so as to make the distribution regular and equal, that the young plants, when they come up, may all have room to grow whithout any crowding. To get the seed to germinate is the next consideration, and the best situation to induce it to do this is a damp, shady part of a cool-house or border close under a north (south in this country) wall, where the pan or pot should be placed under the protection of a hand-light and kept close, and covered with a sheet of paper for a few days, as the great point is to prevent the drying of the soil, for the seed being exceedingly fine, it does not do to water, for unless great care be taken the seed becomes washed away and lost. To save the necessity for watering at all till the seed germinates, many cover the pot or pan in which it is sown with damp moss, which is a good plan, the only danger being that of leaving it on too long, and thereby causing the plants to be drawn. When moss is not used, and it becomes needful to water, the safest way to apply it is to sprinkle by means of a syringe, so as to pass it on as fine as dew; and if this is done daily when the young plants are up their progess will be most rapid. In the raising of herbaceous calceolarias it should be borne in mind that slugs are exceedingly fond of them, and seem to scent them from afar which being the case it is always advisable to take the precautionary measures to keep them at bay, for should they get at them in the small stage they would eat them all up in a night. To prevent this a good way is to stand the pot containing the young plants on a brick in a shallow pan of water, which will not only keep off the slugs, but maintain a genial moist atmosphere around them, a condition of the air highly conductive to the health of the plants. As soon as these are large enough to handle it will be time to prick them out or pot them off singly which should be done in light rich soil, taking care when doing it not to bruise the leaves which are exceedingly tender. When pricked out or potted they will at once require water to settle the soil about them, and the best place to stand them to give them a start is a nice shaded cold frame, where they can be kept a little close and sprinkled with water every afternoon, just before shutting them up. If all goes well they will be ready for repotting in a few weeks, when they may have their final shift, and may then be gently grown on during the winter, at which season they will require the protection of a

house or pit, where they can have a temperature ranging between 60deg. and 50deg., as in a less degree of heat they seldom do well. Besides slugs, greenfly are very partial to calceolarias, but as their foliage is of an exceedingly delicate nature, great caution is requisite in fumigating, which, to be safe, must be done lightly with tobacco, as paper is more dangerous to use.

TEA.

IT is satisfactory to find that the market for Indian tea keeps firm, and, as far as we can judge, there are no signs of the market giving way. The deliveries continue good, and dealers report active inquiries from the country, many firms who have hitherto sold China asking to be supplied with Indian in order to *suit the requirements of their customers.* The small quantity of tea afloat stimulates buyers, and the tendency, as we write, is towards a further advance. We hear that large quantities of fine and finest teas are being kept back in some quarters, in the belief that better prices are sure to be obtainable in a week or two.

No cultivated plant seems to grow so well and readily in Ceylon as tea, and there cannot be the slightest doubt that when Ceylon tea planters have attained the requisite skill in the manufacture of it, they will be able to compete successfully with Indian teas. We have great advantages over Indian tea districts in climate, labour, and means of transport, and we shall be able to put our tea on board ship at a lower cost than it is possible for them to do it. What we require is to give increased attention to "manufacture," and be able to turn out really good teas, and then without doubt tea cultivation will be one of the best investments in the island.

TEA stocks in London are lighter now than they have been for some time, regard being had to the increased consumption. The following are the stocks on 31st October for the past four years :—

	Stocks lbs.	Average monthly consumption, lbs.	Month's supply on hand.
1878	10,462,500	30 90,000	3·58
1879	13,300,000	2,950,000	4·51
1880	17 000,000	3,370,000	5·04
1881	13,200,000	4 100,000	3·22

It will be seen that the increase in consumption has been steady for the past two years, and there seems every prospect of its being permanent. This, with the supplies now going to Australia, should help materially to keep prices up.

THE *Pall Mall Gazette* notes that Indian joint stock tea companies have lately been raising their heads : "Their shares are in some cases far above par, and in others at a heavy discount. The recent history of the tea trade certainly accounts pretty well for the rise in the shares, for it is plain that Indian tea has of late gone into consumption at a rapidly increasing pace. Ten years ago our consumption of Indian tea was but an eighth part of that of the Chinese product ; this year it is equal to half the consumption of Chinese tea. The cause of this tendency, as alleged by correspondents of the *Statist*, is the throwing of rubbishy Chinese tea upon our markets. A few years ago there was a great rise in the tea market ; exporters in China swept up all the siftings, second dryings, and inferior stuff which they could lay hands upon in order to take advantage of the rise, and at the same time the growths of the Indian plantations were extended. Somewhat curiously, the latter did not favour us with rubbish, for of all the officially 'condemned' samples last year none was of Indian tea. Apparently there is no gainsaying these evidences of the increased hold which the Indian article is obtaining in the market."

IT is a cheering fact that, notwithstanding the steadily increasing exports of Indian tea to Europe, the prices keep high and much firmer than they were last year. Up till last year supplies were in excess of demand, and prices naturally kept low. This year commenced with a materially increased consumption, which has averaged a little over four million pounds per month, while the imports did not increase in the same ratio, having been under four million pounds per month. The result has been a decrease in stocks to the extent of between two and three million pounds during the past ten months. On the other hand China imports have decreased as follows, the calculation being in lbs. for twelve months ending 30th September :—

1878	143,000,000
1879	123,000,000
1880	123,000,000
1881	111,000,000

In spite of this falling off, prices have fallen very materially. In 1878 common Congou—of which the bulk of China teas consist—was quoted at an average price of 9*d*. per lb ; now, the same quality is worth only 6½*d*. It follows therefore that, while in the face of an increasing supply of Indian tea, prices have risen about two pence per pound, in spite of a decreasing supply of China tea, prices have fallen two-and-a-half pence per pound. The only conclusion to be drawn from this state of affairs is, that Indian tea is becoming popular, and its virtues are better known now than formerly.

IT is instructive to note the effect which the introduction of Indian tea has had in the consumption of green tea in England. In 1836 the total quantity of green tea used in the United Kingdom was 8,857,000lbs., out of a total of 42,807,000lbs. By the year 1848 the figures had grown to 10,053,000lbs., out of 52,231,000lbs. ; and in 1865—the largest quantity consumed in any one year—no less that 19,550,000lbs. of tea of that description were used, out of a total import of 112,450,000lbs. From the year 1865, however, green tea has lost its place in public estimation. By 1875 it had fallen to ten million pounds, out of a total of 164,000,000lbs. ; and in 1880, out of a total importation of 204,198,000lbs. of tea, only 6,165,000lbs. were of the green variety, a result on which the public is to be congratulated, for we are convinced that the use of green tea is injurious to the consumer.

It is, as will be seen, since the introduction of Indian tea, that the use of green tea has been gradually discontinued, and, in lieu of holding the position it held in 1836, at which time nearly a quarter of the total quantity consumed—a pound in every four pounds drunk—was green tea, it now counts only as one pound in 34lbs.

It is well known that green tea is the result of the preparation of the leaf with mineral powders and other substances that are detrimental to health, so it is encouraging to think that by using Indian teas the health of the community is likely to be benefitted. We are inclined to think that on the Continent, where very little tea is drunk comparatively, owing probably to the dissatisfaction that is felt with the ordinary China variety, good teas of Indian growth would find appreciation, and lead to a steady demand for them if they were properly introduced under the auspices of a syndicate.

INDIAN tea and the companies engaged in the cultivation of the leaf are now attracting the attention of financial journalists in England, and we may look to see the professional speculator shortly entering the field. Referring to the rise in the Indian tea companies' shares which are quoted in this market, a financial writer in the *Pall Mall Gazette* says the recent history of the tea trade certainly accounts for it all, for it is plain that Indian tea has lately gone into consumption at a rapidly increasing pace. Ten years ago our consumption of Indian tea was but an eighth part of that of the Chinese product ; this year it is equal to half the consumption of Chinese tea. The cause of this tendency is the throwing of rubbish y Chinese tea upon our markets. A few years ago there was a great rise in the tea market ; exporters in China swept up all the siftings, second dryings, and inferior stuff which they could lay hands upon in order to take advantage of the rise, and at the same time the growths of the Indian plantations were extended. Somewhat curiously, the latter did not favour us with rubbish, for of all the officially "condemned" samples last year none was of Indian tea. Apparently there is no gainsaying these evidences of the increased hold which the Indian article is obtaining in the market. The *Pall Mall* writer says that the great question, at least for the growers, is whether this stronger position can be maintained. It is calculated that at present prices, at least one joint-stock company in India can get nearly 50 per cent. profit on the average cost per lb., so that we may look for an increase in the growth of Assam teas. On the other hand, the Chinese producer is permanently handicapped by authorised taxes, and by unauthorised exactions of internal small potentates. The rest remains with the season, with the competition among Indian growers, and perhaps also, to a large extent, with the prospects of better railway accommodation between Assam and the shipping ports.

As we have sometimes predicted, the attempt to cultivate tea in the United States of America has proved a failure. The following is from an American trade journal :—

"The yearning after fresh agricultural and commercial conquests is a characteristic of the enterprising Americans. Some of them want to grow tea, and if the experiment should prove that every pound of tea grown costs twice as much as each pound imported, the Commissioner of Agriculture seems determined to grow it. The project, in the opinion of most practical men, is a failure already, but according to the *American Grocer*, land has been leased for twenty years, to be used as an experimental tea farm. It is situated at Summerville, S.C., twenty two miles north-west of Charleston on the line of railway running from Charleston to Augusta. Lands were first examined in Florida in the vicinity of Jacksonville and along the St. John's River as far as Palatka. The Commissioner is firm in the belief that tea culture can be made a profitable industry in the United States. There would be a better chance for success were the enterprise not dependent upon the whims of Congress, the paper referred to says."

The *American Grocer* is in error in saying that it is the connection with Congress that has ruined the scheme ; it may have precipitated the failure, but where the elements of success were wanting, failure was only a question of time. The principal, perhaps the only, element necessary to secure success, which was wanting, was climate, and when the necessary climate was wanting, nothing else could make up for the deficiency. We never doubted that the plant would grow ; it will grow in any moderately temperate climate, but without a certain amount of moisture and heat, coupled with plentiful rainfall, it will not give a yield sufficient to make the cultiva-

tion of the plant a success from a commercial and financial point of view, and we are greatly mistaken in our trans-Atlantic friends if they will continue to cultivate the plant unless it pays.

CHINA TEA TO AUSTRALIA.

A LARGE meeting of tea importers, merchants, and dealers was held October 22nd at the Melbourne Exchange. The Hon. J. Lorimer, M.L.C., presided, and about 150 gentlemen were present.

The Chairman said that the meeting had been called in consequence of the misrepresentations which had recently been made with regard to China teas. It was thought the time had come when it was necessary to give some public contradiction to those misrepresentations, and more particularly to expose the tactics that had been resorted to in making those misrepresentations. He was sure that those interested in the China tea trade would have no objection to those who were interested in promoting the introduction of Indian teas into this market, if they had confined themselves to expatiating upon the alleged superior qualities of those teas; but all must agree that it was certainly not fair and a very un-English thing to seek to damage and detract from the quality of other teas. The meeting had been called to counteract the bad effects which those alleged misrepresentations were calculated to produce. He believed that information would be laid before the public at that meeting which would enlighten them on the subject, and remove a great deal of the ignorance and prejudice which was said to exist. A gentleman with considerable personal experience of the China tea trade was expected to be present, but he had been compelled to leave town to fulfil another engagement. He had, however, sent the following letter:—

"Melbourne, 22nd October, 1881.

"To the Chairman of the Meeting of Tea Merchants.

"Sir,—I regret that my departure from the colony will prevent my attending the meeting advertised for to-day, but I desire none the less to add my evidence to that which will be given at the meeting in contradiction to the supposed shipment of adulterated or spurious teas from Foo-chow.

"After an experience of 16 years in China, I can safely say that so far as I know, there is no spurious or adulterated tea shipped from Foo-chow to the colonies. That a portion of the tea shipped have been once infused, and then refired is, to my mind, as ridiculous a charge as that above contradicted. All who know the manner in which the teas are gathered and packed in the country brought to Foo-chow, and subjected to the inspection of every tea-taster in the place, will confirm what I say. The succeeding crops, or pickings from the same shrub during the same season, differ in strength and flavour. That first crops of successive years also differ among themselves in these particulars, no one conversant with the subject will attempt to deny, but that the severe competition existing in Foo-chow should permit infused leaf to be shipped is to say that in Foo-chow itself tea is not understood. That it is easy to gather the refuse of ten thousand teapots, refire, manipulate it, then run the risk of a sale to the ignorant tea-taster, is in effect the charge made against the Chinese tea merchant, and to do this he must first educate the country people to drink congou, for at present they consume principally other kinds.—I remain, &c.,

"JOHN M. FORBES, Junior.

"Of Messrs. Russell and Co., China."

The promoters of the meeting wanted as much light thrown upon the subject as possible, because one of the worst features of the alleged misrepresentation was the fact that it arose from people whose names did not appear to be known. It was hoped that those detractors of China tea would emerge from their hiding places at that meeting, so that the public might know exactly who they were.

Mr. T. J. Nankivell proposed the following resolution:—

"That this meeting views with indignation the unscrupulous tactics of some unknown persons, designating themselves 'The Calcutta Tea Association,' in attempting to prejudice the public against the use of China tea."

He objected to any person interested in the sale of Indian teas trying to increase their sales by running down the importations from China. If the Indian teas were superior in flavour, or more wholesome—which he for one denied—they would find their way into this market without sensational paragraphs or means of that sort.

Mr. J. Everard seconded the resolution. It might be asked, he said, "Has any adulterated tea come into this place?" Some 16 or 17 years ago a large quantity of tea was shipped to Melbourne, the bulk of which was very poor stuff. The bulk of it was, however, sent to New Zealand, and balance of it to England. In the latter place there was a great demand for tea, the licensed victuallers selling it in packets as against the grocers, and large quantities of this poor stuff was bought up for the purpose. (Laughter.) During recent years, however, the tea which had been imported into this colony had been remarkably free from adulteration. Such a thing as adulteration in Foo-chow tea was unknown. With the exception of gunpowder tea he could distinctly say that not a quarter per cent. of the whole of the imports this season had been adulterated or unfit for use. In Foo-chow they had four pickings of the leaf. The first was generally exceedingly good, in fact the finest tea. The second picking was nearly as good, and the third nearly equal to the other two; but the fourth was only picked when there was a great demand for teas of a low quality. The scientific gentlemen who had professed to make an analysis of teas made a great mistake when they spoke about exhausted tea. They forgot that the leaves which formed the third or fourth pickings had been left upon the trees during the whole of the summer, and the rain and other climatic effects necessarily deprived them of some of their strength. Then, there was the question of coming up to the standard, but who could say what the standard of teas should be? He (Mr. Everard) had this season tried all the teas which had been imported, even the lowest classes of teas, and not one had been adulterated. Some had had a larger proportion of stalk, which made the tea weaker, but there had not been the slightest trace of adulteration. Some of the teas which had arrived this season had been sold at such remarkably low prices that some people ran away with the impression that they must be adulterated. This, however, was a great mistake. Mr. Everard concluded his remarks by producing several samples of teas in bottles, declaring that the clearer appearance of the China teas was due to their more perfect preparation.

Mr. Bowman, M.L.A., protested against Mr. Everard setting up his opinion against the scientists of the world—against Messrs. Cosmo Newbery and Dunn. (Groans.) Indian tea had been spoken against, but it was a remarkable fact that their sale was increasing in the English market, whereas China teas were decreasing to a proportionate extent. The meeting, he thought, instead of denouncing any particular tea, should have shown a desire to help the Government in bringing in a bill to prevent the importation of adulterated tea. At a sale at Messrs. Fraser and Co.'s the other day he was challenged with having said in Parliament that two-thirds of the tea which came from China was adulterated. He had since procured a proof of his speech from the *Hansard* reporters, and he found, as he stated at the sale, that he qualified his remarks with the words "the lower classes of China teas." He was prepared to challenge any tea merchant *for £500 to disprove one word* which appeared in the *Tea News* about the China teas. If they accepted the challenge, and disproved what had appeared in the *Tea News*, he would send the £500 to the Hospital Fund.

The resolution was then carried unanimously.

Mr. J. Jackson proposed the next resolution, which was—

"That in the opinion of this meeting, the ordinary importations of tea from Foo-chow are genuine and unadulterated, and the comparisons by analysis of India and China tea which have lately been published are calculated to create in the public mind erroneous impressions regarding the purity and wholesomeness of Foo-chow teas."

From his experience in the tea trade, he believed it would take a great deal to upset the established interest in China teas in this colony. The merchants of Melbourne had shown great enterprise in securing genuine teas, and the comparison of the analyses which had been made was no fair test of the quality of various descriptions of teas.

Mr. A. Harvey seconded the motion, and said that adulteration had never been practised with Shanghai or Hankow teas, and seldom in Foo-chow. Anyone conversant with our imports knew that at the present time the total import of adulterated teas (that was low gunpowder and low Tayshan congous) was infinitesimal as compared with the balance. No analyst could tell so well as the professional taster whether a tea was soundly cured, sweet or flavoury. A coarse, rank earthy tea would give a splendid analysis extract, but it would be very unpleasant to drink. Analysis was therefore no guide in determining which tea was pleasant to consume and which not.

Mr. Bowman explained that Messrs. Cosmo Newbery and Dunn have made their analyses from 27 samples of tea purchased at random at various establishments in Melbourne, and he agreed with them that the China teas were adulterated.

Mr. A. Harper thoroughly approved of the resolution, but as they as merchants were interested in the sale of both China and Indian teas, he thought it would have been better for the meeting to have confined itself to explaining away the misrepresentations which had been made, and to assisting the Government in passing a bill to prevent the importation of adulterated tea.

The resolution was carried.

Mr. J. Webster then moved—

"That the public statements made by persons engaged in the Indian tea trade, to the effect that a pure China tea is now difficult to obtain, is a gross and scandalous misrepresentation of facts."

This was seconded by Mr. J. Whiting, and agreed to, Mr. Bowman being the only dissentient.

Mr. M. England next proposed—

"That it is desirable that a bill to regulate the importation of tea be passed as soon as possible, and that Messrs. Nankivell, Harper, Everard, Whiting, and Jackson be appointed a committee to watch the bill now before Parliament, and to assist its promoters in making it workable and efficient."

Mr. Bowman seconded this resolution, which was carried *nem con.*

A vote of thanks to the chairman concluded the proceedings.—*Argus.*

MATHEINE.

WHAT is Matheine? It will not be sufficient reply to this question to merely state that it is a new drink, which, in the future, must take equal, and in some respects, even higher rank than tea, coffee, chocolate, and the other well-known domestic beverages that stimulate but not imbriate" the imbiber. It is, in fact, so important an addition to our social resources that we feel it to be a duty to make a more particular record of its characteristic merits. To some of our readers Matheine will present itself as an old friend in another guise; for it is the product of a process discovered by Mr. A. K. Mackinnon (who in connection with the Kopf Company has introduced so many new and excellent food preparations) from the dried leaves of the Ilex Paraguyensis with which South American communities are so familiar under the name of "yerba maté." In the *Revue Scientifique* and other journals of Europe, public attention has been directed to the special advantages of this South American drink. It has been represented and truly represented, as possessing all the cheering and refreshing properties of tea and coffee, without producing any of the unpleasant effect, upon the nerves too frequently attendant of an over liberal use of these popular beverages. But the mode in which it is used is so opposed to established custom in our own and other countries of Europe that journalistic advocacy must have failed to bring it into general consumption on this side of the Atlantic. The common practice in Brazil and the River Plate, where it is extensively used, is to pour boiling water on some of the powder (consisting of dried leaves and twigs of the yerba maté shrub), and then to suck the infusion through a tube, which is passed from mouth to mouth, as the "calumet of peace" under certain circumstances is said to have passed round a circle of North American Indians. This difficulty has, however, been altogether removed by Mr. Mackinon. Matheine, which is in a liquid form, can be utilized with the greatest facility while it may be fairly described as a boon to the weakly and infirm, and of the utmost service to hardworking people in every grade of society. Professor Wanklyn gives the following analysis of this substance; Moisture, 6.72;

ash 5·86; soluble organic matter 25·10, insoluable organic matter 62·82. Another analytical chemist Signor Parodi, now resident in Buenos Ayres, gives a qualitative analysis, viz., Cafetannate of Theine, Cafetannic acid (free). Chlorophyl and Wax, Resin, Gum and Vegetable Albumen, Lignine, and the ashes contain salts of Potash and Lime, Oxide of Iron and Manganese and of Silica. Another analysis demonstrates the presence of Theobromine, which is the active principle in cocoa. However, we are bound to say that, up to the present no satisfactory analysis has been made. We take the following as to its properties, from an announcement of the Kopf Company:—

We know that the infusion of this interesting shrub possesses the properties of tea, coffee, and cocoa. It is sedative and stimulant; prevents the waste of tissues; increases the activity of the brain, and hence is invaluable to brain workers; causes the secretion of milk, and, therefore, of great value to nursing mothers; this which shows its nutritive power is amply exemplified in the fact that the gauchos (native horsemen) undertake long journeys on horseback, at times as much as 60 and 80 miles in a day, with no other aliment but three or four maté cups of their favourite infusion.

To military men this substance would be invaluable, as it would enable them to undertake fatiguing marches better than any other beverage known. Sportsman, angler, and traveller would alike benefit by its use in lieu of strong alcoholic beverages.

To South Americans, not less than Europeans, Matheine should prove exceedingly acceptable. The yerba maté infusion, as actually taken by the former, namely by suction through a tube with a perforated bulb, is liable to serious objection, as the finer particles are swallowed, and in process of time accumulating form irritating concretions in the stomach to the serious injury of the health of the individual. In its liquid form this is altogether avoided. We should add that the proportion is one to two teaspoonfulls to an average sized tea cup of boiling water, with milk and sugar to taste.—*Brazil and River Plate Mail.*

COFFEE.

From a pamphlet on Liberian Coffee in Sumatra, we gather that this variety yields 92 per cent. of caffein, as compared with 56 per cent. obtained in ordinary Java coffee.

From a return recently submitted to Government, we gather that in Cochin about 7,794 acres have been taken up for coffee, of which only 1,436 have been planted in Travancore; the extent of land planted with mature and immature plants is 16,775 acres against 37,067 taken up. For the entire presidency, the figures are as follows: mature plants, 78,822 acres; immature plants, 13,463 acres; not planted out, 83,925 acres; total taken up for coffee, 176,210 acres; approximate yield of coffee, 21,492,682 lbs. The Travancore estates give an average of 175lbs. of coffee per acre of mature plants against 323lbs. in Cochin, and 197lbs. in the Wynaad.

Coffee-leaf disease has unfortunately not only continued to spread in the plantations at the westward end of the island of Java, but has also appeared in several gardens in Central Java. The report of a Commission appointed by Government to investigate the origin of the disease tends to show that it is mostly met with on poor or worked-out grounds, and that the succession of wet seasons has greatly contributed to the spread of the contagion; it is, however, hopped that a recurrence of dry years will cause a marked decrease in the percentage of trees attacked. The presence of the disease may be detected in two ways, either by the appearance of light green spots on the upper side of the leaf, or by the presence on the under side of a collection of an orange-coloured kind of dust. In plants severely attacked, the leaves turn black or brown, and rapidly fall off.

"The Commission, appointed by the Netherlands Government to investigate the coffee leaf disease in Java, has reported the result of its enquiries. These are said to establish the following conclusions as to the causes of the disease—Poverty of soil either naturally or by being worked out; abnormal degree of continuous wet weather. In Java the disease is detected in two ways—the appearance of light green spots on the upper side of the leaf, or the presence underneath of an orange colored kind of dust. Severe attacks are known by the leaf turning black or brown, and rapidly falling off.

"The Commission recommend as a mode of suppression the following simple measures:—

"1. The hoeing up of the ground surrounding the trees beyond the spread of the branches to the depth of about 6 inches, leaving the clods turned up intact.

"2. The construction of ditches or holes about 18 inches deep between every intermediate row of plants, distributing the earth dug out proportionately over the garden.

"3. In irregular gardens, or wherever the construction of ditches is impossible, the formation of holes about 18 inches in diameter at an interval of every four trees, dispersing the turned-up earth among the plants.

"4. The careful manuring of the ground at the distance of about a foot from the stem of each tree, and covering the manure with earth.

"If these measures are really effective, the general immunity from disease of coffee plantations in this district, may be attributed to them, as the holes, or as they are called here renovation pits, are very generally adopted both as receptacles for manure and for the wash." That is to say, the mode suggested is to cultivate more liberally the very cure we have been suggesting all along, as the only one worthy of a moment's consideration.

NEW SUBSTITUTES FOR COFFEE.

(*Translated from the "Indische Mercuur."*)

In a German paper it is remarked that the leaves of the coffee tree are really better adapted for use than the coffee leaves themselves. They are specially rich in caffein and tannin. According to a chemical analysis of Professer Henhouse, the leaves of the Sumatra coffee contain 1·26 p. c. of caffein, besides tannin, but very little sugar and fat. The amount of soluble constituents is much greater in the coffee leaves than in the beans. As caffein and tannin are, by far the most important constituents of coffee, the use of coffee leaves as a substitute has much to recommend it. The leaves should be simply dried—as is the case with tea leaves, and could be brought into the market in this condition. The preparation of the dried leaves could be done in such a way that they could be roasted in the same manner as coffee, with the addition of about 10 p. c. of sugar, and coffee made from the ground powder by means of boiling water. A coffee sustitute, consisting of a mixture of roasted coffee leaves and roasted corn, can in a certain sense entirely take the place of coffee, as this mixture in consequence of its containing caffein and aromatic products of roasting, which owe their origin to the tannin, approaches very closely to the composition of true coffee, whilst in the ordinary substitutes for coffee no trace is to be found of these substances. The history of coffee substitutes is more than ordinarily interesting: the first attempt at the manufacture dates from the second half of last century. In the year 1790 there were already in Magdeburg coffee substitute manufactories, which prepared the chicory root. This industry extended to such an extent, that in 1840 there were already 41 coffee substitute manufactories with 2,500 workmen. What success has attended the manufacture of coffee substitutes in other countries may be judged from the fact that in France alone six million kilograms of chicory root are consumed, not to mention all the other materials from which coffee substitutes are manufactured to an equal extent. The continental theory of Napoleon I. gave a specially strong impetus to the manufacture of artificial coffee, as it did also to the manufacture of beetroot, sugar and soda. From the narrative of travellers we know that coffee substitutes are used by other nations also. In Arabia a kind of coffee is prepared from the roasted seeds of the so-called Durrah plant, and sold under the name of Sudan coffee. Several negro races prepare other seeds in like manner, and the Tunguses use even the seeds of a poisonous plant, viz., the henbane. In our August number (I. M. 1880) we spoke of several new European coffee substitutes, and we shall not therefore refer to these, except to say that they have none of the effects on the nervous system which true coffee produces. It therefore seemed not uninteresting to notice the use of roasted coffee leaves, as in these are found the substances (especially caffein) which exactly constitute the peculiarities and characteristics of coffee.

CINCHONA.

"The Government reserves the right to make Public Roads through the land to be granted without paying any compensation except for the value of Cinchona or other valuable trees actually destroyed in the course of the work."

This is one of the rules for the sale of waste land for Cinchona cultivation in Madras, and is so far liberal. It is just possible, however, that the amenity of an estate may be utterly destroyed by a public road.

Dr. Shortt writes to the Madras Horticultural Society from Yercaud:—"Cinchona hitherto on these hills has been simply an an experiment: one or more trees only were to be seen on a few estates. Of the different varieties, the *Cinchona Succirubra* thrive well here, and this variety is best suited to these hills. Efforts are now being made by a few planters to extend cinchona cultivation, and on my estate self-sown seeds of this variety were found growing in the vicinity of the parent plants, and the trees are so extremely prolific in their seed productions that I have been able to collect and distribute the seeds freely. The difficulty of getting the seeds to germinate is rather trying, as the process requires much care and attention, more especially without the aid of a propagating house. Of the cinchona trees on my estate one seems a hybrid, and on sending specimens of the flowers and leaves to Mr. Jamieson, the Superindent of the Government Gardens, Ootacamund, that gentleman recognized it as one which, he says, has been named Cinchona Lanosa. This plant also seeds very freely and largely."

SERICULTURE.

SILK-GROWING IN BURMA.

Rearing silkworms, though a very profitable occupation, is not looked upon with any favour in Burma. To get the silk the pupæ must be killed; and the taking of life of any sort is an impiety always looked upon with great horror by all rigid Buddhists. Silk-growers are classed together with professional hunters and fishermen. The four states of punishment yawn for them, and their portion will be in the lowest abyss of "Gna-yeh," the lowest hell. Still there are colonies of silk-growers in various parts of the country; but they live apart from the rest of the inhabitants, as a rule, and often have entire villages to themselves. Colonel Horace Browne, who paid some attention to the industry in his district, states that the cultivators near Prome, where more silk is produced than in any other part of Burma, are nearly all Yabehns—a race of the same stock as the Burmese, but despised by them independently of their crime in the way of taking animal life. They usually live on the hill-sides, occupying themselves, like the poorer Burmans and Karens, with toung-ya cultivation: that is to say, clearing the forest-lands on the mountain-slopes, burning the felled timber just before the rains, and then sowing the ground [thus enriched by the wood ashes] with rice, cotton, or oil-seed. The system is laborious and not viewed with much favour by the authorities; for the toung-ya soil, hardly exhausted by the single crop grown off it, immediately produces a dense forest growth of no use to anybody. Silk production is a much simpler matter, involving the least possible amount of toil and at the same time being very much more profitable. Moreover, the Burmese mulberry-bush, which is quite distinct from the

ordinary *Morus Indica*, does not grow well on alluvial soil. It flourishes, however, on the hill-sides, where the Yabehns mostly live. The silk obtained from caterpillars nourished on the leaves of the hill shrubs is very much better than that obtained from lowland mulberry-bushes. Thus it happens that the richer Burmans down in the alluvial plains have not the same temptation to impiety which confronts the Yabehns up in the hills; and the number of silk-growers is, for a similar reason, limited.

It is certain that neither the silkworm nor the mulberry-bush are indigenous in Burma; and, as Colonel Horace Browne points out, it is more probable that both were introduced from Western China, down the valley of the Irrawady, than that they came over the hills, through turbulent mountaineers, from India. The shrub does not grow much more than ten feet high, and seldom produces good succulent leaves for a longer period than three years. After that the plants are apt to get coarse and stringy, and the cultivators ordinarily abandon the plantation or root out the bushes and plant new ones. The shrub will not flower, and has therefore to be propagated by cuttings. The Burmans call it the poh-tsabin, "the tree the silkworms eat." There is another tree—that from the bark of which the Burmese get the coarse paper used for their parabeik, or note-books, the leaves of which the caterpillars will eat; but the silk thus obtained in much coarser, and recourse is therefore had to the ma-hleing-bin only when the mulberry-trees give out. In any case, however, the silk produced in Burma is of a very inferior kind. It is rough and coarse; but it is all the better suited for the strong loongyees and putsoes in use for ordinary every-day wear among the Burmese, the finer cloths all coming from China or Manchester.

The whole process of growing the silk is of the simplest possible character, and is exactly suited to the Burmese were it not for the necessity of killing the pupæ. Silk can, indeed, be spun from the cocoons out of which the moths have escaped; but it is very much coarser even than the ordinary silk and commands somewhat less than half the price. Except the occasional trouble of strolling out for a few leaves, there is almost nothing to be done; and the whole operations are carried on in the rickety bamboo hut of the cultivator, within a yard or two of the place where his food is cooked. The caterpillars do not seem to care a whit for the smoke or the dirt; and the pupæ are equally callous to the fumes of tobacco which circle about them constantly during the few days that remain to them before they are stewed. The female moths are placed upon pieces of coarse cloth with palm-leaf lids put over them. The eggs stick to the cloth and form a compact little circle. A day or two over a week suffices to produce the larvæ, and these are then thrown upon flat trays, made of strips of bamboo plaited closely together and guarded by a slightly raised edge. For four or five days the little caterpillars are fed on finely chopped mulberry-leaves, the tenderest that can be found. After that they change their skins, and, beyond getting plenty of leaves, do not receive much attention. They are sturdy creatures, and they would need to be, for they are often very roughly treated. The trays are scarcely ever cleaned, and if the larvæ are to be shifted from one tray to another, they are scraped up in handfuls and thrown down as if they were bits of wood. Gauze or mosquito-netting is usually thrown over the trays to keep away the ichneumon flies which otherwise deposit their eggs in the silkworm's skin, which of course kills him. In about a month's time the caterpillar is full grown. He is then bundled into a fresh tray; in which there lies wound about in the form of a spiral, a narrow plaited bamboo strip. The ripe larvæ are thrown into this with as little ceremony as if they were pebbles. In about a day's time they have spun their cocoons, fastening them to the slips of bamboo. These are torn off and kept in baskets for a day or two, when a pot, with water in it, is filled with the pupæ which are set to simmer over a slow wood fire. From a triangle over the pot is suspended a small bamboo reel, and down below near the pot is a wooden cylinder. The reeler is usually a girl. She fishes about after a time in the simmering pot, and, catching a few threads of silk, passes them over the reel and down to the cylinder, to which they are fastened. She then turns the handle of the cylinder, winding on the silk, and at the same time constantly fishing up and fastening on new filaments, which she does by means of a light bamboo double-pronged fork. Not the least trouble is taken to keep the silk clean. Any rubbish that may be floating on the surface of the water is wound on to the cylinder without an attempt being made to disengage it. When all the silk has been got off the cocoons and wound on to the cylinder, the pupæ are taken out of the water and fried in oil to furnish a dish for the family dinner. They are not by any means unpleasant—tasting, barring the oil, very much like roasted chestnuts; and indeed the dish is considered a great dainty.

The silk growers mostly sell their silk. A loom is to be found in almost every Burman's house in the country; and in Prome and Shway-Doung, as being close to the place where the silk is produced, great quantities of articles of dress are made for sale. The native-grown silk is only used for every-day clothes of simple patterns; the more elaborate being all worked from imported Chinese silk. The silk is bought raw, the separate filaments twisted into a thread by means of a wheel, and then made up into hanks. These are boiled in soap-and-water and are then ready for the dye. The commonest colours are green, yellow, orange, different shades of red and light blue; black and dark blue are only in favour with the Shans. The dyes are obtained from various jungle seeds, roots, flowers, leaves and barks; the yellow dye obtained from the wood of the Jack (*Artocorpus integrifolia*) being reserved for the monkish robes. After being dyed, the thread is unwound again. The weaving machine is very much like the old hand-loom still occasionally seen in out-of-the-way parts of England. The operators are almost always young women; and they are very clever at working the treadle and shooting through the shuttle, while talking all the time to village gossips or admiring swains. Some of the tamehns (the women's dresses) are extremely intricate in pattern, and require between twenty and thirty shuttles. The treaddle raises and lowers the alternate threads on the warp. Except the rough dresses and the most complicated in pattern, however, not many native-made clothes are worn now. The townspeople prefer the showy and cheaper imported articles, and, though the Manchester goods are too frequently adulterated and do not last long, yet this does not trouble the Burman much for he is fond of a change of dress, and, unless he is poor, will never wear a putsoe, except about his house, after it has been washed. All the more elaborate designs are, however, native-made. The "dogs' tooth" pattern is almost confined to Mandalay court looms. The achit putsoe or tamehn, of a wavy complicated design, which middle-aged Burmans remember as being the cherished object of desire of their young days, is now considered rustic. Young Rangoon will tell you that you always know a Tau-tha (a jungle Wallah) at the Pagoda feast by his wearing an achit putsoe; and although it may cost from 150 to 800 rupees, that does not redeem it in their eyes.

SHWAY YOE.

—*St. James's Gazette.*]

SILK-GROWING IN CEYLON.

WITH reference to Dr. Vanderstraaten's paper on the subject, we may call attention to the following extract from our "Review of Agriculture and Planting Enterprise in Ceylon," published in our Handbook for 1876-78:

"There is a spot on the banks of the Kelani river 3 or 4 miles above the Bridge of Boats *en route* to Hanwela 'Orte Saide' or Silk Garden where the Portuguese are believed to have fed silkworms. The Dutch unsuccessfully attempted to propagate the silkworm and produce silk at Jaffna. In the British period silk has been tried more than once, more particularly by a coffee planter (Mr. H C. Bury), in Haputale, on whose produce a favorable report was received by us a few years ago, from a Coventry firm, but the difficulty of securing careful skilled labour and the injurious effects of thunderstorms on the silkworms prevented the continuance of the experiment. Sir Wm. Gregory took a great interest in silk-growing, as in all other experiments with new products. In 1872 he reported that the mulberry tree grows quickly and vigorously in Ceylon, and the worms are reported to be hardy and to thrive well, but the difficulty was to find patient and skilled hands to wind the silk. Accordingly he recommended the dried cocoon to be sent to Europe to be spun, but the cost of female labour in England is another difficulty. Sir Wm. Gregory introduced and distributed Japanese silkworm eggs in Ceylon."

Dr. Vanderstraaten writes to us in reference to his paper:—"I was indebted to Mr. Alex. Geddes of Moratuwa for the floss silk exhibited. The white is from the Bombyx mori, a Chinese silkworm; the brown is from the Tussur silk moth (Antheroea Mylitta, or A. Paphia). Mr. Geddes finds that the Tussur moth cannot be domesticated. Mulberries are plentiful all over the island, and can be freely cultivated from cuttings; in two to three years each tree will supply 5lb. weight of leaves. As a new industry mulberries can be cultivated with tea. It is a profitable and interesting amusement for women and children. Every year about £1,500,000 is sent from Europe to China and Japan for eggs; principally from Italy where mulberries are plentiful. It is introduced into orphan schools, reformatories, prisons, leper and lunatic asylums: supplies of eggs can be sold to the general public. The early history of Ceylon from Valentyn in 1663 to Tennant has been consulted. In 1663 the Dutch cultivated it in Colombo and Jaffna. When the English came to Ceylon a garden of mulberries and buildings for the rearing of silkworms were found at Orte Saide (Portuguese for silk-garden) near the Bridge of Boats at Kelani. The silkworms exhibited at the Polytechnic Exhibition were from Father Palla's supply. It ought to be tried more largely now that the experiment has been successful as shown yesterday."

We are glad to learn that an experiment is being conducted so far with success in "silk-growing" in lower Dimpula, and we learn from another gentleman, who has taken considerable interest in the matter that though his experiment in Colombo was a failure, he his trying again with more chances of success, and is inclined to experiment with the very abundant "lettuce" (pisina alba) tree leaves instead of those of mulberry. If the silkworms thrive on the leaves of this plant, the industry ought to prosper in and around Colombo.—*Ceylon Observer.*

TOBACCO.

TOBACCO CULTURE IN AUSTRALIA.

MANUFACTURERS of Victorian-grown tobacco all admit that the best leaf grown in the colony is that from the North-Eastern district, the bulk of which is grown on the flats of the King and Ovens rivers, the aspect, soil, and climate of which appear to be more suitable to the growth of this crop than in any other locality in Victoria. At present there are about 500 acres of land on these rivers under tobacco culture, the principal growers being Messrs. Izzard, Smith, and Bowie. The plan which has been found to be the most successful is to let the land to parties of Chinese on shares in the crops, the owner of the land finding provisions for the workmen. Chinese cultivators have been found to possess more patience in growing tobacco, which requires constant attention, than any other class of labourers. The crop is a highly remunerative one when all goes well with it, but there are many difficulties to contend with. One of the worst of these is a grub, which attacks the roots, and which, unless removed speedily, destroys the plant. This necessitates constant and minute inspection of the crop, and for this work Chinese labourers are more suited than Europeans. The tobacco crop suffers from severe frosts, but it is believed that these may be avoided by planting at a later date than has been the rule hitherto. In very wet seasons the plant is liable to suffer greatly from mildew, whereby its value is greatly depreciated. Occasionally a heavy hailstorm has been known to utterly ruin the season's crop. A good crop will, however, make up for two indifferent seasons. About 15cwt. of leaf tobacco to the acre is regarded as a good crop. Before he turned his attention to hop culture, Mr. Henley was a large grower of tobacco, which he manufactured on the farm, 25 tons of manufactured tobacco being turned out yearly. At present he has entirely given up tobacco cultivation. For a long time the general crops in this district were sold to Melbourne manufacturers in the form of leaf tobacco, but the growers complained that they did not receive a fair value for their produce, and to meet this difficulty the town council gave the sum of £1,000 to encourage a Chinese firm to establish a tobacco factory in Wangaratta. This speculation answered very well, about 30 tons of manufactured tobacco being turned out of the factory per annum. Owing to one of the firm returning to China, there was a probability that the business would be discontinued, and a company has lately been formed with a capital of £2,000 to carry it on. The premises and plant of the Chinese firm have been purchased, and considerable alterations and additions will be made. The growers of tobacco in the district are the principal shareholders in the new company. As fully two-thirds of the tobacco grown in Victoria, and certainly the finest quality is grown on the Ovens and King rivers, there is a good prospect of success for the new company. The tobacco growers estimate that from 6*d.* to 9*d.* per lb. for the best quality of leaf will pay them well. Last year the price was 4*d.* per lb. The shareholders of the new company expect to do a large trade, as they will have nothing but the finest leaf tobacco in the country to work up.—*Australasian.*

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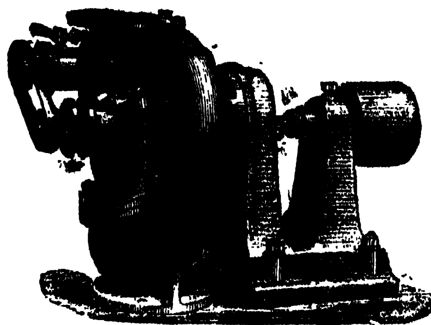
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